CLOUD – INDEX MODELLING OF SOLAR RADIATION ON THE EARTH'S SURFACE FROM SATELLITE IMAGES

BY

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A thesis submitted to the School of Postgraduate Studies, University of Lagos in partial fulfillment of the requirements for the award of Doctor of Philosophy (Ph.D.) degree in Physics

February, 2014.

SCHOOL OF POSTGRADUATE STUDIES
UNIVERSITY OF LAGOS

CERTIFICATION

This is to certify that the Thesis:

"CLOUD-INDEX MODELLING OF SOLAR RADIATION ON THE EARTH'S SURFACE FROM SATELLITE IMAGES."

Submitted to the
School of Postgraduate Studies
University of Lagos

For the award of the degree of

DOCTOR OF PHILOSOPHY (Ph.D.)

is a record of original research carried out

By:

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DEDICATION

This work is dedicated to the creator of light and source of knowledge.

“ And God said, Let there be light: and there was light” Gen. 3:3

ACKNOWLEDGEMENT

The successful completion of any project or endeavor is a thing of joy to the one who has carried it out. It is also an opportunity to reflect on the experiences one has passed through and to appreciate the contributions of individuals to this work and to the Ph.D. programme. However, I will like to first thank Almighty God the Father, His Son, our Lord and Saviour Jesus Christ and the Holy Spirit for the gift of life and knowledge, both of which are very important for any successful endeavor. I wish to appreciate the contributions of those that have greatly aided the successful completion of this work. I want to express my deep appreciation to my supervisors, Professor Chendo – who has been an encouragement right back to the days of my Masters degree programme especially in providing relevant publications and the interest in my welfare – and Dr. (Mrs.) Olorode – for the encouragement, advise and facilitating the procurement of important equipment needed for this work during her tenure as Head of Physics. I also recognize the encouragement, support and advise of my colleagues in the Department of Physics which include Dr. Oyeyemi (Postgraduate programme coordinator), Dr. Adeloye (under whose tenure as departmental Head the transaction on the equipment where completed), late Dr. Akinrimisi, Dr. Boyo, Dr. Oyebola, Prof. Njah and all others as well as Professor Ayolabi, and Drs. Oyedele and Adeoti of Geosciences Department. I wish to express my gratitude to EUMETSAT for granting me access to their satellite images archives in Darmstadt, Germany and for providing the software used for extracting image data from the images. I also wish to express my gratitude to Dr. Clair Thomas of Transvalor, Mougins, France for the data derived from Heliosat used for comparing the results obtained in this work and Chris Gueymard for granting me access to Simple Model of the Atmospheric Radiative Transfer of Sunshine (SMARTS2) software. I acknowledge the assistance of Mr. Onadeko of Government College, Sokoto for setting up the instrument for recording solar radiation in Sokoto. I want to appreciate the contributions of

family members beginning with my wife who has had to endure many occasions of my staying at the office for over three years to carry out the necessary field work and analysis as well as my mother, mother-in-law, brothers and sister for their support in prayer and encouragement. To these people and others I probably have not mentioned, I say thank you and God bless you all.

TABLE OF CONTENTS

Title Page		**i**
Certification		**ii**
Dedication		**iii**
Acknowledgement		**iv**
Table of Content		**vi**
List of Tables		**ix**
List of Figures		**x**
Abstract		**xiii**
CHAPTER 1	**INTRODUCTION**	**1**
1.1	Background to the Study	1
1.2	Statement of Problem	3
1.3	Aim and Objectives	3
1.4	Research Questions	4
1.5	Limitation of Scope of Study	4
1.6	Significance of this work	4
1.7	Operational Definition of Terms	5
CHAPTER 2	**LITERATURE REVIEW**	**8**
2.1	Solar Radiation in the Atmosphere	8
2.2	Solar Radiation Estimation on the Earth surface	11
2.3	Satellite estimates of ground-reaching solar radiation	21

2.4 Clear-sky model 38

2.5 Atmospheric Turbidity 41

CHAPTER 3 METHODOLOGY 45

3.1 Theoretical Framework 45

3.2 Materials Preparation and Methods 52

3.2.1 Characterising the atmosphere from the Earth's surface 52

3.2.2 Extraction of data from satellite images 54

3.2.3 Clear-sky radiation and atmospheric turbidity 55

3.2.4 Simple Model of the Atmospheric Radiative Transfer of Sunshine version 2.9.5 (SMARTS2) radiative transfer code 58

CHAPTER 4 RESULTS AND DISCUSSION 59

4.1 Solar radiation in a clear atmosphere 59

4.1.1 Atmospheric characterisation and clear-sky model 63

4.2 Satellite derived solar irradiance 68

4.2.1 Estimation of visible/near infra-red (V/NIR) and photosynthetically active radiation (PAR) 74

4.3 Estimating Linke turbidity factor 77

4.4 Summary of Findings 80

CHAPTER 5 CONCLUSION 82

5.1 Contributions to Knowledge 82

REFERENCES 84

APPENDIX A 94

APPENDIX B 96

APPENDIX C 97

APPENDIX D 136

LIST OF TABLES

4.1 Normalized values of mean bias error (NMBE) and root mean square error (RNMSE) for radiation estimated from satellite images 70

4.2 Comparison of the result from this work with HCL-2 (HelioClim 2) results for Faculty of Science UNILAG (lat. 6.515ºN; long. 3.400ºE) 71

LIST OF FIGURES

2.1	Diagram shows the effect of the interaction of solar radiation in the atmosphere in the downward transmission of solar radiation. Courtesy of NASA's ERBE program	**9**
2.2	Diagram shows the effect of the interaction of solar radiation in the atmosphere in the downward transmission of solar radiation (From Kiehl and Trenberth, 1997).	**9**
2.3	Solar radiation pattern showing irradiance taken at 5minutes interval from 1st January to 31st March, 2010. (CBSS / UNN weather station, Faculty of Science, University of Lagos, Akoka)	**10**
2.4	Solar radiation pattern showing irradiance variation in day for three days: 10/4/10, 20/4/08 and 20/4/09. Scattering is observed in the morning and around mid-day while the afternoon exhibit the characteristics of clear-skies (CBSS / UNN weather station, Faculty of Science, University of Lagos, Akoka)	**11**
2.5	Spectral reflectance of Vegetation, soil and water (Hashimoto *et. al.* 1999)	**20**
2.6	Spectral reflectance of different types of plants. (Hashimoto *et. al.* 1999)	**20**
2.7	Broadband reflectance for vegetation (grass) and concrete taken at Faculty of Science, UNILAG on 09/09/2012. Time range; vegetation: 13.52 – 14.53; concrete: 14.55 – 16.21.	**21**
2.8	Comparison of irradiance values calculated using Kasten's model (for Linke coefficient at airmass 2, $T_L(AM2)$ = 3.96) with measured values on 26/4/2012 at Akoka; Kasten's model largely over-estimates the radiation around peak solar period (solar noon).	**39**
2.9	Aerosol optical depth over parts of Nigeria on 26/04/2012 (Source: NASA's Science Mission Directorate - Goddard Earth Sciences (GES) Data and Information Services Center (DISC).")	**42**
2.10	Day time cloud fraction over parts of Nigeria on 26/04/2012 (Source: NASA's Science Mission Directorate - Goddard Earth Sciences (GES) Data and Information Services Center (DISC).")	**43**
2.11	Optical depth for land and ocean pixel counts (MOD08 D3 051 Area Map) for parts of Nigeria covering Lagos area (lat. 5^0 -8^0 and lon. 2^0 – 5^0) on 30/11/2011 (Source: NASA's Science Mission Directorate - Goddard Earth Sciences (GES) Data and Information Services Center (DISC).")	**44**
3.1	Lambertian surface- satellite - Sun geometry	**47**

3.2	Solar radiation interactions with the atmosphere and ground.	**48**
4.1	Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance calculated using SMARTS2 for Akoka on 30/11/2011 (appendix C)	**59**
4.2	Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance calculated using SMARTS2 for Akoka on 26/4/2012 (appendix D)	**59**
4.3	Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance in the wavelength range approximately 400nm to 1100nm corresponding to response window of satellite sensor in the HRV range, calculated using SMARTS2 for Akoka on 30/11/2011 (appendix C)	**60**
4.4	Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance in the wavelength range approximately 400nm to 1100nm corresponding to response window of satellite sensor in the HRV range, calculated using SMARTS2 for Akoka on 26/04/2012 (see appendix D)	**60**
4.5	Water vapour transmittance for Akoka on 30/11/2011 calculated using SMARTS2 (see appendix C)	**61**
4.6	Water vapour transmittance for Akoka on 26/04/2012 calculated using SMARTS2 (see appendix D)	**61**
4.7	Aerosol transmittance for Akoka at solar noon for 30/11/2011 calculated using SMARTS2 (see appendix C),	**62**
	Abuja and Sokoto	
4.8	Aerosol transmittance for Akoka at solar noon for 26/04/2012 calculated using SMARTS2 (see appendix D)	**62**
4.9	Variation of $\log_e(G / G_O)$ with cloudiness index for Akoka, Owerri, Abuja and Sokoto	**64**
4.10	Variation of $\log_e(G / G_C)$ with cloud index for all locations	**65**
4.11	Variation of $\log_e(G / G_C)$ with cloud index for all locations in the range $0 < n \leq 0.8$	**65**
4.12	Variation of $\log_e(G / Gc)$ with cloud index for all locations in the range $0.8 < n$	**66**
4.13	Comparison of clear-sky model of equation 3.39 with WMO1 model for Akoka on 30/11/2011.	**67**
4.14	Comparison of clear-sky model of equation 3.39 with WMO1 model for Akoka on 26/04/2012.	**67**
4.15	Variation of $\log_e(G / G_C)$ with satellite derived cloud index (n') for all locations	**68**
4.16	Variation of satellite derived cloud index (n') with cloud index from ground data	**69**
4.17	Solar irradiance day profile for Akoka on 3/12/2011	**72**
4.18	Solar irradiance day profile for Owerri on 3/3/2012	**73**

4.19	Solar irradiance day profile for Sokoto on 15/6/2012	**73**
4.20	Variation of measured values of both V/NIR with global solar radiation (14^{th} – 21^{st} September, 2011)	**75**
4.21	Variation of measured values of both PAR with global solar radiation (20^{th} – 30^{th} November, 2011)	**75**
4.22	Relationship between estimated and measured V/NIR	**76**
4.23	Relationship between estimated and measured PAR for 30/11/2011	**76**
4.24	Variation of Linke factor with cloud index observed under clear sky	**77**
4.25	Graphical presentation of measured and estimated Linke turbidity factor for all locations.	**78**

ABSTRACT

This work is focused on the extraction of ground-reaching solar radiation from satellite images. The present methods center mainly on the clear-sky scenario; this work addresses this by developing an all sky approach. The methodology for extracting ground-reaching solar radiation from satellite images has been conceptualized such that a cloud index based model was developed for a two-stage process to address the all-sky condition. The first stage involved characterizing the atmosphere with respect to its solar radiation transmitting property. Solar radiation measurements were taken at different locations in Nigeria during various seasons of the year for this purpose. These measurements make up the data from which ground cloudiness indices were calculated. The characteristic curve, with respect to extra-terrestrial radiation, for the atmosphere was obtained by plotting $\log_e(G/G_O)$ against the calculated cloudiness index where G and G_O are measured ground-reaching solar radiation and extraterrestrial radiation respectively. The ground-reaching radiation may be global solar radiation or spectral components of solar radiation in the visible spectrum or visible / near infra-red spectrum. The clear sky transmittance was applied in the formulation of a clear sky model. The clear sky model was applied in characterising the atmosphere by plotting $\log_e(G/G_C)$ against the calculated cloud index The next stage of the process involved analysing the reflectance for some locations in Nigeria in level 1.5 images of the Earth and calculating the satellite cloud index from each image. The reflection in each pixel of the images is presented as digital count and percentage albedo. The cloud index was determined from the observed reflectance and the reflectances for the reference clear and cloudy atmospheres. The reflectance for the reference clear atmosphere was determined from the digital count while that for cloudy atmosphere was taken as the highest possible reflectance that the satellite's sensor can register for a given elevation of the Sun. The atmosphere was also characterized with respect to the derived satellite cloud index. This model was compared with the modified Kasten clear sky model to enable the correlation of the cloud index derived from satellite images with the attenuating term in the Kasten clear-sky model. This was applied to satellite images to estimate Linke turbidity factor, T_L for Akoka/Lagos. The results obtained from the method in this work show that the normalized root mean square error (NRMSE) and normalized mean bias error (NMBE) ranges from 0.0667 to 1.4546 and 0.0104 to 0.1819 respectively. The NMBE and NRMSE of the spectral components, visible/near infra-red (V/NIR) and photosynthetically active radiation (PAR), are 0.0620, 0.0812 and -0.0750, 0.2568 respectively. The NMBE and NRMSE of the estimated values for Linke turbidity factor are 0.0013 and 0.2453 respectively. The results obtained from our method compare favourably with results obtained from Solar Data based on Heliosat method – HelioClim. The originality of this work lies in the fact that it presents a novel approach of exploiting satellite images in the estimation ground-reaching solar radiation and the extraction of information about atmospheric turbidity. An empirically

derived clear-sky model that agrees with observed clear sky profile is an outcome of the method proposed in this work.

CHAPTER 1

INTRODUCTION

1.1 Background to the Study

The estimation of the amount of solar radiation reaching the Earth's surface plays an important role in the utilization of the Sun's energy. The amount of solar energy reaching the Earth at any given time depends on atmospheric and astronomical factors. The utilization of solar radiation requires the knowledge of how much of it is available at any given location and for specific periods – during the day and throughout the year.

The amount of solar radiation can be determined either by measuring it or estimating it through other physical parameters. A number of methods for estimating the amount of solar radiation reaching the Earth's surface have been developed. These methods include modification of Angstrom's formula (proposed in the mid-1920s) for estimating global solar radiation which depends on sunshine duration by Page (1961) among others. Liu and Jordan (1960) presented a modified form of Angstrom's formula for estimating the diffuse component of solar radiation. Linke, in 1922, proposed the turbidity coefficient (known by his name) for describing the degree of transparency of the atmosphere. This allows for the calculation of solar radiation that would reach the Earth's surface under a transparent atmosphere. Also, other authors have developed models which depend on meteorological parameters such as temperature, humidity, cloud cover, atmospheric pressure along with site-specific parameters such as latitude and elevation; the aim in some cases have been the improvement of the model's performance. These methods, along with others that were developed later, were used for estimating the monthly mean daily solar radiation.

Satellite based assessment of solar radiation reaching the Earth's surface began in the 1960s (Hanson *et. al.*, 1967; Hanson, 1971; Vonder Haar and Ellis, 1975; Tarpley, 1979). The development of this method was made possible through technological advancements from the

early 1960s when the first meteorological satellite was launched into space. The significance of this method is the spatial and temporal coverage it offers for the assessment of the amount of the Sun's energy reaching the Earth's surface. It represents one of the promising methods for solar energy assessment as well as environmental monitoring, climate recording and much more. The potentials of satellite based assessment is more apparent when the cost of ground based stations for radiation measurement is considered and the fact that some organisations charged with the maintenance of these stations are being faced with challenges of keeping up with the demands of such stations especially in the developing world.

Research works have been carried out by various scientists on estimating ground-reaching solar radiation over Africa through models developed for global application. According to the authors (Rigollier *et. al.*, 2004; Mueller *et. al.*, 2004), these models do not require tuning with ground data but are dependent on turbidity values obtained from ground stations and other satellites.

This work considers various aspects of solar radiation estimation with regards to estimating ground–reaching solar radiation from satellite images based on solar radiation measurements taken at four locations in Nigeria, for specific days. Verification of the results obtained from the model proposed in this work was carried out with solar radiation measurements taken at the same locations: these locations are Akoka (lat. 6.515^{O}N, long. 3.399^{O}E), Owerri (lat.5.48^{0}N, long.7.06^{0}E), FCT Abuja (lat.8.84^{0}N, long.7.04^{0}E) and Sokoto (lat.13.03^{0}N, long.5.26^{0}E). The model proposed in this work provided us the opportunity of exploring other uses of satellite images, specifically, in the assessment of atmospheric turbidity. In this regard, the application of satellite images for estimating Linke turbidity factor for Akoka has been considered. Linke turbidity factor can be applied in the estimation of both direct and diffuse solar radiation.

1.2 Statement of Problem

The earlier methods for estimating solar radiation from satellite images were based on geometrical factors and tuning the method to each location. The need for improvement led to the introduction of atmospheric turbidity clear sky model into the assessment process. Though these methods are independent of location, they require explicit knowledge of the parameter of turbidity for the clear sky model – a parameter that may not be available from ground-measurements for many locations in Nigeria. The assumption is that satellite based assessment should be mainly dependent on the data generated from its images. This raises the following issues:

(a) A description of the transmission of solar radiation through the atmosphere from ground-measurements of solar radiation in such a way that it is independent of location;

(b) The need to develop site-independent process for estimating ground-reaching solar radiation from only satellite image data;

(c) Lack of information, locally, about atmospheric turbidity arising from lack of relevant data of solar radiation such as minute or hourly time-series solar radiation measurements.

1.3 Aim and Objectives

The aim of this research is to estimate ground – reaching solar radiation from satellite images. The objectives of this work are to:

(a) develop a site-independent cloud index model for the characterisation of the atmosphere;

(b) determine the amount of ground-reaching solar radiation from satellite images;

(c) develop a method for estimating Linke turbidity factor from satellite images.

1.4 Research Questions

In considering the works of other researchers and our stated objectives, we have articulated the process necessary for achieving our objectives. This is mainly through continual assessment of the procedure we have adopted and our expected outcome. This makes it necessary to outline the following research questions;

(a) What other approach can be explored to model the cloud index such that it assumes the role of an attenuating term in a model of the form of Beer – Lambert type of equation (i.e. $G = G_0 \exp(m \ .T_L \ . \ d)$) where it can be used to characterise the atmosphere and yield the same result that is independent of location?

(b) How can the solar irradiance on the Earth's surface be estimated from satellite images through a different approach that involves the use of a site-independent atmospheric characterisation model?

(c) What correlation (if any) exits between cloud-index and the attenuating term in Kasten's clear sky model and can it aid in estimating Linke turbidity factor?

1.5 Limitation of Scope of Study

The following represents the scope of this work:

(a) Satellite data in the high resolution visible (HRV) channel have been applied in this work.

(b) The period of the day covered in this work is from 8:00a.m to 5:00p.m local time.

1.6 Significance of this work

The significance of this work is in three fold; this work:

(a) addresses the issue of characterising the atmosphere by developing a cloud index based model that is easier to apply to different geographic locations and atmospheric conditions: the main outcome being the formulation of a clear sky model for Akoka;

(b) proposes a new method of utilising the cloud index from satellite images to estimate the solar irradiation at the surface of the Earth that will cover all sky conditions and will be at least as accurate as - if not better than - some of the current methods;

(c) provide more information about the atmosphere through the estimation of Linke' turbidity coefficient. This will make it possible to determine the direct solar radiation and global solar radiation for other locations (especially in Nigeria).

1.7 Operational Definition of Terms

(a) **Albedo** is the fraction of the total solar radiation that is reflected by the Earth to space.

(b) C**learness index. (K_T)** is the ratio of global solar irradiation on a horizontal surface on the Earth to the solar irradiation on a horizontal surface at the top of the atmosphere.

(c) **Clear – sky index. (Kc)** is the ratio of the global radiation on a horizontal surface to the global solar radiation for a clear-sky on the same surface

(d) **Cloud index (n)** is the ratio of the difference between the clear sky solar radiation and observed global solar radiation to the extra terrestrial solar radiation (note: n' denotes satellite derived cloud index)

(e) **Cloudiness index** is the ratio of the difference between extra terrestrial solar radiation and observed global solar radiation to the extra terrestrial solar radiation.

(f) **Diffuse solar irradiation** refers to solar irradiation that reaches the Earth's surface after being scattered by the atmosphere.

(g) **Digital counts** are the numbers registered by the satellite in response to solar radiation reaching its sensor – it is proportional to the radiation reaching the sensor and it ranges from zero to 255.

(h) **Direct solar irradiation** refers to solar irradiation that is unaffected by the atmosphere through the mechanism of absorption and/or scattering as it reaches the Earth's surface.

(i) **Global solar irradiation** is the sum of the components of direct solar irradiation and diffuse solar radiation.

.(j) **Global solar irradiance** is the sum of components of direct solar irradiance and diffuse solar radiance.

(k) **Lambertian surface** is the reflection from an ideally diffusely reflecting surface such that the observed radiant intensity from an ideal diffusely reflecting surface is directly proportional to the cosine of the angle θ between the observer's line of sight and the normal to the surface given as

$$\frac{I}{I_o} = \cos \theta \qquad (1.1)$$

where I is the observed radiant intensity and Io is the incident radiant energy on the surface.

(l) **Linke turbidity factor, T_L ,** is an atmospheric parameter that determines the number of clean and dry atmospheres that will produce the same attenuating effect on solar radiation as that observed for a given atmosphere.

(m) **PAR - Photo-synthetically Active Radiation** is the solar radiation spectrum in the range of wavelength approximately 400nm – 700nm

(n) **Radiance, *L,*** is the radiation calculated from the digital count expressed as

$$L = m\,C + n \tag{1.2}$$

where m and n are the calibration coefficients of the satellite's sensor.

(o) **Reflectance, ρ,** is the apparent albedo observed by the satellite's sensor for a given pixel *(i,j).* It is the bidirectional reflectance assuming the Lambertian hypothesis

$$\rho(i,j) = \frac{\pi L(i,j)}{\varepsilon . I . \sin \gamma_s} = \frac{\pi L(i,j)}{\varepsilon . I . \cos \theta_s} \tag{1.3}$$

where L is the radiance, ε is eccentricity of the Earth, I is the band solar irradiance at one *Astronomical Unit (AU)*, γ_S is the Sun's elevation angle and θ_S is the Sun's zenith angle.

(p) **Solar radiation** is the radiant energy from the Sun.

(q) **Solar irradiance** is the instantaneous radiant energy (or radiant energy per unit time) per unit area on the surface on which it is incident.

(r) **Solar irradiation** is the radiant energy per unit area on the surface on which it is incident.

(s) **V/NIR - Visible/near infra-red** is the solar radiation spectrum in the range of wavelength approximately 530 – 2500nm

CHAPTER 2

LITERATURE REVIEW

Solar radiation travels through space, from the Sun to the Earth. The intensity of solar radiation outside the Earth's atmosphere (or at the top of the atmosphere) depends on the Sun – Earth distance. However, an understanding of the processes involved in the transmission of solar radiation through the atmosphere requires a detailed look at the interaction of solar radiation with the constituents of the atmosphere.

2.1 Solar Radiation in the Atmosphere

Solar radiation is depleted in a very clear atmosphere by three distinct processes; these are

- selective absorption by water vapour, molecular oxygen, ozone and CO_2 at certain wavelengths
- Rayleigh scattering by molecules of different gases and dust particles in the atmosphere
- Mie scattering

The following figures describe the proportion of the Sun's energy at various stages in the atmosphere as well as the resulting long wave emission in a clear atmosphere. The downward transmission of the Sun's energy is affected by the atmosphere and cloud. Note the closeness in the estimates presented for solar energy absorbed by the atmosphere and reflected by the cloud. The reflection from the ground in Figure 2.1 is twice that in Figure 2.2.

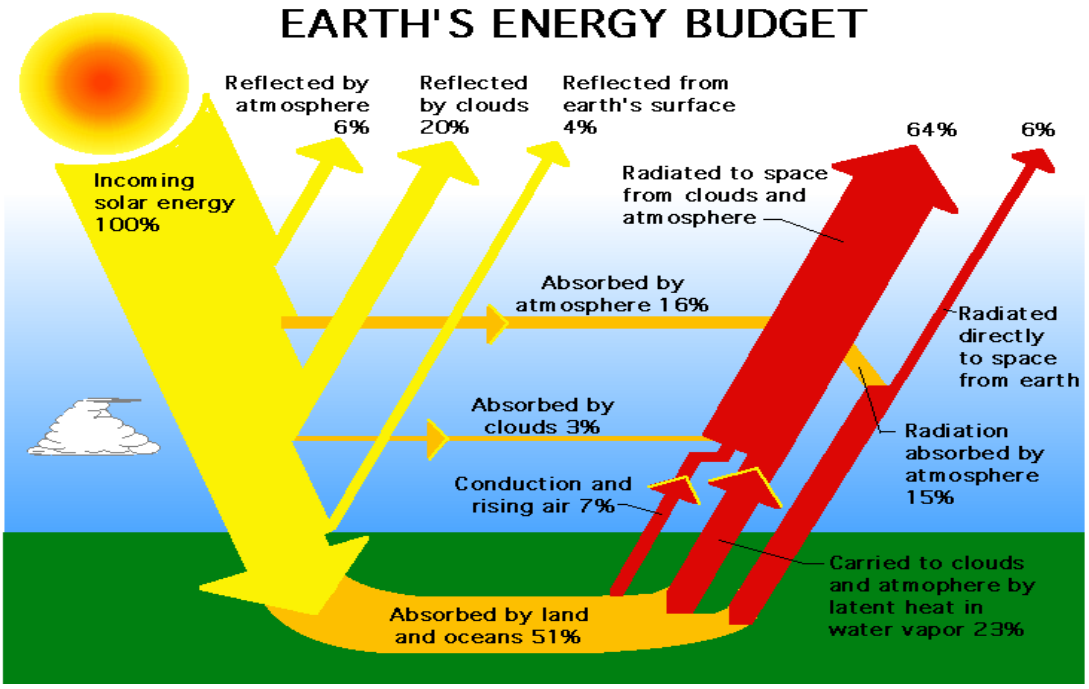


Figure 2.1 Diagram shows the effect of the interaction of solar radiation in the atmosphere in the downward transmission of solar radiation. Source: National Aeronuatic and Space Administration (NASA) Earth Radiation Budget Experiment (ERBE) program.

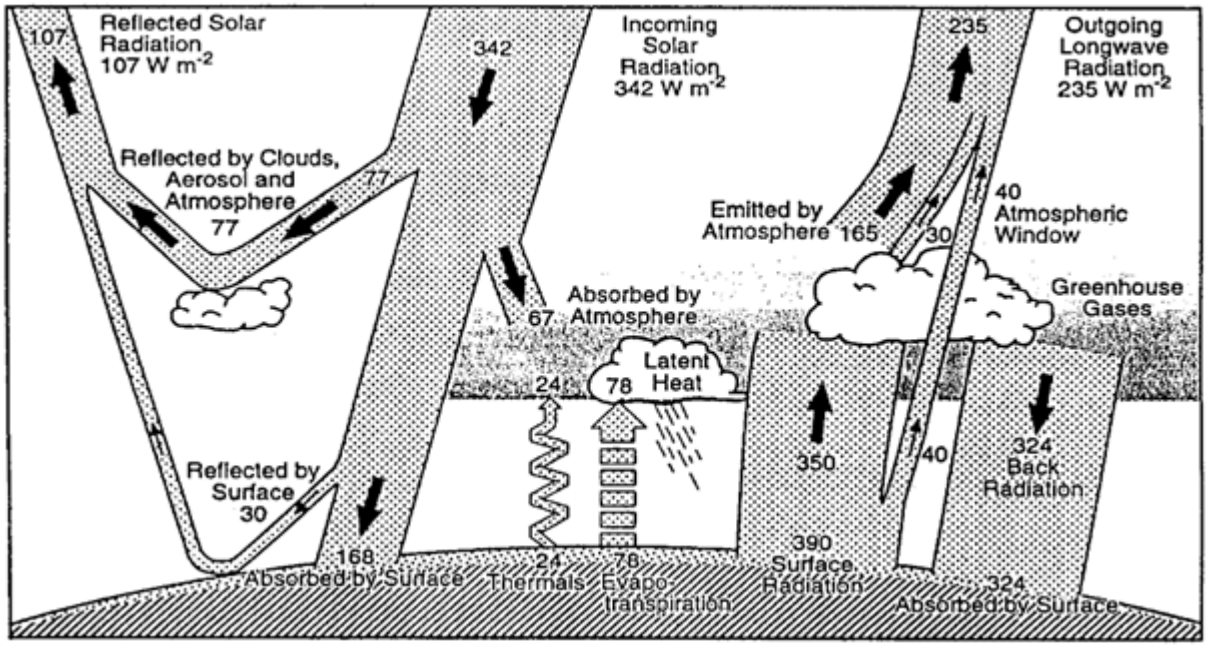


Figure 2.2 Diagram shows the effect of the interaction of solar radiation in the atmosphere in the downward transmission of solar radiation. (From Kiehl and Trenberth, 1997)

The scattering of solar radiation by gas molecules / particles of much smaller dimension when compared with the wavelength of the radiation takes place in accordance with Rayleigh's theory which indicates that the scattering coefficient is of the order of λ^{-a} where λ is the wavelength of the radiation. About half of the scattered radiation is sent back to space while half is directed downwards to the Earth surface as diffuse radiation. The scattering of radiation by particles of dimensions that is much larger that the wavelength of the radiation constitute Mie scattering. The radiation in this case experiences real scattering and absorption. The scattered radiation is directed towards the Earth surface in form of diffuse radiation. The degree at which this takes place (along with variation in Sun-Earth distance) can be observed in a typical profile of the ground-reaching solar radiation. The variation of available solar radiation in a clear atmosphere depends on atmospheric turbidity and solar altitude. Heermann *et. al.* (1984) estimated daily clear-sky solar radiation for some locations in the United States. It was reported that when data for atmospheric turbidity were not available, the latitude and altitude may be used to calculate the clear-sky radiation. A similar situation will normally be observed for a day variation. The following profile shows the pattern for three days.

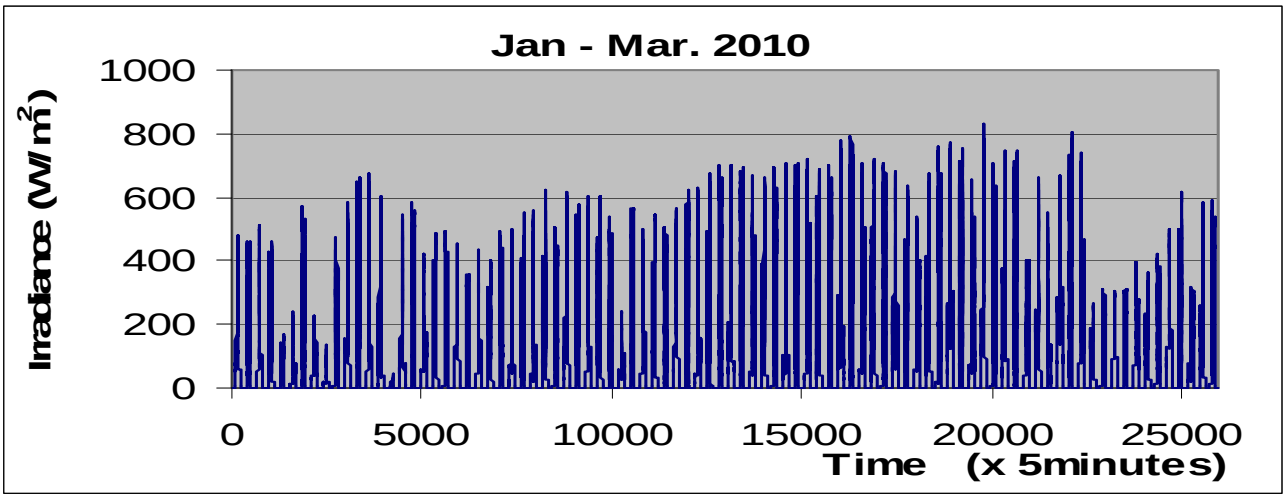


Figure 2.3 Solar radiation pattern showing irradiance taken at 5minutes interval from 1st January to 31st March, 2010. (CBSS / UNN weather station, Faculty of Science, University of Lagos, Akoka)

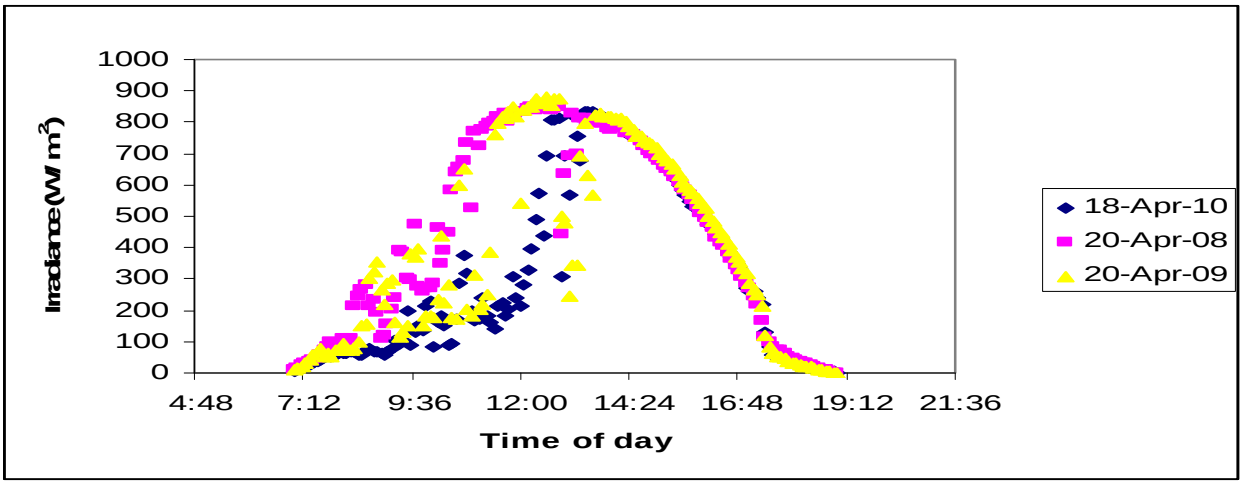


Figure 2.4: Solar radiation pattern showing irradiance variation in day for three days: 10/4/10, 20/4/08 and 20/4/09. Scattering is observed in the morning and around mid-day while the afternoon exhibit the characteristics of clear-skies (CBSS / UNN weather station, Faculty of Science, University of Lagos, Akoka)

The degree of scattering in the atmosphere determines the amount of solar radiation that reaches the Earth's surface.

2.2 Solar Radiation Estimation on the Earth surface

The ideal procedure for assessing the amount of solar radiation reaching the Earth surface is through the taking of measurements. Ground-based measurement of solar radiation began early in the 20th century and early estimates of extra-terrestrial radiation were made by extrapolating ground measurements (Iqbal, 1983). Measuring instrument (usually located in meteorological stations) provide data on the amount of the components solar radiation for various applications. Rietveld (1978) noted that there are a limited number of meteorological stations where solar radiation is measured. This remains the situation presently. The number of stations world-wide that make up the network of the United States National Oceans and Atmospheric Administration (NOAA) involved in solar radiation measurement were considered and it was observed that many

countries do not have a station. For this reason, the amount of solar energy is estimated on the basis of other meteorological data which are easier to measure (Rietveld, 1978). According to Iqbal (1983), from limited solar radiation measurement, empirical models can be developed to predict the availability of solar energy at other locations.

One of the first attempts at estimating global solar radiation was made by Angstrom in 1924 through the use of sunshine hour (Rietveld, 1978). Angstrom suggested a linear relationship between global solar radiation and sunshine duration and introduced the formula (Rietveld, 1978; Page, 1961)

$$R_g = R_O(\alpha + (1-\alpha)\frac{S}{S_O}) \qquad (2.1)$$

where Rg = daily amount of global solar radiation;

Ro =daily amount of solar radiation on a perfectly clear day;

S = number of sunshine hours measure by a sunshine recorder;

S_O = maximum number of sunshine possible on the day and place in question

α = a constant.

The major objection to this equation is the arbitrariness in the definition of the term R_O whose value was difficult to determine. The value of R_O for various perfectly clear days may vary considerably due to differences in the moisture and dust content of the atmosphere. Prescott, in 1940, modified the original Angstrom formula by replacing R_O with the short wave radiation received at the top of the atmosphere (Rietveld, 1978)

$$R_g = R_a(a + b\frac{n}{N}) \qquad (2.2)$$

where Rg = daily amount of global solar radiation

Ra = short wave radiation received; at the top of the atmosphere

n = number of sunshine hour measured by sunshine recorder

N = astronomically determined day length

a = fraction of Ra reaching the earth's surface; on a completely cloud – covered day;

b = fraction of Ra absorbed by the clouds on a completely cloud – covered day.

This formula was widely applied in the estimation of monthly mean day solar irradiation because sunshine hour measurements were recorded in many meteorological stations. The accuracy of the result obtained with equation (2.2) depends on the accuracy with which the coefficients *a* and *b* were estimated. Attempts at universal application of this equation were not successful due to limitations in the accuracy of estimating these coefficients. Investigations showed that the relationship between daily global solar radiation and the fraction of possible sunshine considered on the basis of individual daily value is not linear as suggested by equations (2.1, 2.2) (Page, 1961). The linear relationship was observed by Page (1961) only when equation (2.2) was applied to a few days ranging from ten days to one month. Some efforts were made to improve on the performance of equation (2.2); these includes those by Page (1961), Liu and Jordan (1960) and later Rietveld (1978). Page (1961) applied equation (2.2) in deriving solar radiation on inclined surfaces and determined the diffuse and direct components of solar radiation from the calculated global solar radiation. Rietveld (1978) proposed a method for estimating the regression coefficients *a* and *b* in equation (2.2). The method considered the nature of the variation associated with these coefficients. Observations by Rietveld (1978) show that the coefficients a and b are related linearly and hyperbolically, respectively, to the appropriate mean value of n/N. Equation (2.2) (which is also described as Angstrom–type equation) has been applied in the estimation of available average monthly global solar radiation in some locations in Nigeria by Arinze and Obi (1983), Ezeilo (1985), Awachie and Okeke (1985) among others. Jackson and Akuffo (1991) have applied sunshine duration for estimation monthly average global solar radiation in Kumasi. A modified form of this equation was applied by Sambo and Doyle (1986) to estimate global and

diffuse solar radiation for some cities in Nigeria. Liu and Jordan (1960) modified equation (2.2) to obtain the relationship between the beam and diffuse components of global solar radiation. This essentially maintains the linear relation between Rg and n/N. Maduekwe and Chendo (1995) made an attempt at determining the relationship between beam and diffuse solar irradiation using the ratio of sunshine hour to astronomical day length n/N. They observed that a correlation exists between records of bright sunshine hour and the daily and monthly component of the total hemispherical solar radiation for Lagos, Nigeria. Maduekwe and Chendo (1997) developed four new models which includes the predictor in the Angstrom – type model (H/Ho) for diffuse and beam fraction. Their result showed that their model improved on the result from the Angstrom - type model by over 25% .

Attempts exist in literature by various researchers at proposing models through the correlation of solar radiation with meteorological and geometrical parameters. Bindi and Miglietta (1991) presented a model for estimating global solar radiation from air temperature and rainfall measurements. They applied their model to a number of locations in Europe and the United States of America. The percentage relative error for the various locations ranged from 22.3% to 33.2%. This error range is significant for energy applications when it is considered that they are computed for daily values. Al Riza *et. al.* (2011) presented methods for estimating hourly radiation from ambient temperature and relative humidity. The first method involved the use of decision matrix from measured relative humidity and ambient temperature data while the second method was by using relative humidity – clearness index, clearness index – beam atmospheric transmission and beam atmospheric transmission – relative humidity correlations. Their results show that the first method yielded better result – a correlation coefficient between estimated and measured values of 0.97 and RMSE of 87.6W/m^2 (or NRMSE of 8.2%) was achieved. Al Riza *et. al.* (2011) tried to predict missing portions of a time series data using empirical methods. Although the input

parameters were diversified to include site-specific data, a large scale application to various locations may bring out a typical limitation in these methods – a larger error compared to that for a single site. The need for proper characterisation of the atmosphere with respect to its ability to transmit solar radiation has made it necessary to revisit a term proposed earlier by Angstrom in 1924 - Ro (the daily amount of solar radiation on a perfectly clear day). The characterisation of the atmosphere with respect to Ro requires a study of the behaviour of atmospheric constituents and how this affects solar radiation transmission. This is referred to as cloudless sky (or clear sky) condition and it has received the attention of many authors including Iqbal (1983), Iniechen and Perez (2002), Gueymard (2003a, 2003b) etc.

The increasing utilization of solar radiation in the field of energy generation and efficiency, among others, has made it necessary to explore other methods of assessing the amount of solar radiation reaching the Earth's surface. Methods involving the use of meteorological parameters such as temperature (Hargreaves and Samani, 1982) have been used for Agriculture and passive solar energy applications. These methods, along with those adopted earlier have some common features – they were largely empirical and involved data gathering on location basis while in some cases, the methods developed showed strong bias in favour of the locations whose data were used for developing the models. Li *et. al.* (2011) examined the performance of some proposed models that need only sunshine duration for estimating global solar radiation on a horizontal surface. These models are linear, quadratic, cubic, logarithmic, linear logarithmic, exponential, linear exponential and power proposed by various authors. It was reported that these models were applied to data from four locations in Tibet, China and these models were evaluated using error indices such as correlation coefficient r, MPE, MBE, RMSE, and Nacth-Suitcliff error (NSE). It was noted that no location returned the best value for all the error indices both for daily data and monthly mean daily

data. The data covered a fourteen year period. The results reveal the dependency of empirical models proposed for solar radiation estimation on location.

Sometime in the 1990s, there was renewed interest in artificial neural networks and after the year 2000, it was introduced as a method for the estimation of solar radiation reaching the Earth's surface by some researchers. Research works in this regard include those of Dorvlo *et. al.* (2002), Reddy and Ranjan (2003), Soares *et. al.* (2004), Zarzalejon *et. al.* (2005) and Moustris *et. al.* (2008). Dorvlo *et. al.* (2002) investigated both Radial Basis Function (RBF) and Multilayer Perception (MLP) artificial neural networks using data from eight stations in Oman. The inputs to the networks were latitude, longitude, altitude, sunshine ratio and month of the year while the output was the clearness-index. The ground-reaching solar radiation was obtained by multiplying the clearness-index with the extra-terrestrial solar radiation. They trained the networks with data from six stations and validation was carried out using the remaining two stations. The performance of the networks was assessed using RMSE and they were stated for MLP with different number of layers as well as for RBF in the units of radiation ($MJ/m^2/day$). The MLP with one layer presented the smallest RMSE of 1.01 $MJ/m^2/day$ and the range of RMSE of 1.01 to 9.41$MJ/m^2/day$. The validating stations had mean day solar radiation of 21.01 $MJ/m^2/day$ and 19.25 $MJ/m^2/day$. The RBF network range of RMSE was 0.83-10.08 $MJ/m^2/day$. The validating stations had mean day solar radiation of 21.01 $MJ/m^2/day$ and 20.08 $MJ/m^2/day$. The best percentage RMSE are 4.8% and 3.6% for MLP and RBF respectively while the worst values are 57.5% and 66.4%, also for MLP and RBF respectively. The range of error from this result is quite large. A similar pattern was observed in the result for global irradiance for Thessaloniki from Moustris *et. al.* (2008). Their result showed a range of 0.5% to 54.7% for hourly global solar radiation. This range of error may significantly affect the confidence in the result from ANN. Reddy and Ranjan (2003), working with annual data from eleven locations obtained results with less than 15% error. They

used geographic location, meteorology and time as input data while the output is hourly global radiation. One limitation to the wide application of this ANN is the requirement of meteorological data such as wind-speed and rainfall among others.

The Earth's surface is opaque to the Sun's radiation. The Sun's radiation is either absorbed or reflected (or both absorbed and reflected) when it falls on an opaque object. The albedo expresses the amount of radiation that is reflected away from the Earth. It is for this reason that the Earth's surface and objects on the Earth appear bright when viewed from space.

Shortly after the launching of the first meteorological satellite in the early 1960s, some researchers started working on the possible exploitation of images from the satellite for the determination of the amount of solar radiation reaching the Earth surface. The efforts of Hanson *et. al.* (1967), Hanson (1971), Vonder Haar and Ellis (1975), Tarpley (1979), Gautier *et. al.*(1980) and Cano *et al.* (1986) are noted in this regard. The work of Cano *et al.* (1986) served as the basis for the scheme for exploiting satellite data for determining ground-reaching solar radiation known as Heliosat I. In recent years, some researchers have taken a look at the principles on which the work of Cano and others was based (i.e. *Heliosat 1*) and have come up with methods of enhancing the results obtained in *Heliosat I* (Diabate *et. al.*, 1989; Beyer *et. al.*, 1996; Iniechen and Perez, 1999; Hammer *et. al.*, 2003; Rigollier *et. al.,* 2004; Mueller *et. al.* 2004). The efforts of Rigollier *et. al.,* (2004) and Mueller *et. al.* (2004) come under the *Heliosat* programme comprising of *Heliosat II* and *III* respectively. *Heliosat II* method sought to replace the un-calibrated digital counts with calibrated radiances. This method, like Heliosat I, depends on the construction of a cloud index and relating it with the clear sky index. A radiation map (of clear sky) is used in the determination of important parameters for calculating the cloud index and the clear-sky index for different ranges of value of cloud index (Rigollier *et al.,* 2004).

The equation used in the calculation suggests that the relationship between clear-sky index, and cloud index depends on the operational value of the cloud index. A closer consideration for this work led to a suggestion that rather than fitting of values for the clear sky index, some inputs could be made into the clear sky model from the satellite such that the determination will be based only on cloud indices. The implication here is that the expression for estimating the amount of ground-reaching solar radiation will be only in terms of only the cloud index. The authors made effort towards eliminating the need for empirical fitting with ground measured data as this was one limitation they observed in the earlier method. The inclusion of Linke turbidity factor improved on the calculation of the clear-sky radiation. It should be noted that the radiation data for the estimation of turbidity is not available locally for many parts of our country. Available online data are usually long term and on a global scale such as daily or monthly averages. This may be a limitation on the application of this method.

At about the same period Rigollier *et al.* (2004) published their work , another group (Mueller *et al.*, 2004; Dagestad, 2005) presented a different approach on how to determine the amount of solar radiation using cloud cover from satellite images. This method, referred to as *Heliosat III* (Mueller *et al.,* 2004), is based on radiative transfer code approach using the SOLIS clear sky module or radiative transfer module (RTM). It includes the use of some parameters such as atmospheric aerosol and water vapour. Cloud cover information from satellite images that have been estimated using software or cloud index from the method *Heliosat I* served as input for calculating clear-sky conditions. The program is executed to obtain the solar radiation reaching the ground. The results reported show that a very high level of accuracy for both global and direct radiation was achieved from the data for the six locations considered. The mean bias deviation (MBD) and root-mean-square deviation (RMSD) for direct and global radiation were reported as -0.2% and 2.3% for direct radiation and 0% and 4% for global radiation. As impressive as this results appear, they

agree with the usual pattern for clear-sky conditions; this is the normal characteristics of a good RTM. However, the real test is when cloudy conditions are considered – this was not reported. Also, the extensive use of atmospheric data, though a major contributor to the achieved results (which include spectral content determination), may be a limitation in applying this model in our environment.

The approach adopted by these authors involved the determination of cloud indices from the images of the Earth. Pixels in images of the Earth were analyzed for brightness to determine the cloud amounts. This was compared with clear pixels to obtain the cloud index. This process was improved upon with the application of software for extracting information about cloud cover by determining the reflectance of cloud and the reflectance of a clear atmosphere.

The assessment of solar radiation on the Earth's surface falls in the class of remote sensing referred to as Visible and Reflective Infra-red remote sensing (Hashimoto, 1999). The atmosphere and ocean are translucent. They transmit a portion of light while absorbing or reflecting the rest. The sensors on meteorological satellites are known as radiometers. They are designed to take advantage of the atmospheric window that transmits solar radiation. These instruments measure radiation brightness in narrow wavelength bands referred to as channels. Eumetsat's second generation satellites such as meteosat – 9 (just like other satellites such as GOES) have twelve channels. These channels are visible, infra-red, water vapour and high resolution visible (Conway, 1997).

The reflectance observed in a clear atmosphere comprises of that due to the atmosphere and the Earth's surface. For very clear-skies, a greater portion of the Earth's albedo is made up of solar radiation reflected from the Earth's surface. Knowledge of the reflection from landscape is therefore important. Satellite images for parts of Sub-Sahara Africa suggest the prevalence of vegetation (Appendix A). This is expected to have a greater effect on the counts registered by the

sensor. Figure 2.5 shows the reflectance of various constituents of a landscape. The reflectance is very low for clear river water and in fact, deceases with increasing wavelength. The reflectance of vegetation is low in the visible spectrum but increases sharply beyond this spectrum. A detailed response can be seen in Figure 2.6 for different types of plants (Hashimoto, *et al.*, 1999). The reflectance is quite low for various plants due to the absorbance of parts of the visible spectrum for energy production in green leaves. This is significant considering that the satellite response is in the range of approximately 5.8um to 7.2um with the peak of about 6.3um.

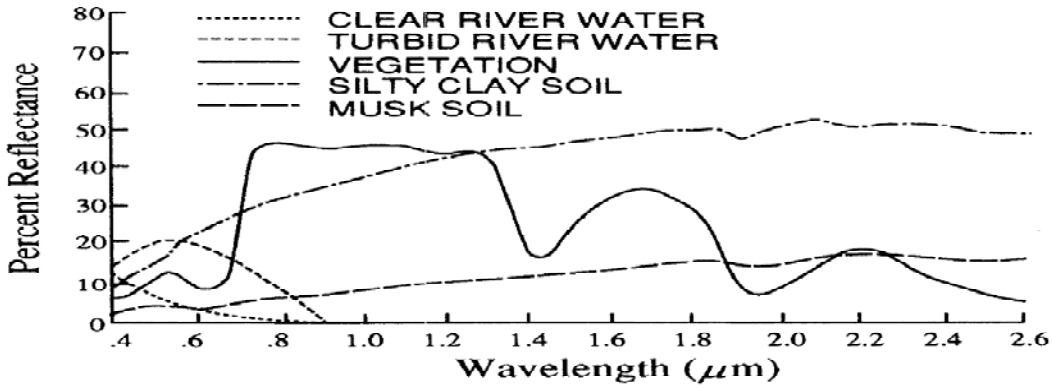


Figure 2.5: Spectral reflectance of Vegetation, soil and water (Hashimoto *et. al.* 1999)

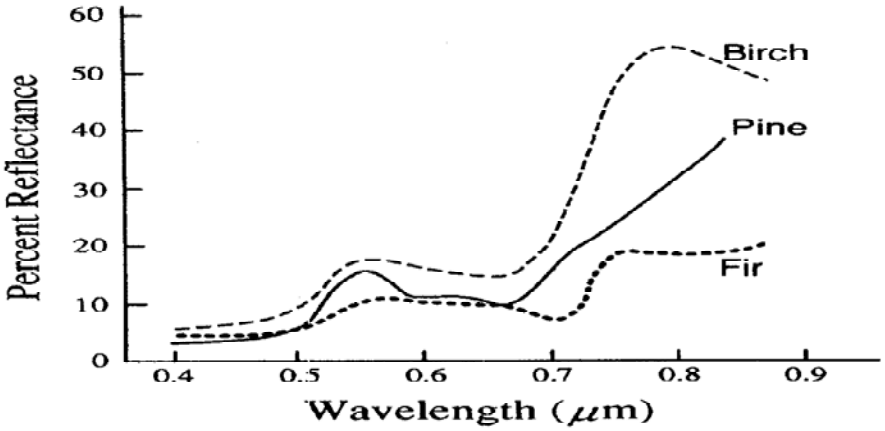


Figure 2.6: Spectral reflectance of different types of plants. (Hashimoto *et. al.* 1999)

Appendix B shows the percentage albedo for some features in satellite images of the Earth. An experiment was carried out to measure the reflectance of vegetation and concrete at the faculty of Science, University of Lagos to assess the broadband reflectance of these surfaces. Our observation is as shown in Figure 2.7.

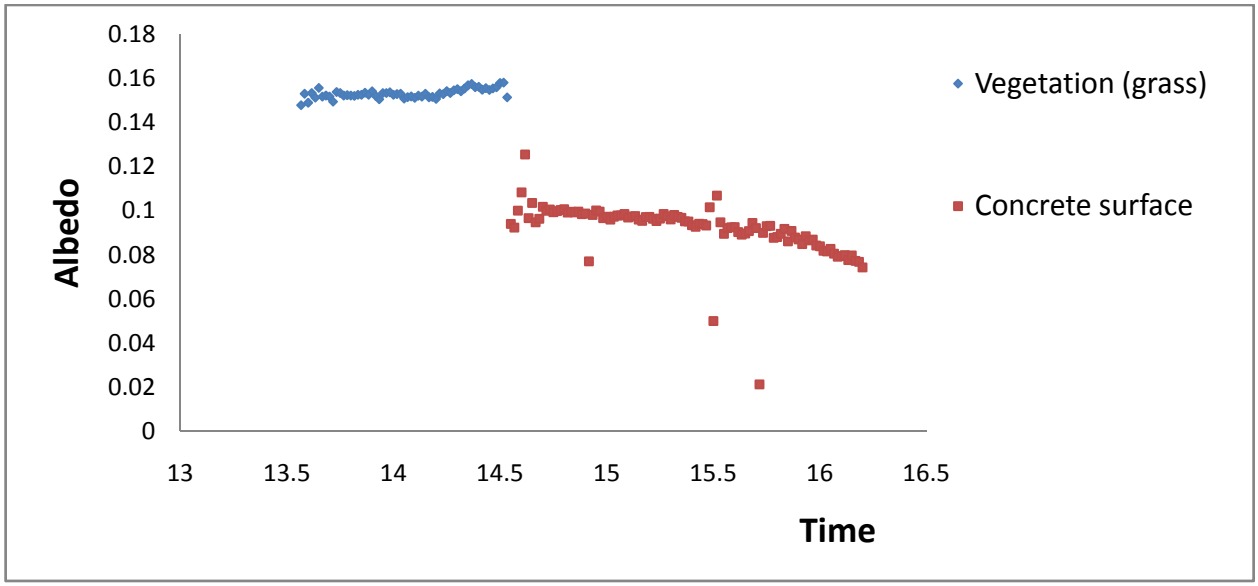


Figure 2.7: Broadband albedo for vegetation (grass) and concrete taken at Faculty of Science, UNILAG on 09/09/2012. Time range:- vegetation: 13.52 – 14.53 local time ; concrete: 14.55 – 16.21 local time.

It was observed that vegetation (grass) presented a higher albedo. This may be due in part to the poor absorption of wavelengths beyond the visible spectrum.

2.3 Satellite estimates of ground-reaching solar radiation

Tarpley (1979) presented the report of the Great Plains experiment which was undertaken by the National Environmental Satellite Service (NESS) and the Great Plain Agricultural council (GPC). The experiment involved determining if incoming solar radiation at the Earth surface can be determined from geostationary satellite data. The experiment entailed the collection of coincident

satellite, conventional meteorological and pyrometer data for the region of the US Great Plains. This was for the summer of 1977 (from 1st of June to 15th of August). The data from GOES satellite were used in the experiment. The GOES satellite was located on the equator at longitude 75^0W and the observing instrument on this satellite was the VISSR which made observations in the visible region (0.55 – 0.75μm) at 30 minutes intervals. Visible data, in the picture resulting from the scan, were in form of counts ranging from zero to 63 which gave a measure of the relative brightness. The visible channel on the VISSR was not properly calibrated. Tarpley (1979) did not convert the counts obtained to radiance for this reason. The satellite derived quantities were applied in describing cloud conditions and the total radiation at each target in the region. The mean target brightness measures the radiation reflected from each target. Pictures were processed as they were received. The processing required that cloud-free pixels in the picture were identified. Regression technique was applied to obtain expected value for clear bright pixel. Clear brightness regression coefficients were computed for over 100 observations per target in the month of May 1977 before the test period. A regression equation was used to fit the coefficients for the days with clear sky.

A flow diagram was developed and the process was carried out in an iterative manner such that pixels containing clouds were filtered out in the process. The cloud amount in each target was, next, computed by applying a two threshold method. Tarpley applied an approximation to define the class a pixel belonged to. The classes were: clear, 50% cloud covered or 100% cloud covered.

The number of pixels in each class was weighted to give the fractional cloud cover. Pixels are placed in each class based on their relative brightness with respect to the thresholds separating the clear from partly cloudy (50%) and partly cloudy from the cloudy (100%). Applying this to the partly cloudy class for instance, the cloud fraction n was expressed as;

$$n = \frac{0.5N_2 + N_2}{N_1 + N_2 + N_3} = \frac{N_2 + N_2}{2N} \tag{2.3}$$

where N is the total number of pixels in the target area and N_1, N_2 and N_3 are the numbers of pixels in the clear, partly cloudy and cloudy classes respectively. Tarpley obtained a clear/partly cloudy threshold T_1 by adding three counts to the clear radiance predicted by regression.

The condition for a clear pixel is if its count value was less than or equal to T_1 while that for partly cloudy pixels where those with count greater than T_1 bit less than or equal to T_2 (T_2 is the partly cloudy / cloudy threshold obtained by adding five counts to the clear radiance). The effectiveness in determining ground radiation depended on accurate determination of the cloud amount. This work also considered the effects of precipitable water and surface pressure on surface radiation.
Tarpley (1979) stated two possible methods of inferring solar radiation from observed meteorological variables – a modeling approach and a statistical method.

According to Tarpley (1979), the statistical approach is better suited because it does not demand precise knowledge of the physics of atmosphere – radiation interaction. The energy conservation of Hanson (1967) was applied to determine the ground albedo. This method was applied to derive hourly insolation. The standard error of estimate for clear sky was 5.56, for partly cloudy was 12.19 and cloudy was obtained as 11.36. The correlation coefficients for these three categories were 0.94, 0.77 and 0.70 respectively. The correlation coefficients were obtained on the basis of the number of pictures per day. The correlation coefficients for one, two and seven or more pictures per day were 0.68, 0.88 and 0.91 respectively. This method is quite detailed following a rigorous but not an exact procedure.

It was a major innovation at the time it was carried out and some of the principles adopted such as the definition of a clear sky condition and cloudy condition are still being applied in present research. The error for clear days was less than 5% while that for mean daily insolation less than 10%. This is not too far from results that are achievable today when compared with results compiled by Polo *et. al.* (2008).

Gautier *et. al.*, (1980) proposed a physical model for determining the amount of solar radiation reaching the earth surface. This involved calculating the addition or depletion of the solar radiation in the atmosphere and the surface as well as the energy detected by the satellite. The upwelling short wave radiant flux was presented in an expression that described the effect of atmosphere on it and the amount reaching the satellite. The primary variable in the depletion of shortwave radiation by absorption, where there is no cloud, is the integrated path of water vapour through the atmosphere. The aerosol effect was not treated due to its complexity. They obtained equations for the incident shortwave at the Earth surface and the net shortwave at the Earth surface. The transmission of solar radiation in a cloudy atmosphere was discussed. They assigned fractions of precipitable water and therefore water vapour above and below cloud height for both the downwelling and upwelling paths. An average of 30% of water vapour above cloud level was estimated and cloud absorption was assumed to vary linearly with cloud brightness because of uncertainties related to cloud size, type and thickness. From the linear relationship, the absorption ranged from zero (for clear sky) to 0.02 (for very deep clouds). An equation was obtained for the energy at the satellite. An equation was obtained for the incident shortwave at the Earth surface and the net shortwave at the surface. The satellite data source for the work of Gautier *et. al.*, (1980) came from the eight visible sensors of the Visible Infrared Spin Scan Radiometer (VISSR) on GOES-2. These data are expressed in counts which are transformed into reflectance values

using calibration equation. The calculation of incident solar radiation for each pixel necessitated that they decided whether its brightness value represents a cloud or cloud-free region. Cloudy pixels have higher brightness than clear pixels. Their results were presented in tabular as well as graphical form. It covered ground measurements using pyranometer at three locations in Canada: Ottawa, Montreal and Toronto. These were compared in their presentations along with satellite derived measurement. The days covered were spread between the winter and summer periods. A total of 15 days were considered. The hourly measurements were integrated to obtain the daily measurements. It was reported that the daily cumulative insolation in a large variety of clouds can be estimate to within 9% of the mean insolation measured by pyranometers.

Cano *et. al.* (1986) presented a remote sensing method which involved the use of data from the geostationary satellite Meteosat observations of the Earth, both in the visible and the thermal infra-red spectral ranges. Each satellite image was processed by applying geometrical correction, noise filtering, and normalization of digital counts by the direct spectral irradiance that would be measured on a horizontal plane located at each pixel under clear sky. The normalization is equivalent to the computation of a bidirectional reflectance factor since the digital counts can be directly related to the upward radiance. Lambertian surface is assumed hence the computation of an image of the albedo of clear sky-ground system (planetary albedo for clear sky) with variable cloudiness. Meteosat satellite sensors were not calibrated; the specific relationship between upward radiation could not be determined. This was addressed by Rigollier *et. al.* (2004). The albedo which is the quantity obtained from the normalization was taken as being proportional to the actual albedo. The processing of the images was divided in two steps. A cloud cover index was first derived for each location n(i, j) called a pixel, of the original satellite image and subsequently used in the second step in a statistical estimation of the global radiation.

In this model, they applied the clear sky model of Bourges for which the global radiation at ground G. at instant t is:

$$G(t) = 0.71(\sin.\nu)^{1.15} \tag{2.4}$$

where G(t) is the extraterrestrial solar irradiance for the day under consideration, normal to beam and ν is the elevation of the Sun. The irradiance measured by the satellite sensor in the absence of clouds and coming from the system of clear sky - ground of albedo ρ(t) may be expressed in the following:

$$E(t) = \rho(t).0.7.I_O(\sin.\nu)^{1.15} \tag{2.5}$$

A reference map of the planetary albedo for clear sky is computed preparatory to calculating a cloud index. For a time-series of images, each pixel is evaluated in a recursive fashion by minimizing the variance between the measured radiances and the radiances resulting from the clear sky model. Pixels that show cloud presence are eliminated at each step. This serves as a reference map and it is updated daily. The cloud cover index n'(i, j) at point (i, j) for given time t depends on the characteristic reference albedo ρ'(i, j), the apparent albedo at the same point as measured by the satellite ρ(i, j), and the average albedo of the cloud tops ρ_c. The cloud index was computed for each pixel as:

$$n'(i,j) = \frac{\rho'(i,j) - \rho(i,j)}{\rho_c(i,j) - \rho(i,j)} \tag{2.6}$$

They obtained a linear relationship between the clearness index and cloud index from which the surface global solar radiation could be determined. The result published show that the linearity between estimated and measured values was better than 0.8. The results for hourly global radiation during the month of April 1982 show that the accuracy ranged from 0.05 to 0.07 (Diabate *et. al.* 1988). This method was been adopted for the Heliosat program with some modifications.

One limitation of the clearness index - cloud index relationship proposed by Cano (Cano *et. al,.* 1986), according to Rigollier (Rigollier *et.al,.* 2004), is the presence of the empirically determined constants. The accuracy of Cano's equation for each location where it was applied depended on the value of the empirically determined constants.

Rigollier *et al.,* (2004) proposed a method that required the use of calibrated counts which were converted into radiances L in W m^{-2} sr^{-1}. The reason for this was that it allowed for the change of sensor, gain and calibration in a time series and therefore a large time series spanning over several changes in sensor or satellites may be processed. This way the need for empirical parameters was drastically reduced by expressing them using known physical laws. The relationship defining the cloud index applied by other authors such as Moser and Raschke (1984), Diabate *et. al.* (1988) and Cano *et al.,* (1986) and other authors, was also adopted. This is based on the comparison of what is observed by the satellite's sensor to what would be observed if the sky were clear. Rigollier *et al.,* (2004) however defined the cloud index (which was earlier defined in terms of un-calibrated digital counts) in terms of the Earth's reflectance calculated from calibrated digital counts. This required an exact/accurate definition of the clear sky irradiation since the clear sky model would play an important role in the accuracy of estimated ground-reaching radiation. For this reason, they adopted the European Solar Radiation Atlas (ESRA) (Rigollier *et. al.,* 2000) which proposed two sets of models, each providing the global solar radiation G along with the beam and diffuse components. One of the two models is best for estimating radiance while the other is best suited for hourly and daily sum of radiation. For a clear sky, the observed reflectance is dependent on the ground reflectance, the sun and satellite zenith angles θs, θv as well as the difference in the Sun and satellite azimuths. They expressed the observed reflectance ρ as:

$$\rho = \rho_{atm} + \rho_g Tr(\theta_S) Tr(\theta_v) \quad (2.7)$$

where ρ is the observed reflectance, ρ_{atm} is the reflectance of the atmosphere (cloud free), ρ_g is the ground reflectance while $Tr(\theta_S)$ and $Tr(\theta_v)$ are atmospheric transmittances with respect to sun and satellite zenith angles respectively.

The implication of equation (2.7) is that, for a clear atmosphere, the atmospheric reflectance is fairly constant and the observed reflectance is largely dependent on the ground reflection and the positions of the Sun and satellite being the major determinants of this dependency. Tr(θs) is expressed as:

$$Tr(\theta_S) = T_B + T_D \quad (2.8)$$

where T_B is the beam transmittance and T_D is the diffuse transmittance; each of these were expressed as (Rigollier et al., 2000):

$$T_B = \exp(-0.8662 T_L . (AM2.) . m . \delta(m)) \quad (2.9)$$

$$T_D = Tr(T_L(AM2)) . F_d(\theta_S . T_L . (AM2.)) \quad (2.10)$$

where m is airmass, δ(m) is the integral Rayleigh optical depth, $Trd(T_L\ (AM2))$ is the transmittance at zenith and Fd (θs, T_L (AM2)) is the angular correction. They adopted the principle of reciprocity by assuming that the downward transmittance and upward transmittance are identical thus,

$$Tr(\theta_S) = Tr(\theta_v) \quad (2.11)$$

This required the calculation of airmass and the integral Rayleigh optical depth in terms of the satellite zenith angle for T (θv). This is a reasonable assumption since the time interval between downward and upward transmission is reasonably short for any change in the atmosphere that would affect its transmittance. They next expressed the apparent ground albedo ρ_g as:

$$\rho_g = \frac{\rho - \rho_{atm}}{Tr(\theta_S).Tr(\theta_v)} \tag{2.12}$$

Next, they derived a model for the cloud reflectance as:

$$\rho_c = \frac{\rho_{eff} - \rho_{atm}}{Tr(\theta_S).Tr(\theta_v)} \tag{2.13}$$

where ρ_c is the apparent cloud albedo and ρ_{eff} is the effective cloud albedo.

$$\rho_{eff} = 0.78 - 0.13[1 - \exp(-4\cos(\theta_S)^5)] \tag{2.14}$$

The cloud index was defined as

$$n = \frac{\rho - \rho_g}{\rho_C - \rho_g} \tag{2.15}$$

where ρ, ρ_c and ρ_g are the observed, apparent cloud and ground reflectance respectively.

The accuracy of equation (2.14) depends mainly on the accurate determination of the ground reflectance. Equation (2.7) can be viewed as a specific expression for the clear sky case. However, a general expression is considered more appropriate and is proposed for this work. It applies the transmittance to the atmospheric reflectance ρ_{atm} such that as the transmittances diminish the atmospheric reflectance should increase for all sky conditions. The proposed equation for this work takes the form:

$$\rho = \frac{\rho_{CLEAR}}{Tr(\theta_v)} - \rho_g Tr(\theta_S).Tr(\theta_v) \tag{2.16}$$

where ρ_{CLEAR} is normalized with the downward transmittance T(θv). The form of presentation of equation (2.16) is however appropriate since it is meant to determine ρ_g . The ground-reaching radiation was determined by first calculating the clear sky index from the system of equation according to Rigollier *et. al.* (2004):

$$
\begin{aligned}
n < -0.2 ; &\quad Kc = 1.2 \\
-0.2 \le n < 0.8 \ ; &\quad Kc = 1 - n \\
0.8 \le n < 1.1 \ ; &\quad Kc = 2.0667 - 3.6667\, n + 1.6667\, n^2 \\
1.1 \le n \ ; &\quad Kc = 0.05
\end{aligned} \tag{2.17}
$$

The ground irradiance becomes

$$G = G_C K_C \tag{2.18}$$

Mueller *et al.,* (2004) presented the clear sky module of a new scheme that involves the use of a radiative transfer model. The new scheme known as Solar Irradiance Scheme (or simply as SOLIS) allows the integrated usage of a radiative transfer model (RTM) by relating it to the well known cloud index – clearness index *(n – k)* relation proposed by Cano *et al.*, (1986), Rigollier *et. al.*, (2004). This method however required more meteorological parameters, than the Linke turbidity used in Rigollier *et. al.*, (2004).

Mueller *et. al.,* (2004) developed the SOLIS scheme such that it fully utilized the enhanced capabilities of Meteosat Second Generation Satellite's (MSG) instrument called SEVIRI and ENVISAT's SCIAMACHY. The aim was to significantly increase the accuracy of the estimated solar irradiance through the use of the scheme that exhausts the capabilities of new satellites like the MSG and ENVISAT. In addition, the calculations for the new scheme would be fast, accurate compared to previous methods and should provide spectrally resolved solar irradiance data. The calculations involve large data (about 2.5 million pixels every 15 minutes), hence the requirement for speed. To achieve this, the system for this scheme had a RTM (radiative transfer model) integrated into it to carry out all the necessary computations based on satellite data. The data

include daily values of water vapour and aerosols – a contrast to the use of monthly turbidity climatology or aerosol and water vapour climatologies as was in previous methods.

The starting point was that they modified the Lambert – Beer relationship to give:

$$I = I_O \exp(-\tau) \tag{2.19}$$

where τ is the optical depth and I is the direct radiation at ground, I_O is the extra-terrestrial radiation when the sun's zenith angle is zero. The extension of the path of the radiation for zenith angle θz (or Solar Zenith Angle (SZA) θz), the irradiance at θz, *I(θz)* is;

$$I(\theta_Z) = I_O \exp\left(\frac{-\tau}{\cos \theta_Z}\right) \cos \theta_Z \tag{2.20}$$

which is the direct monochromatic radiation in the atmosphere. This equation was inverted by making the optical depth the subject such that the optical depth is given as;

$$\tau = -\ln\left(\frac{I(\theta)}{I_O \cos \theta_Z}\right) \cos \theta_Z \tag{2.21}$$

Equation (2.20) was modified so that wavelength bands can be calculated. This was done by first calculating a vertical optical depth (at SZA = 0) using the following equation;

$$\tau_O = -\ln \frac{I(\theta_Z = 0)}{I_O} \tag{2.22}$$

and next, they applied a correction to τ_o leading to the modified Lambert–beer relation (MBL).

$$I(\theta_Z) = I_O \exp\left(\frac{-\tau_O}{\cos^{a} \theta_Z}\right) \cos \theta_Z \tag{2.23}$$

The correction parameter 'a' is calculated at SZA = 60^0. The versatility of equation (2.23) as reported in the literature is such that in addition to calculating for wavelength band, for direct irradiance, it can also be applied to wavelength bands for global and diffuse irradiance. The

inherent strength of the Lambert-beer relation also motivated the approach adopted in this research.

They were able to show the accuracy of calculated direct and global solar radiation using equations (2.22, 2.23). This approach has a great advantage in addressing various aspects of solar radiation components by presenting a single equation that is flexible in application. The equation is a physical solution that is compatible with the RTM and, according to their report, yield very good match. However, the complexities of these methods sometimes may turn out to be their weak points. Though, this method has been applied to clear sky with very impressive outcome, cloudy and partly cloudy skies have not been considered. The parameters that served as inputs to this method do not play a major role outside a cloud free sky. RTM usually perform best under clear sky conditions. The daily estimates using this method may not be as impressive as the hourly estimates for days with significant cloud presence.

Hai-Tien and Ellingson (2002) developed a nonlinear statistical method that used satellite radiance observations directly to estimate the downward longwave radiation (DLR) at the earth's surface. They proposed a technique that has root mean square regression errors of about 9W m^{-2} for clear-sky conditions, and about 4 to 8Wm^{-2} for overcast conditions, depending on the cloud levels. They showed that this technique can produce unbiased estimates over a large range of meteorological conditions. They performed sensitivity studies for major error sources, including the cloud amount, cloud-base pressure, and surface pressure. On average, the DLR was most sensitive to the error in the cloud amount. The overall combined errors for an instantaneous DLR estimate they obtained, excluding the effects of the surface pressure errors, ranged from about 7 to 12 W m^{-2} when the uncertainties in cloud amount and cloud-based pressure were ±10% and ±100 hPa.

Tovar and Baldasano (2001) presented a statistical model for the determination of hourly global solar radiation from the National Oceanic and Atmospheric Administration advanced very high resolution radiometer (NOAA AVHRR) satellite data. This satellite provided a wide coverage together with adequate spatial resolution (approximately 1.1 km at the nadir). They divided the process into three steps. The first step consisted of a cloud detection procedure. The second step involved the determination of the cloud index for each point in the satellite image, which was then used for the third step, which is the application of the global solar radiation statistical model. The coefficients for the model were determined by regression from the global solar radiation data obtained from eleven stations. After the coefficients have been determined they interpolated the surface to obtain the entire coefficient field for the area they studied with the objective of applying the model. They compared the estimates they obtained from their model with data from other 10 ground radiation measurement stations in Catalonia, Spain. They tested the model for the 11 consecutive months beginning in February of 1998 and reported that the correlation between estimated values and measured values were greater than 0.98 in all cases, together with an RMSE of between 9.6% and 15.8% and a bias that varied from 9.5% to 1.3%. They compared satellite estimates with interpolated hourly data and observed that the quality were similar in southern Catalonia (RMSE of about 3%–15%) while the satellite estimates were better in northern Catalonia (RMSE of 7%) than those obtained from interpolation of surface station data (RMSE of 11%–16%).

Meetschen *et. al.* (2004) developed a fast offline integration scheme to modify numerical weather prediction (NWP) model cloud fields based on Meteosat visible and infrared observations. They produced a dataset from the cloud fields and computed downward shortwave and longwave radiation at the surface using the NWP radiative transfer model. Their work was for a period of 15

months and it covered Europe and was produced and validated against measurements of ground stations on a daily basis. They used data were from The Netherlands, Germany and France. An increase in the accuracy of shortwave surface radiation was observed when the integration system was applied. The root mean square error (RMSE) in the model forecast was 32 Wm^{-2} and 42 Wm^{-2} for the period from October 1999 to December 2000 for the stations in Germany. These values were reduced to 21 Wm^{-2} and 25 Wm^{-2} through the application of the integration scheme. Larger errors were reported during the summer months than the winter months. This system has the advantage of not being affected by snow cover.

Otkin *et. al.* (2005) carried out a study where estimates of hourly and daily integrated insolation at 20-km resolution, based on Geostationary Operational Environmental Satellite (GOES) visible imagery were compared with pyranometer measurements made at 11 sites in the U.S. Climate Reference Network (USCRN) over a continuous 15-month period. This study was carried out in order to examine the accuracy of the satellite insolation estimates over a diverse range of seasons and land surface types. The relatively simple physical model of insolation that was tested yielded good results, with seasonally averaged model errors of 62 Wm^{-2} (19%) and 15 Wm^{-2} (10%) for hourly and daily-averaged insolation, respectively, including both clear- and cloudy-sky conditions. The level of accuracy they obtained was reported as being comparable, or superior, to results that have been obtained with more complex models of atmospheric radiative transfer models and noted that the model performance can be improved in the future by addressing a small elevation-related bias in the physical model, which was most likely due to inaccurate modelling of precipitable water.

Zheng *et. al.* (2008) presented a method for deriving incident photosynthetically active radiation (PAR) using GOES data. Their method does not require an external knowledge of atmospheric conditions. It retrieved both atmospheric and surface conditions using only at-sensor radiance through interpolation of time series of observations. Validations against ground measurement were carried out at four "FLUXNET" sites. They reported values of RMSE of estimated and ground-measured instantaneous PAR at the four sites as 130.71, 131.44, 141.16, and 190.22mol m^{-2} s^{-1} respectively. At the four validation sites, the RMSE were obtained as the percentage of estimated mean PAR value as 9.52%, 13.01%, 13.92%, and 24.09%, respectively while the biases were 101.54, 16.56, 11.09, and 53.64mol m^{-2} s^{-1} respectively. The advantage of this method is that it can be applied in many situations where the knowledge of atmospheric condition is not available.

Wahab *et. al.* (2009) **c**ompared two databases of solar surface irradiance (SSI) derived from satellites with ground measurements for Algeria, Egypt, Libya and Tunisia. They found that it was possible to accurately derive the SSI from geostationary meteorological satellites, even with a coarse spatial resolution. The two databases they used were HelioClim-1 and SSE; they observed that both exhibited similar and good performances. The bias was lower for SSE than for HelioClim-1, as a whole; inversely, HelioClim-1exhibited a smaller scattering of data compared to ground measurements (that is, a smaller standard-deviation) than the SSE, thereby allowing better performances when mapping the long-term variations in the SSI. They reported that the long-term variations from 1985 to 2005 showed that these four nations experienced dimming as a whole. They reported that Helio-Clim-1 supported their findings from their analysis of the range and spatial distribution of dimming at the sites with long-term records.

A review of literature by Polo *et. al.* (2008) includes, in addition to those already discussed, the works of Perez and others as well as Brasil – SR and DLR – SOLEMI methods. Perez and others, proposed a model that evolved from Cano *et. al.* (1986). They proposed the following equation for hourly global solar irradiance (I_G) from cloud-index (n) and global clear-sky irradiance $I_{(CS)}$ on the Earth's surface:

$$I_G = I_{CS} f(n)[0.0001 I_{CS} f(n) + 0.9] \tag{2.24}$$

where I_G is the irradiance on the Earth's surface, I_{CS} is clear – sky irradiance and f(n) indicates the dependence on cloud- index, n. They expressed the function f(n) as

$$f(n) = 2.36n^5 - 6.2n^4 + 6.22n^3 - 2.63n^2 - 0.58n + 1 \tag{2.25}$$

This model accounts for effects due to Sun-satellite angle and external information concerning snow cover. The Brasil – SR method evolved from the model of Moser and Raschke (1984). It provides irradiation maps by solving radiative transfer equation using the Geostationary Operational Environmental Satellite (GOES) images and ground data on temperature, surface albedo, relative humidity and visibility. The surface global irradiation is determined by cloud index, sky transmittances and cloudy conditions by,

$$I_G = I_O[nT_{Cloud} + (1-n)T_{Clear}] \tag{2.26}$$

where T_{Cloud} and T_{Clear} are atmospheric transmittances under cloudy and clear skies. This model shows similarity with the equation proposed by Cano *et al.*(1986). These expressions were developed for other satellites. They however show the importance of the cloud-index in satellite based assessment of solar radiation on the Earth's surface.

The DLR–SOLEMI method for direct normal incidence (DNI) solar irradiation is based on Bird's clear-sky model (Bird and Hulstrom, 1981). The DLR–SOLEMI depends on the use of the transmittance of various atmospheric constituents and is expressed as:

$$DNI_{Clear} = I_O T_R T_g T_O T_W T_A \tag{2.27}$$

where DNI_{Clear} is direct normal incident radiation under clear–sky condition, I_{on} is derived from extra-terrestrial solar radiation while T_R, T_g, T_o, T_w, and T_a represent the transmittances for Rayleigh scattering, mixed gases, ozone, water vapour and aerosols respectively. Polo *et. al.* (2008) stated that the models of Perez *et al.* and Brasil-SR are empirical (just like Cano's model) while DLR–SOLEMI method aligns with the radiative transfer approach which requires a number of atmospheric parameters. The limitations of the various *Heliosat* methods apply to these methods.

Zarzalejo *et. al.* (2005) as well as Erusiafe and Chendo (2011) have explored the use of artificial intelligence approach (Artificial Neural Networks) for the estimation of ground-reaching solar radiation from satellite images. Erusiafe and Chendo (2011) considered the possibility of an approach which involved combining remote sensing with artificial intelligence. This is to harness the potentials these two techniques provide – the geo-spatial coverage of satellites and the power of ANN as a modelling tool for relating data from different sources. The method involved the calculation of the cloud index using the method proposed by Cano and others (Cano *et. al.,* 1986). The cloud indices were used for training a Cascade – forward back propagation network to obtain the mean irradiance. It was observed earlier that the mean irradiance for an hour can be determined from four values of irradiance taken at equally spaced intervals within the hour (Erusiafe *et. al.,* 2010). The relative error in the results obtained ranged from 2% for clear-sky to about 22% for cloudy - sky. The wide range in error may be attributed to the limited range of the visible (vis06) data used for the assessment. The results obtained here compares favourably with the results reported by other researchers Polo *et. al.* (2008).

2.4 Clear-sky model

The exploitation of satellite images for the assessment of solar irradiation reaching the Earth surface requires the development of an appropriate clear–sky model. According to Gueymard (1993) "the modelling of the clear sky components of solar radiation is necessary in many applications of solar energy (systems design and simulation, control process of the accuracy of radiometers, data quality control, gaps filling process etc), as well as in routine engineering practice (e.g. the peak cooling load of buildings is determined for a hot, cloudless summer day)". This is also very true for our environment. A number of models have been proposed for the calculation of clear–sky irradiation. Some of these models may be more suited for certain applications than others. The models considered, among others, include the following:

1. Bourges (Cano *et. al.*, 1986, Rigollier and Wald, 2000)

$$G = 0.7 I_O \varepsilon \sin \nu^{(1+X)} \tag{2.28}$$

where ν is solar elevation, *Io* is solar constant and x takes values in the range $0.15 \leq x \leq 0.17$ but typically 0.15; .

2. Perin de Brichambaut, Vague (PdBV) (Moussu *et. al.*, 1989, Rigollier and Wald, 2000);

$$G = 0.8 I_O \varepsilon \sin \nu^{(1+X)} \tag{2.29}$$

where ν is solar elevation, *Io* is solar constant and x takes values in the range $0.15 \leq x \leq 0.17$ but typically 0.15;

3. World Meteorological Organization (WMO1) model (Rigollier and Wald, 2000):

$$G_{(WMO1)} = \frac{0.95 \varepsilon I_O \sin \gamma}{1 + 0.2 \cos ec \gamma} \tag{2.30}$$

where γ is solar altitude, *Io* is solar constant and ε corrects for Sun-Earth distance.

Kasten proposed a clear sky model for global solar radiation as follows (Iniechen and Perez, 2002):

$$G_{hck} = 0.84 I_O \varepsilon \sin\theta \exp(-0.027 am(fh1 + fh2(T_L - 1))) \quad (2.31)$$

where *Io* is solar constant, *h* is solar elevation, *am* is air-mass, *fh1* and *fh2* relate the altitude of the site with that of atmospheric interactions while T_L is Linke turbidity factor. A modified version of this model was proposed by Iniechen and Perez (2002) which addressed the dependency of Linke turbidity coefficient on airmass. This is with a view to addressing the constraints placed on Linke turbidity due to its variation with airmass and therefore making it useful for the estimation of this parameter for various applications. They formulated an airmass independent Linke factor for Kasten clear sky model thus modifying it. The limitations in the above listed models become apparent when compared with available data. Kasten model was applied to Akoka and compared with measured data. They showed varying degree of agreement at various times of the day as can be seen in Figure 2.8 for estimated Linke's coefficient at airmass 2 ($T_L(AM2)$ = 3.96). The WMO1 model according to Rigollier *et. al.* (2000) showed a better representation when applied to satellite data. The WMO1 and modified Kasten clear sky models were adopted for this work because they satisfy the requirement necessary for the fulfilment of our objectives: while WMO1 is not dependent on turbidity factor, the dependence of the modified Kasten model on Linke turbidity makes it useful for estimating Linke turbidity (and therefore, optical depth) from satellite images.

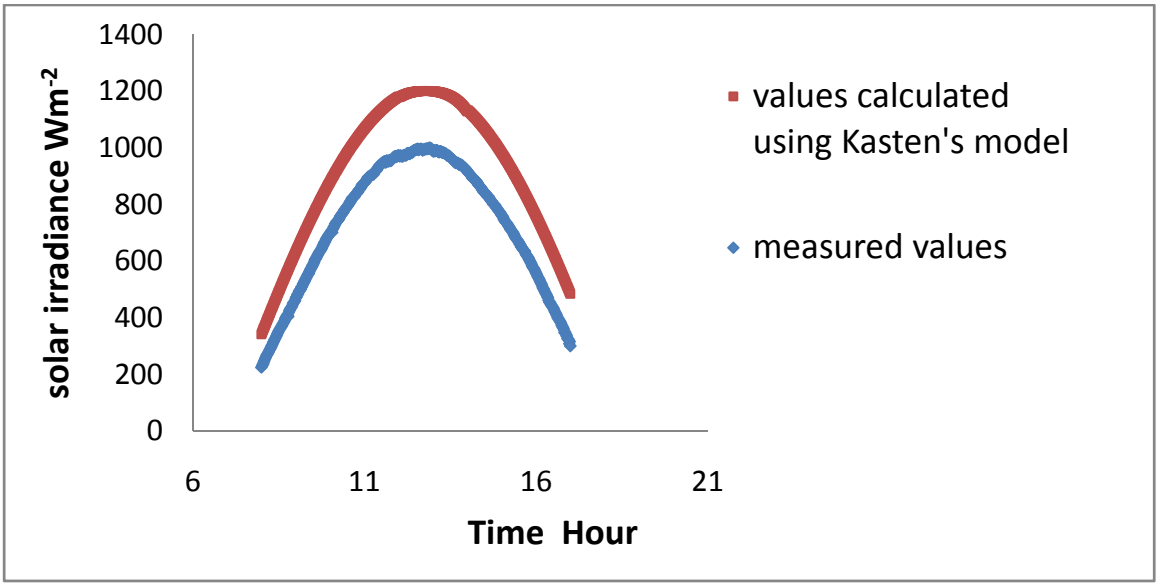


Figure 2.8: Comparison of irradiance values calculated using Kasten's model (for Linke coefficient at airmass 2, $T_L(AM2)$ = 3.96) with measured values on 26/4/2012 at Akoka; Kasten's model largely over-estimates the radiation around peak solar period (solar noon).

The European solar Radiation Atlas (ESRA) clear sky model considered the direct and diffuse components of solar radiation separately (Rigollier *et. al.*, 2000). The direct component was estimated by using the modified lambert-Beer equation (Rigollier *et. al.*, 2000).

$$B_C = I_O \varepsilon \sin \gamma_S \exp(-0.8662\, T_L(AM\ 2).m.\delta_R(m)) \qquad (2.32)$$

where I_0 is the solar constant (i.e the extraterrestrial irradiance normal to the solar beam at the mean solar distance), ε is the correction for the Sun - Earth distance from the mean value, γ_s is the solar altitude angle, T_L(AM2) is Linke turbidity factor at airmass equal to 2, m is the relative optical airmass, $\delta_R(m)$ is the integral Rayleigh optical thickness. The exponential term in this equation represents the transmittance of direct (or beam) solar radiation through a cloudless sky.

The diffuse component was estimated using the following equation (Rigollier *et. al.*, 2000)

$$D = I_O \varepsilon . T_{rd} . T_L(AM\ 2) \qquad (2.33)$$

where D is the diffuse irradiance, $T_{rd}(T_L\ (AM2))$ is the transmittance of diffuse solar irradiance in a cloudless sky. An important feature of this model is the use of Linke turbidity factor – a parameter

that varies with airmass. Linke turbidity has not received enough attention in terms of measurement in our environment in the past for its application. Solar radiation data necessary for its estimation are not available in significant amount throughout Nigeria and probably Africa. The Aerosol Robotic Network (AERONET) which takes measurements of atmospheric aerosol is sparsely located in Africa with only one located in Nigeria. However, satellite data of atmospheric aerosol such as that provided by NASA (National Aeronautic and Space Administration), Moderate-resolution Imaging Spectroradiometer (MODIS) can be a useful aid in the study of the transmitting properties of the atmosphere.

2.5 Atmospheric Turbidity

Linke turbidity factor was proposed by Linke in 1922 with the aim of describing the broadband clear-sky atmospheric transmittance (Ineichen and Perez, 2002). Linke proposed that the optical thickness of a clean and dry atmosphere δ_{CDA} and the Linke turbidity coefficient T_L, which is the number of clean and dry atmosphere that will produce an observed atmospheric attenuation, both determine the solar radiation at the Earth's surface. The direct horizontal incidence solar irradiance is as expressed in equation (2.32). This equation will normally be used to estimate the beam solar radiation if Linke turbidity factor is known and in other cases where the direct (or beam) radiation is known, Linke turbidity factor can be estimated from it. Equation (2.32) is a form of clear-sky equation for estimating direct solar irradiance.

Angstrom (1929) characterised the atmosphere with respect to its transmission of solar radiation. He carried out an analysis of the various factors that result in depletion of the solar spectrum in the atmosphere. He defined a turbidity coefficient that is independent of selective absorption, molecular scattering, wavelength and airmass: this gives Angstrom turbidity coefficient an advantage over Linke turbidity factor. However, Linke's turbidity is easier to estimate since it is

based on broad spectrum measurement which is often available. The availability of data for optical depth and cloud fraction such as that from from NASA Giovanni website makes the estimation of Angstrom‘s turbidity possible. This can provide a complementary source of information about the atmosphere especially in challenging situations with the images in the visible spectrum. Figures 2.9 and 2.11 show the optical depth over land and ocean in pixel counts for some parts of Nigeria. These data were acquired on 26-04-2012 and 30-11-2011. The ground reaching solar irradiance can be estimated from the optical depth. This information is however available on daily basis. A time series data such as those from EUMETSAT’s satellites, if adapted, can provide more details about the atmosphere’s optical properties within a day.

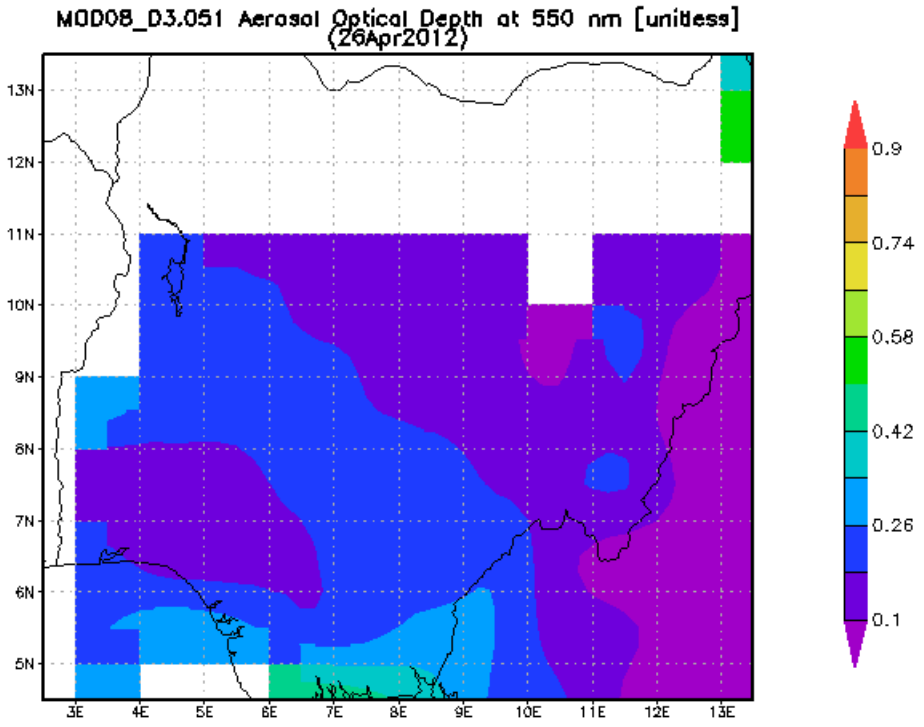


Figure 2.9 Aerosol optical depth over parts of Nigeria on 26/04/2012 (Source: NASA's Science Mission Directorate - Goddard Earth Sciences (GES) Data and Information Services Center (DISC).")

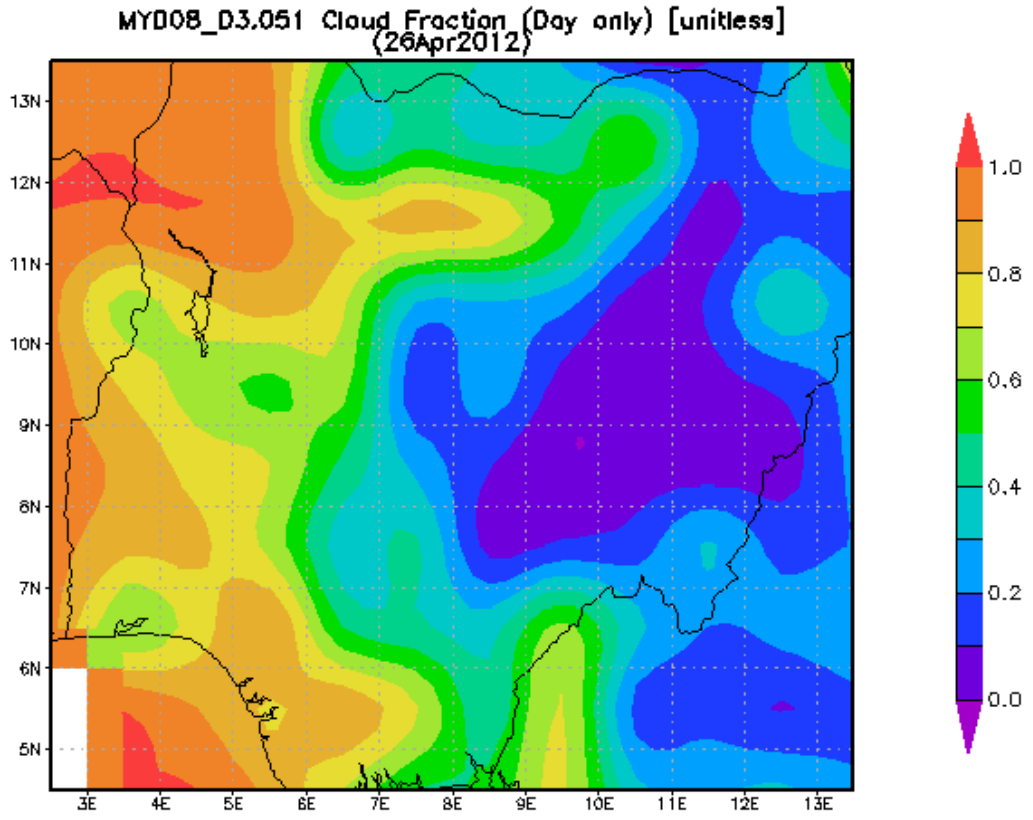


Figure 2.10 Day time cloud fraction over parts of Nigeria on 26/04/2012 (Source: NASA's Science Mission Directorate - Goddard Earth Sciences (GES) Data and Information Services Center (DISC).")

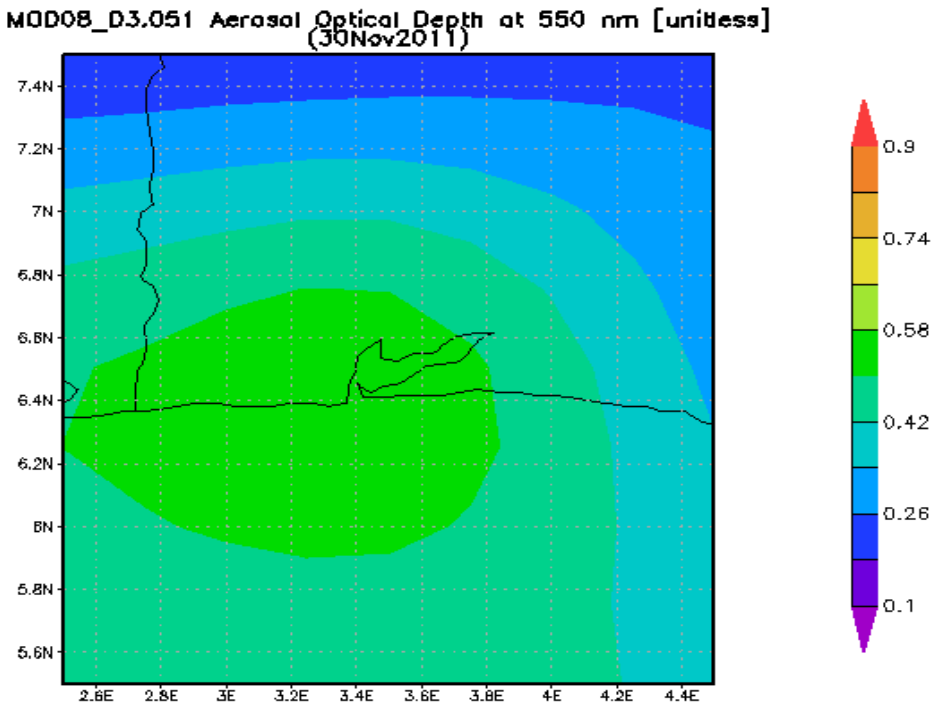


Figure 2.11 Optical depth for land and ocean pixel counts (MOD08 D3 051 Area Map) for parts of Nigeria covering Lagos area (lat. 5^0 -8^0 and lon. 2^0 – 5^0) on 30/11/2011 (Source: NASA's Science Mission Directorate - Goddard Earth Sciences (GES) Data and Information Services Center (DISC).")

The spectral distribution of solar radiation reaching the Earth' atmosphere is very important in such applications as photovoltaic power systems of satellites while the distribution on the Earth surface depends on the extra-terrestrial distribution (Iqbal, 1983). However, the degree of attenuation across the spectrum varies as solar radiation travels through the atmosphere.

CHAPTER 3

METHODOLOGY

3.1 Theoretical Framework

Satellite data are recorded as digital counts which correspond to the brightness of the image and the level of radiation reflected by the Earth which reaches the satellite's sensor. Our approach requires that digital counts be converted to radiance – a quantity that has physical meaning (Rigollier *et. al.* , 2004). The radiance is defined by Kidder and Vodder Haar (1995) as:

$$L_r(\theta_r,\varphi_r) = \int_0^{2\pi}\int_0^{\pi/2} L_i(\theta_i,\varphi_i)\gamma_r(\theta_i\varphi_i;\theta_r\varphi_r)\cos\theta_i \sin\theta_i d\theta_i d\varphi_i \quad (3.1)$$

where L_i is the incident radiance from the direction (θ_i ,φ_i) which is partially reflected in the direction (θ_r ,φ_r), γ_r is the bi-directional function which requires the following condition:

$$\int_0^{2\pi}\int_0^{\pi/2} \gamma_r(\theta_i\varphi_i;\theta_r\varphi_r)\cos\theta_i \sin\theta_i d\theta_i d\varphi = A \quad (3.2)$$

Such that γ_r is the fraction of L_i reflected to the direction (θ_r ,φ_r) and A is the total fraction of reflected light in all direction, the albedo.

They considered that the Sun is the only source and that L_i becomes a delta function:

$$L_r(\theta_r,\varphi_r) = L_i .....\theta_i = \theta_0 .....\varphi_r = \varphi_0$$

or

$$L_r(\theta_r,\varphi_r) = 0_i .....\theta_i = \theta_0 .....\varphi_r = \varphi_0 \quad (3.3)$$

where L_i is the solar emitted radiance. Also, assuming a uniformly reflecting surface (i.e Lambertian reflector), then the incident solar irradiance will be reflected in all directions. Defining the bi-directional reflectance as:

$$\gamma_r(\theta_i\varphi_i;\theta_o\varphi_o) = \frac{\rho}{\pi} \quad (3.4)$$

So that

$$\int_0^{2\pi}\int_0^{\pi/2} \gamma_r(\theta_i\varphi_i;\theta_r\varphi_r)\cos\theta_i \sin\theta_i d\theta_i d\varphi = \rho \quad (3.5)$$

Applying equations (3.4) and (3.5), equation (3.1) becomes:

$$L_r(\theta_r, \varphi_r) = L_O \cos\theta_O . \Omega_O . \frac{\rho}{\pi} \tag{3.6}$$

where Ω_O is the solid angle of the Sun subtended by the Earth. Therefore $L_r(\theta_r, \varphi_r)$ becomes:

$$L_r(\theta_r, \varphi_r) = . \frac{\rho}{\pi} I_O \cos\theta_O \tag{3.7}$$

$$I_O = L_O \Omega_O$$

I_O is the extra-terrestrial radiation and it is defined specifically with respect to the wavelength of the satellite's sensor.

Hammer and others in Aksoy *et. al,* (2011) proposed the following relation for obtaining reflectance by normalizing the difference between the observed digital count, C, and the digital count obtained for clear atmosphere C_{atm}, with the top of atmosphere radiation (TOA) G_O.

$$\rho = \frac{C - C_{atm}}{G_O} \tag{3.8}$$

It was observed that a very close correlation exists between equation (3.8) and measured irradiance for Akoka. This suggests the possibility of assessing the ground-reaching solar radiation directly from the satellite's digital counts.

The Earth's reflectance was defined in line with the definition of Rigollier *et. al.* (2001) and equation (3.7) from Kidder and Vonder Haar (1995) by converting the satellite counts into radiance and normalizing with solar constant I_O. The reflectance becomes

$$\rho = \frac{\pi L}{I_O . \varepsilon . \cos\theta .} \tag{3.9}$$

where L is the radiance, ε is the eccentricity in Sun – Earth distance, θ is the Sun's zenith angle and T(φ) is the transmittance of the atmosphere as viewed from the satellite.

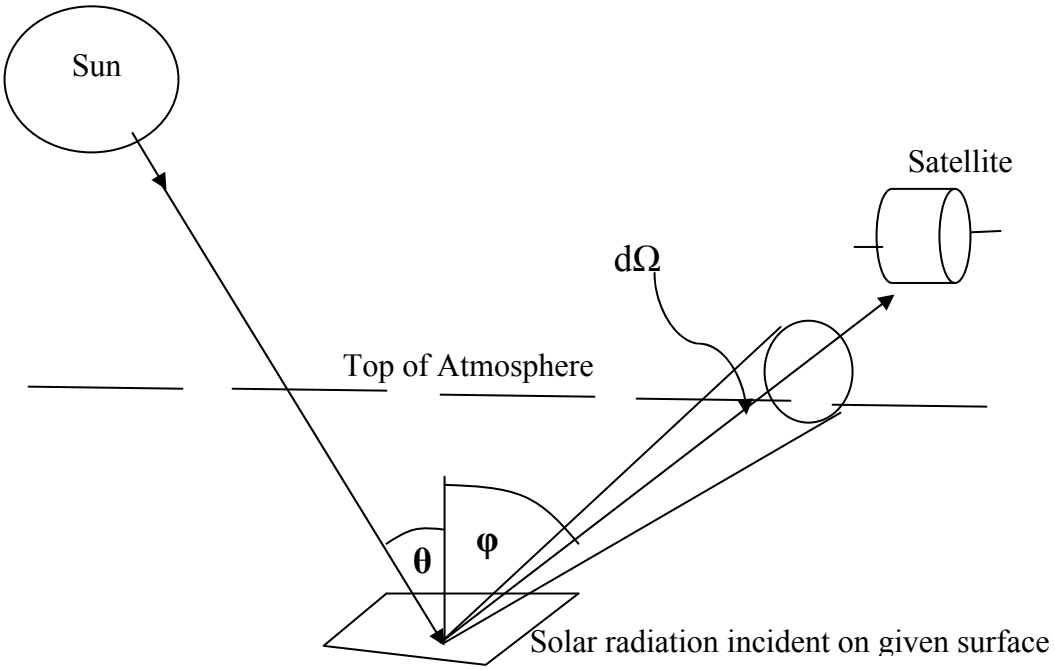


Figure 3.1 Lambertian surface- satellite - Sun geometry

The basic assumption here is that the reflecting surface is a Lambertian surface as shown in Figure 3.1, that is, the observed radiant intensity from an ideal diffusely reflecting surface is directly proportional to the cosine of the angle φ between the observer's line of sight and the normal to the surface given as (Hashimoto *et. al.* 1999):

$$\frac{I}{I_o} = \cos \varphi \tag{3.10}$$

The total solar radiation reaching the ground is made up of diffuse radiation and direct or beam radiation. Solar radiation experiences scattering and absorption in the atmosphere as well as absorption and reflection at the Earth's surface.

Solar radiation experiences scattering in a cloudy atmosphere where a large portion of the radiation (depending on type and geometry of the cloud) is reflected back to space. The interaction of solar radiation in the Earth's environment is illustrated in Figure 3.2.

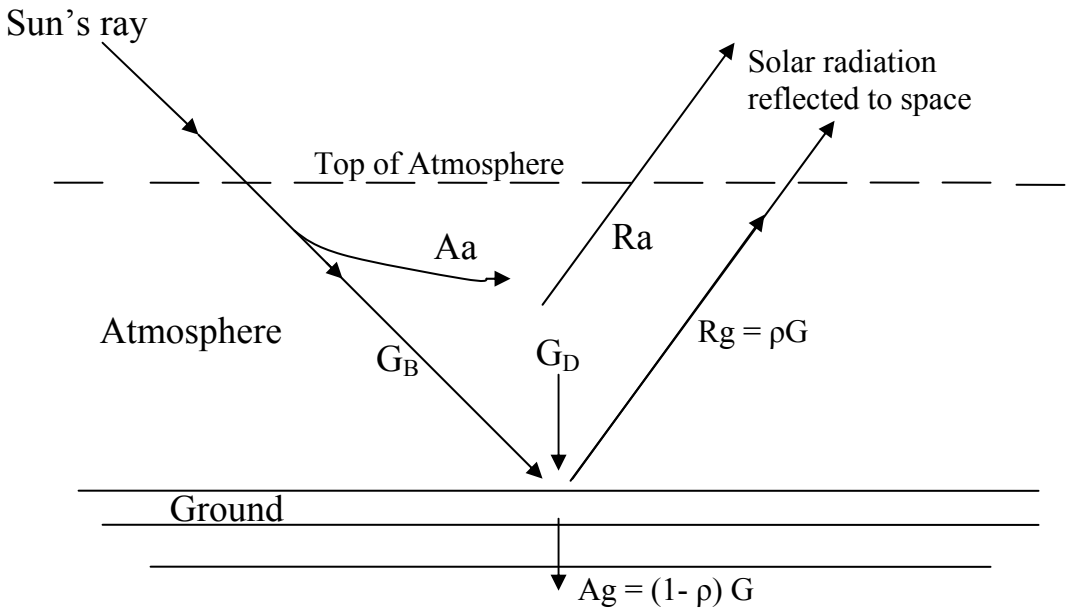


Figure 3.2 Solar radiation interactions with the atmosphere and ground.

The reflectance of the atmosphere is determined by subtracting the reflectance of the atmosphere from the observed reflectance such that the reflectance observed by the satellite represents that for cloud and ground (Rigollier *et. al.*, 2004). The cloud index was constructed as defined by Cano *et. al.*(1986). The cloud index obtained was related with the clearness index by Cano *et al.,* (1986) in a linear manner as given in equation (1.2). Rigollier *et. al.*(2004) related cloud index to clear sky index through a system of equations which described various parts of the plot of clear-sky index with cloud index. For instance, the range of cloud index from -0.2 to less than 0.8 is linear. This approach was successful and a number of modifications were introduced to it by individuals and institutions (Polo *et. al.*, 2008). In particular, it served as the basis for the *Heliosat* programme

which is mainly aimed at the development of techniques for exploiting the use of satellite data to determine ground – reaching solar radiation.

The total solar radiation transmitted through the atmosphere may be expressed as

$$G_O = G + A_a + R_a \tag{3.11}$$

and

$$G = G_B + G_D \tag{3.12}$$

where G_O is the extra-terrestrial irradiance, G is the ground-reaching irradiance, G_B and G_D are direct (or beam) and diffuse irradiance respectively while the solar radiation absorbed and reflected by the atmosphere are $A_a = \alpha G$ and $R_a = \beta G$ respectively. Equation (3.11) can be written as:

$$\frac{G}{G_O} = 1 - \frac{(A_a + R_a)}{G_O} \tag{3.13}$$

$$\frac{G}{G_O} = 1 - \frac{R_a}{G_O} - \frac{A_a}{G_O} \tag{3.14}$$

Equation (3.14) can be expressed in terms of R_a as:

$$R_a = G_O(1 - \frac{G}{G_O} - \frac{A_a}{G_O}) \tag{3.15}$$

For a cloudy atmosphere

$$(\frac{G}{G_O} + \frac{A_a}{G_O}) << 1$$

and R_a is proportional to the atmospheric reflectance ρ_c.

The ground-reaching solar irradiance, G, can be expressed as

$$G = G_{.Rg} + G_{Ag} \tag{3.16}$$

$$G_{.Rg} = R_g G \tag{3.17}$$

$$G_{.Ag} = G - R_g G \tag{3.18}$$

$$G = \frac{G_{Ag}}{1 - R_g} \tag{3.19}$$

where G_{Rg} , G_{Ag} are ground reflected and absorbed radiation while R_g is the fraction of solar radiation that is reflected. Let μ be the ground absorbance, then μ = G_{Ag} /G; the radiation reflected by ground becomes

$$R_g = (1 - \mu).G \tag{3.20}$$

R_g is proportional to ground reflectance ρ_g. For a given atmosphere with reflectance R, the cloud index can be expressed as:

$$n = \frac{R - R_g}{R_a - R_g} \tag{3.21}$$

R is proportional to the observed reflectance ρ. The extraction of information about ground – reaching solar radiation depends on the construction of a cloud index, n, as follows (Cano *et al.,* 1986) :

$$n'(i,j) = \frac{\rho(i,j) - \rho_g(i,j)}{\rho_c(i,j) - \rho_g(i,j)} \tag{3.22}$$

where $\rho(i,j)$ is the observed reflectance; $\rho_g\ (i,j)$ is the ground reflectance; it is the smallest reflectance that the observed reflectance, $\rho(i,j)$, would normally present under clear-sky condition. $\rho_c\ (i,j)$ is the effective reflectance of the brightest cloud in the pixel. $\rho_g\ (i,j)$ is as defined in equation (2.16) where ρ_{CLEAR} is calculated using SMARTS2 radiative transfer model (or RTM) by Gueymard (2003a, 2003b). SMARTS2 is a radiative transfer model that calculates the amount of solar radiation transmitted, absorbed and reflected by the atmosphere from meteorological and

geographical parameters of a given location among other functions. ρ_c *(i,j)* is defined in terms of the maximum digital count, C_{MAX} , of the satellite sensor as:

$$C = C_{MAX} \cos(\theta_S) \tag{3.23}$$

where θ_S is the Sun's zenith angle and C_{MAX} is estimated from the images.

The cloud index obtained was then related with the clearness index as follows (Beyer *et al.,* 1996);

$$k_C = an + b \tag{3.24}$$

where a and b are constants. These constants are empirical and depend on the location for which they are determined. Rigollier *et. al.* (2004), modified this method by the introduction of Linke turbidity in the assessment process. They applied the following set of equations for the calculation of clear-sky index:

$$\begin{aligned} n < -0.2 ; &\quad k_C = 1.2 \\ -0.2 \leq n < 0.8 ; &\quad k_C = 1 - n \\ 0.8 \leq n < 1.1 ; &\quad k_C = 2.0667 - 3.6667\, n + 1.6667\, n^2 \\ 1.1 \leq n ; &\quad k_C = 0.05 \end{aligned} \tag{3.25}$$

For equations (3.24, 3.25), the ground-reaching solar radiation, G, is the product of the calculated clear-sky index and the clear-sky radiation; this is as expressed in equation (2.18).

The method proposed in this work correlates the cloud index from ground solar radiation data with that obtained in equation (3.22). The ground-reaching radiation is determined by characterising the atmosphere first with respect to ground observation and next satellite observation and inserting the cloud index from equation (3.22) into the cloud index based model in the following:

$$G = G_C \exp(f(n'(i, j))) \tag{3.26}$$

where G_C is the estimated clear-sky radiation. Equation (3.26) is site-independent for regions with similar atmospheric transmittance and without Linke turbidity factor explicitly expressed in it. Also, f(n(i,j)) forms the basis for estimating Linke turbidity from satellite images.

3.2 Materials Preparation and Methods

3.2.1 Characterising the atmosphere from the Earth's surface

The importance of the cloud index and clearness index for determining the transmission of solar radiation through the atmosphere can be exploited for the characterisation of the atmosphere. For this reason, the cloudiness index from Earth surface, n_g, is expressed in terms of the clearness index (or G / G_O) as;

$$n_g = 1 - \frac{G}{G_O} \tag{3.27}$$

where G and G_O are global solar irradiance measured on the Earth's surface and the clear–sky irradiance estimated from our clear–sky model respectively.

The theory of solar radiation interaction with matter which has been applied in various forms (including the Beer–Lambert formula) can be applied for estimating the amount of solar radiation reaching the Earth surface. This can be implemented by introducing the cloudiness index as the moderating term in form of a function $f(n_g)$. For the purpose of operational use, we define the function $f(n_g)$ of the cloudiness index n_g for our proposed model as follows:

$$G = G_O \exp(f(n_g)) \tag{3.28}$$

Note that G and G_O can also be expressed for any wavelength or range of wavelength such that this equation can take a general form:

$$G_\lambda = G_{O.\lambda} \exp(f(n_{g\lambda})) \tag{3.28a}$$

G_λ, $G_{O\lambda}$ and $n_{g\lambda}$ are respectively the irradiance, extra terrestrial irradiance and cloudiness index for the defined wavelength or range of wavelengths.

The exponential term depends on n_g. From equation (3.28), the following can be obtained;

$$\log_e(\frac{G}{G_O}) = f(n_g) \tag{3.29}$$

Note that equation (3.29) can yield polynomials of various degrees for the variation of $\log_e(\frac{G}{G_O})$ with n_g. One such relationship is similar to Kasten's parameterization which relates $(\frac{G}{G_O})$ to cloud cover (in Octet) through a second degree polynomial (Kasten and Czeplak, 1980 **;** Iziomon and Meyer, 2001). However, Kasten's parameterization is limited in the result it could yield since it is based on the Octet and cannot be directly related to clear-sky index. The clearness index can be expressed in terms of the clear sky index from the following relation:

$$\frac{G}{G_O} = \frac{G}{G_C}.\frac{G_C}{G_O} \tag{3.30}$$

where G is the observed irradiance, Gc is the clear sky irradiance and the ratio Gc/Go gives the clear sky constant. If the cloud index for a clear atmosphere is given as n_c where n_c is expressed as:

$$n_c = (1 - \frac{G_C}{G_O}) \tag{3.31}$$

therefore equation (3.30) can be expressed as:

$$\frac{G}{G_O} = \frac{G}{G_C}.(1 - n_c) \tag{3.32}$$

A similar approach that yielded equations (3.28, 3.29) can yield the following equation with respect to the clear sky irradiance for characterising the atmosphere as:

$$G = G_C \exp(f(n)) \tag{3.33}$$

$$\log_e(\frac{G}{G_C}) = f(n) \tag{3.34}$$

Equation (3.34) will be applied in characterising the atmosphere with respect to cloud index.

3.2.2 Extraction of data from satellite images

The satellite data consist of images from EUMETSAT's *meteosat 9* satellite. This satellite was launched into orbit in 2005 with the capacity to gather information about the Earth's environment. This satellite rotates about its axis which is parallel to the Earth's axis and it is equipped with an instrument known as SEVIRI – Spectral Enhanced Visible Infra-Red Imager - with which it scans the Earth. It rotates with a speed of 100 revolutions per minute. It scans the Earth in wavelengths ranging from visible to infra-red during each cycle. The images used in this work are level1.5 images recorded in image format referred to as native format. These images have been processed such that the pixels contain information about geographic location and the amount of light reflected. The reflection of solar radiation from the Earth is sensed by the satellite's sensors during each scan for each wavelength in the range of wavelengths.

The coverage area of the images of *metoesat9* varies with geographic region. The satellite is positioned at longitude / latitude (0^0, 0^0). The pixels of the image show the amount of light received by the sensor.

The image files are read with software provided by EUMETSAT known as UMARF native format reader. The software reads the digital count and percentage albedo for geographic locations (based on the latitude and longitude) on the Earth's surface.. The resolution of the geo-locator on the image varies with position. Examples of the images can be seen in Appendix A for clear days and cloudy days.

3.2.3 Clear-sky radiation and atmospheric turbidity

The effect of the atmosphere on solar radiation from section 2.1 show that solar radiation can be transmitted to the Earth's surface, absorbed by the atmosphere and reflected back to space. In a clear atmosphere, the amount of solar radiation reflected by the atmosphere is much smaller when compared with the amount that reaches the Earth's surface. The amount that is reflected can be estimated by determining the amount absorbed by various gaseous constituents and the amount that reaches the Earth's surface. The Sun's energy that reaches the Earth's surface under clear sky condition is referred to as clear sky radiation. This radiation can be estimated from a model – clear sky model. Clear sky models can be categorized into simple and complex types. The simple types usually depend on geometric parameters which are easily estimated such as the Sun's elevation (or zenith) angle while the complex types depend on atmospheric parameters such as pressure and turbidity. The turbidity dependent types can sometimes be inverted to obtain the turbidity (especially, Linke turbidity) where radiation data exits. Some clear sky models have been discussed in chapter two. The formulation of a clear sky model requires the amount of solar radiation entering the atmosphere and the attenuating factor for the atmosphere. The amount of solar radiation will depend on the elevation angle of the Sun while the attenuating factor will depend on the atmospheric transmittance. For a simple model, the format can be presented as:

$$G_C = I_O \varepsilon . f(\theta) . Tr \tag{3.35}$$

where I_O and ε are solar constant and eccentricity respectively. f(θ) is the function of the elevation angle while Tr is the transmittance. An empirical approach may be suitable for the determination of f(θ) and Tr for any given location or region. Comparing equation (3.30) with equation (3.28) gives the following for f(θ) and Tr:

$$G_O = I_O . \varepsilon . f(\theta) \tag{3.36}$$

$$f(\theta) = \alpha + \sin\theta \tag{3.37}$$

$$Tr = f(n_g = n_g(\min)) \tag{3.38}$$

α is a correction term while $n_g(min)$ is the minimum value n_g can take. The clear sky model becomes:

$$G_C = I_O.\varepsilon.(\alpha + \sin\theta)\exp(f(n_g(\min)) \tag{3.39}$$

The atmospheric characteristic model becomes;

$$G = G_C \exp(f(n)) \tag{3.40}$$

where G is the measured irradiance, G_C is the calculated clear sky irradiance and f(n) is a function of the cloud index, n.

The underlying philosophy that guided this work was to be able to develop a model that will not require ground meteorological information for its operation (beyond the development stage). Given the lack of adequate meteorological data for most parts of Africa, the effective application of methods that require such data may be hampered. The determination of atmospheric turbidity (in particular, Linke's turbidity factor) can be carried out by modifying a clear–sky model that depends on Linke's turbidity. This entails substituting the argument of the exponential term with the cloud index function such that it takes the form of equation (3.28). The following equation is the modified Kasten's clear-sky model (Ineichen and Perez, 2002):

$$G_{hck} = a_1 G_O \sin(h)\exp(-a_2.am.(fh_1 + fh_2(T_L - 1))) \tag{3.41}$$

where G_{hck} is the clear-sky global solar irradiance, G_o is the extra-terrestrial solar radiation, h is the solar elevation, am is the airmass, T_L is Linke turbidity factor while a_1, a_2 , fh_1 and fh_2 are respectively defined as follows: $a_1 = 5.09 \times 10^{-5}alt + 0.868$; $a_2 = 3.92 \times 10^{-5}$ alt + 0.0387; $fh_1 = exp(-altitude/8000)$ and $fh_2 = exp(-altitude/1250)$.

Rationalizing equation (3.41) by comparing it with equation (3.28) gives the following:

$$f(n') = \log_e a_1 + (-a_2.am.(fh_1 + fh_2(T_L - 1))) \tag{3.42}$$

Re-arranging equation (3.42) to obtain the exponent of equation (3.41), this gives:

$$f(n') - \log_e a_1 = (-a_2.am.(fh_1 + fh_2(T_L - 1))) \tag{3.43}$$

The two unknowns in equation (3.43) are f(n') and Linke turbidity coefficient, T_L. The determination of n' from satellite data therefore makes it possible to determine T_L for any image obtained for clear sky conditions. The transmittance from equation (3.41) which is the downward transmittance is:

$$Tr(\theta) = \exp(-a_2.am.(fh_1 + fh_2(T_L - 1))) \tag{3.44}$$

This can be generally expressed as:

$$Tr(\theta) = \exp(\tau.\sec(\theta)) \tag{3.45}$$

where τ is the optical depth. The function sec(θ) is given as airmass (am) in equation (3.44). Therefore, τ can be expressed as:

$$\tau = -a_2.(fh_1 + fh_2(T_L - 1)) \tag{3.46}$$

The upward transmittance may be assumed to be identical to the downward transmittance as proposed by Rigollier *et. al.* (2004) since the reflection from the ground will essentially travel through the same atmosphere and atmospheric conditions are assumed to be the same within the time frame for the transmittance to take effect. The upward transmittance is generally expressed as:

$$Tr(\varphi) = \exp(\tau.\sec(\varphi)) \tag{3.47}$$

φ is the zenith angle of the satellite. Thus sec(φ) is the airmass corresponding to the path through which the upward travelling radiation passes through the atmosphere to the satellite. Applying the relations in equations (3.43, 3.46) to equations (3.45, 3.47), the downward and upward transmittance can now be expressed as:

$$Tr(\theta) = \exp((f(n_g) - \log_e a_1).\sec(\theta)) \tag{3.48}$$

$$Tr(\varphi) = \exp((f(n_g) - \log_e a_1).\frac{\sec(\varphi)}{\sec(\theta)}) \quad (3.49)$$

The significance of equations (3.48, 3.49) is that they can be solved from data from ground measurement and they account for the atmospheric properties involved in the attenuation of solar radiation. Equations (3.48, 3.49) serve as correction factors for reflectance observed under clear sky.

3.2.4 Simple Model of the Atmospheric Radiative Transfer of Sunshine version 2.9.5 (SMARTS2) radiative transfer code

The SMARTS2 radiative transfer code was developed by Dr. Christian Gueymard for the calculation of surface solar irradiance in the shortwave spectrum (ranging from 280nm to 4000nm) under clear-sky conditions. SMARTS2 is written in FORTRAN. The features of this software allows for the estimation of atmospheric properties such as its absorbance at various wavelengths as well as its reflectance. These features make it a necessary tool for this research, especially for the evaluation of atmospheric cloud-free reflectance. The inputs to the code include site atmospheric pressure, type of atmosphere, waters vapour, gaseous absorption, CO_2 concentration, reference atmosphere, atmospheric turbidity, solar geometry and others. Some of these inputs were supplied from observed values for Lagos such as the meteorological range (for atmospheric turbidity) and solar geometry while others were adopted from standard values for an urban setting provided in the software. SMARTS2 can calculate various atmospheric parameters, some of which are presented in appendices C and D.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Solar radiation in a clear atmosphere

The transmitting property of a clear atmosphere was modelled using SMARTS2 radiative transfer code (Gueymard, 2003a, 2003b). The equivalent extra-terrestrial irradiance and the clear-sky irradiance were calculated using the radiative transfer code. This is shown in Figures 4.1 through 4.4 for two days.

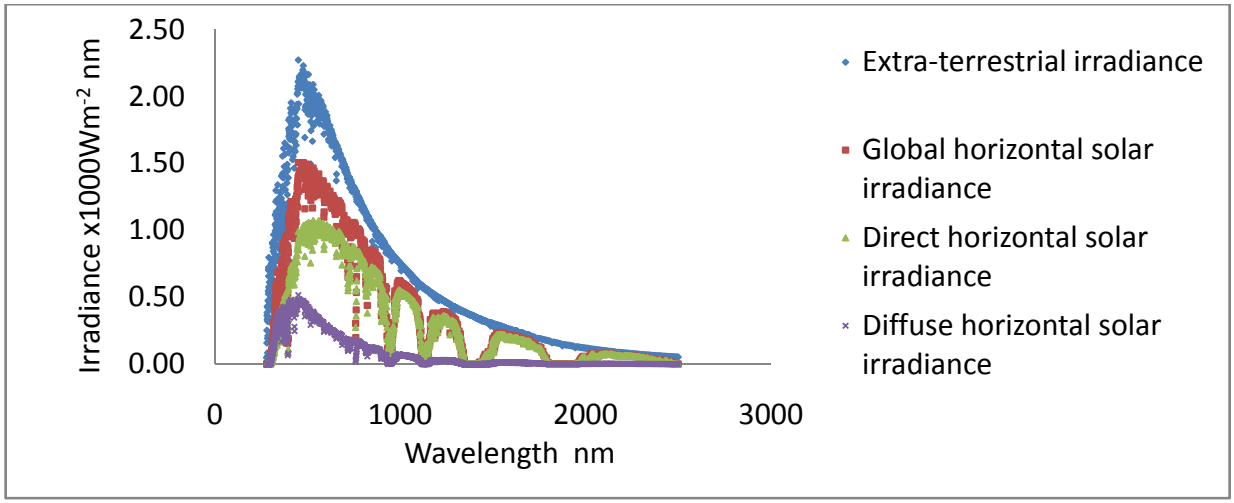


Figure 4.1 Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance calculated using SMARTS2 for Akoka on 30/11/2011 (appendix C)

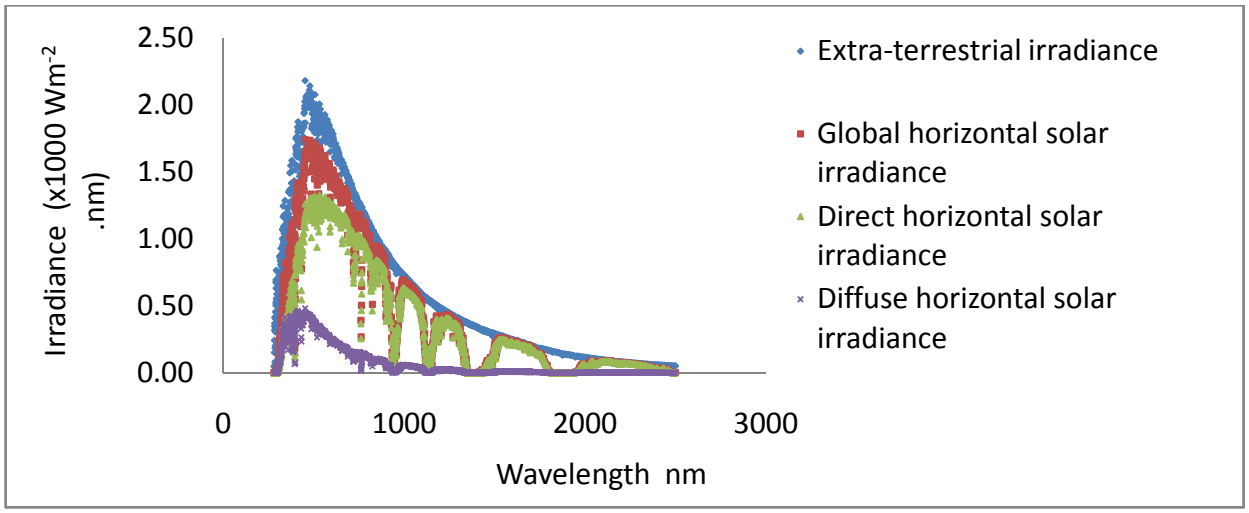


Figure 4.2 Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance calculated using SMARTS2 for Akoka on 26/4/2012 (appendix D)

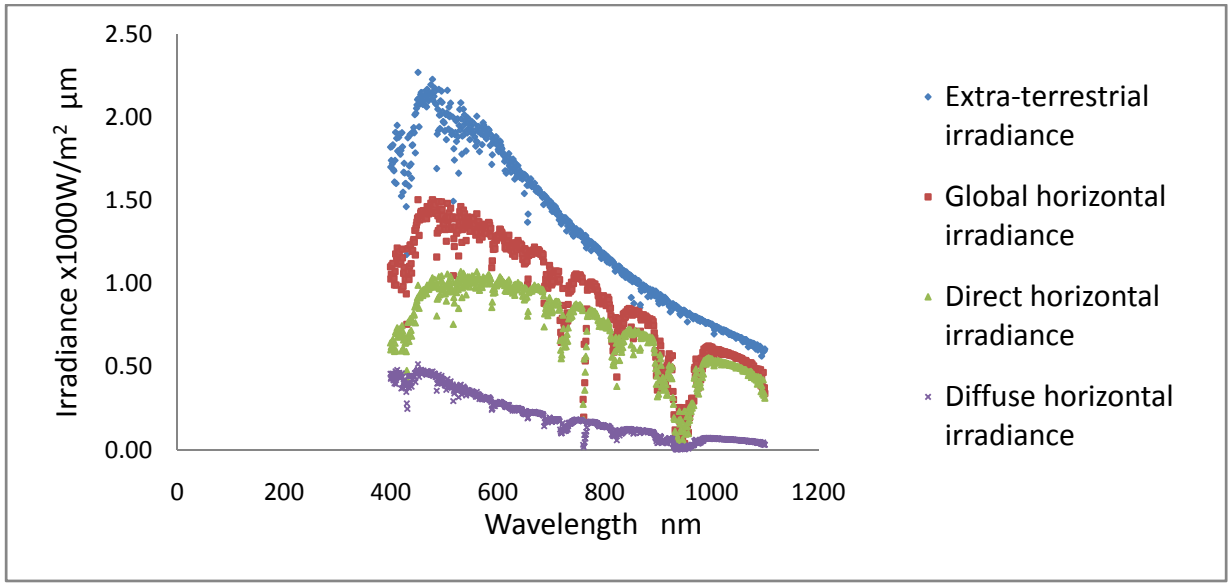


Figure 4.3 Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance in the wavelength range approximately 400nm to 1100nm corresponding to response window of satellite sensor in the HRV range, calculated using SMARTS2 for Akoka on 30/11/2011 (appendix C)

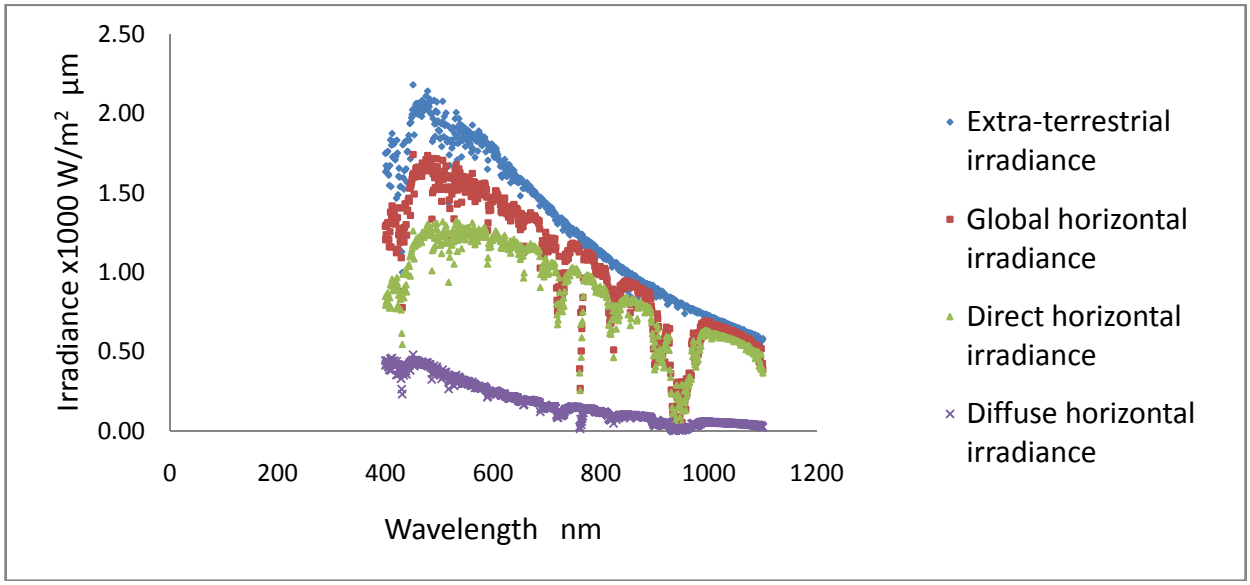


Figure 4.4 Extra-terrestrial and ground-reaching (global, direct and diffuse) irradiance in the wavelength range approximately 400nm to 1100nm corresponding to response window of satellite sensor in the HRV range, calculated using SMARTS2 for Akoka on 26/04/2012 (appendix D)

Figures 4.5 through 4.8 show the effect of the interaction of solar radiation with the atmospheric constituents as calculated using SMARTS2. These calculations are for the same days as in Figures

4.1 to 4.4. The total solar radiation reaching the ground comprises both diffuse radiation and direct or beam radiation.

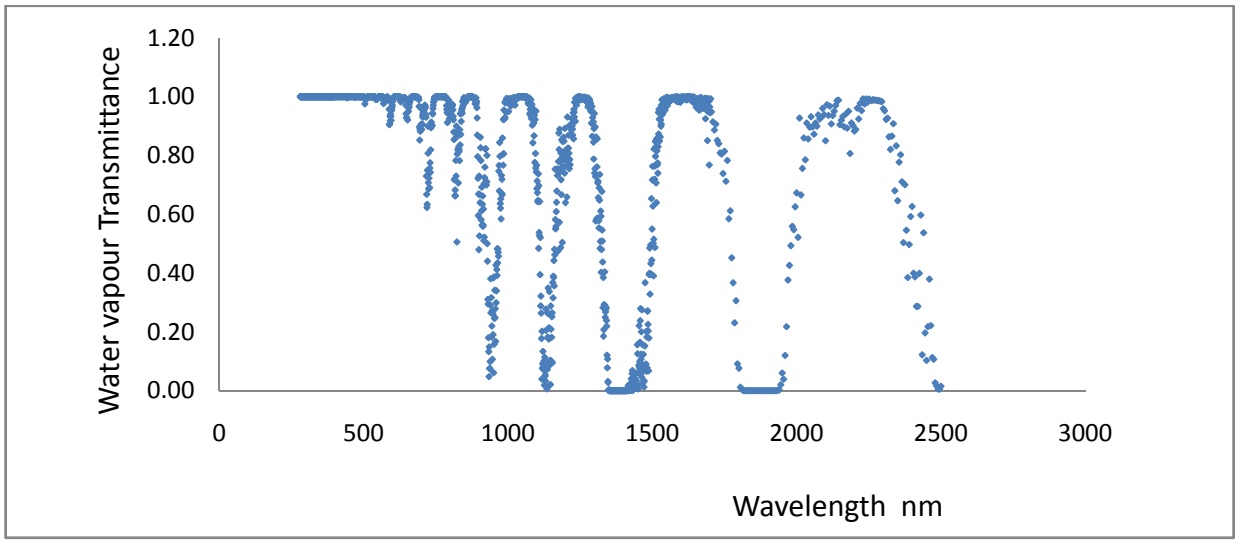


Figure 4.5 Water vapour transmittance for Akoka on 30/11/2011 calculated using SMARTS2 (appendix C)

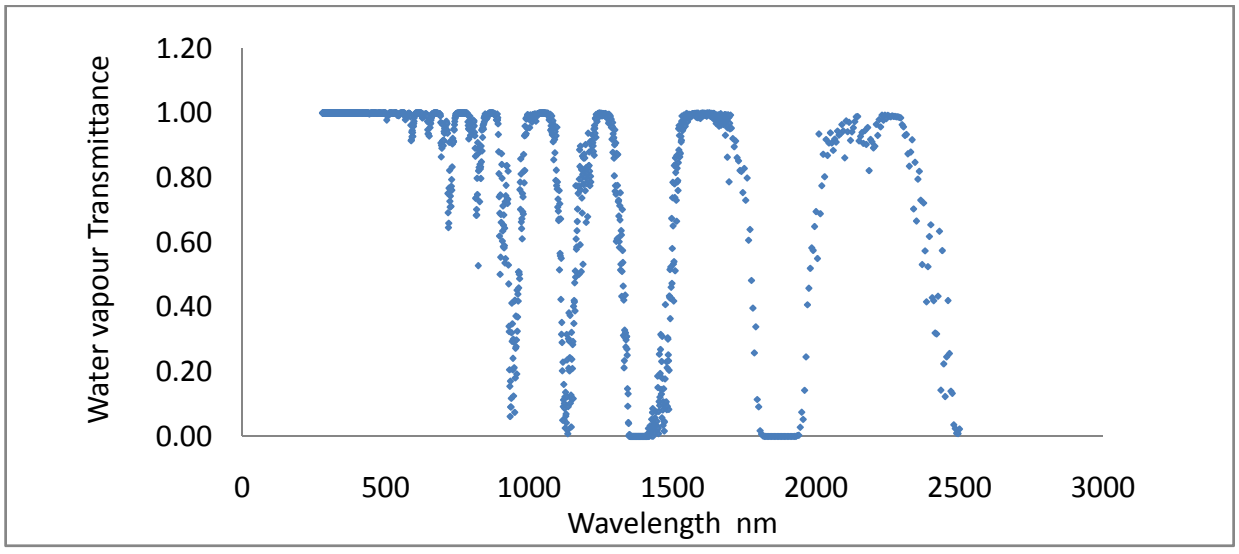


Figure 4.6 Water vapour transmittance for Akoka on 26/04/2012 calculated using SMARTS2 (appendix D)

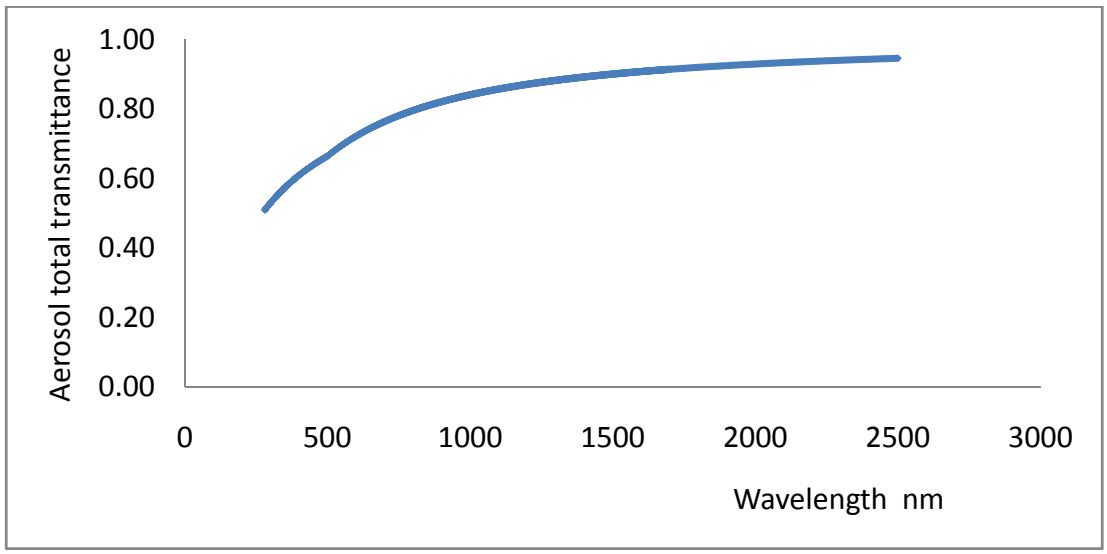


Figure 4.7 Aerosol transmittance for Akoka at solar noon for 30/11/2011 calculated using SMARTS2 (appendix C)

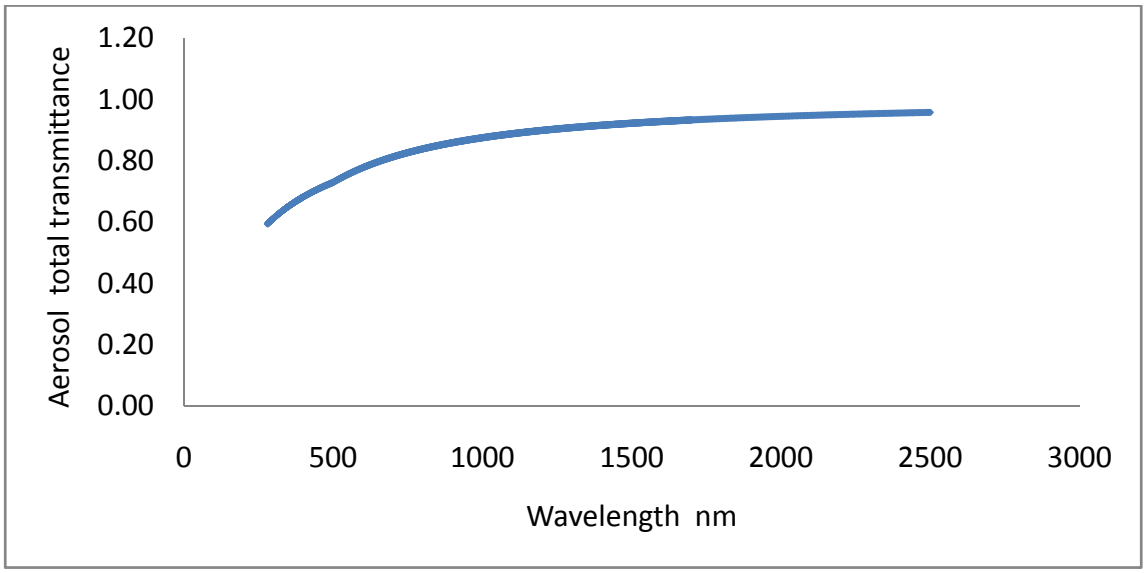


Figure 4.8 Aerosol transmittance for Akoka at solar noon for 26/04/2012 calculated using SMARTS2 (appendix D)

Figures 4.1 and 4.2 are spectral calculations corresponding to the range of wavelength which the ground instrument (pyranometer) can measure. The error in the global solar irradiance calculated from Figures 4.1 and 4.2 is less than 5% of the measured irradiance. The portion of the solar spectrum that the satellite's sensor responds to in the High Resolution Visible (HRV) channel is

shown in figures 4.3 and 4.4; the irradiance calculated from these figures is over 98% accurate when compared with the data published by EUMETSAT (Govert and Clerici, 2004). Figures 4.5 through to 4.8 present the effects of water vapour and aerosol on solar radiation in a clear atmosphere. The effects are very similar for both days – the UV/visible end being less affect than the visible/near infra-red end. These calculations were made at periods close to solar noon for both days. The spectrum at other periods such as the early or latter part of the day may vary widely for both days. The calculated back scattered radiation – i.e. the part of the solar irradiance that is reflected back to space or the atmospheric albedo – is approximately 4% of diffuse irradiance for both days and approximately 0.84% and 0.66% of global solar irradiance for 30/11/2011 and 26/04/2012 respectively. The percentages of solar radiation that is absorbed in the atmosphere are 39% and 28% for 30/11/2011 and 26/04/2012 respectively. This wide variation in the amount of absorbed radiation contributes largely to uncertainties in the estimated ground irradiance from season to season. The situation in a cloudy atmosphere is very different. Solar radiation experiences scattering in a cloudy atmosphere where a large portion of the radiation is reflected back to space. The back scattered solar radiation from clouds (depending on the type of cloud and the degree of cloud cover) could begin from around 20% as shown in Figures 2.1 and 2.2.

4.1.1 Atmospheric characterisation and clear-sky model

Equations (3.27, 3.28) were applied to solar radiation data for Akoka (lat.6.51^{0}N, long.3.39^{0}E), Uratta Estate, Owerri (lat. 5.48^{0}N, long. 7.06^{0}E), Kwali, Abuja (lat. 8.84^{0}N, long. 7.04^{0}E) and Sokoto (lat. 12.02^{0}N, long. 5.24^{0}E). The plot of $\log_e(G / G_O)$ against cloudiness index in Figure 4.9 was obtained from data for all four locations to obtain $f(n_g)$.

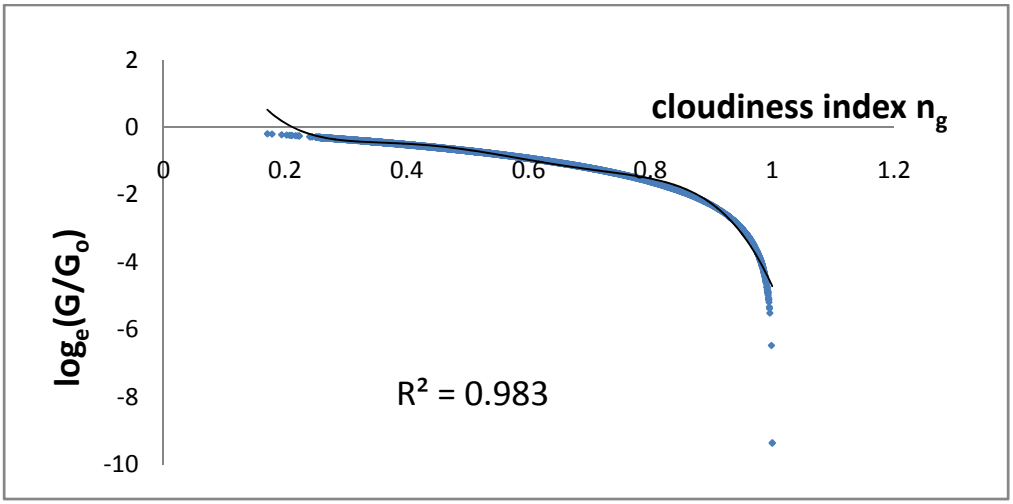


Figure 4.9 Variation of $\log_e(G / G_O)$ with cloudiness index for Akoka, Owerri, Abuja and Sokoto

Log_e(G/Go) decays almost uniformly until around 0.9 where it experiences a fast decay; it drops rapidly as cloudiness index approaches unity. The best fit for this curve is a sixth order polynomial. The maximum value for $\log_e$(G/Go) defines the clear sky transmission factor; this factor is required to set the transmitting limit in a clear sky model. It should be noted that this value is only a representative value as it may not be the same for all locations considered. This value was determined as 0.83; the required equation becomes:

$$G_C = 0.83 G_O \sin\theta \tag{4.1}$$

where θ is the solar elevation. The atmosphere was characterised for cloud index by calculating the clear sky irradiance.

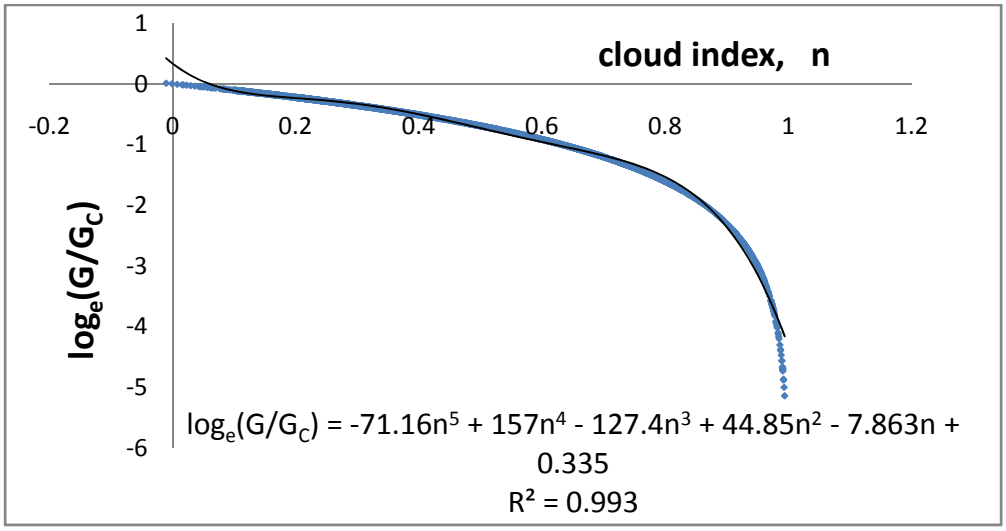


Figure 4.10 Variation of $\log_e(G / G_C)$ with cloud index for all locations

The curve in Figure 4.10 begins at a point that is very close to the origin unlike in Figure 4.9. However, the curves in both figures exhibit similar pattern in the variation of cloud index. This necessitates a resolution of the curve around the region where rapid drop in $\log_e(G/Gc)$ occurs. The range of values of cloud index was considered at the knee of the curve and the following conditions are applied; $0 < n \leq 0.8$ and $0.8 < n$ for better fits. The curves obtained are as shown in following figures:.

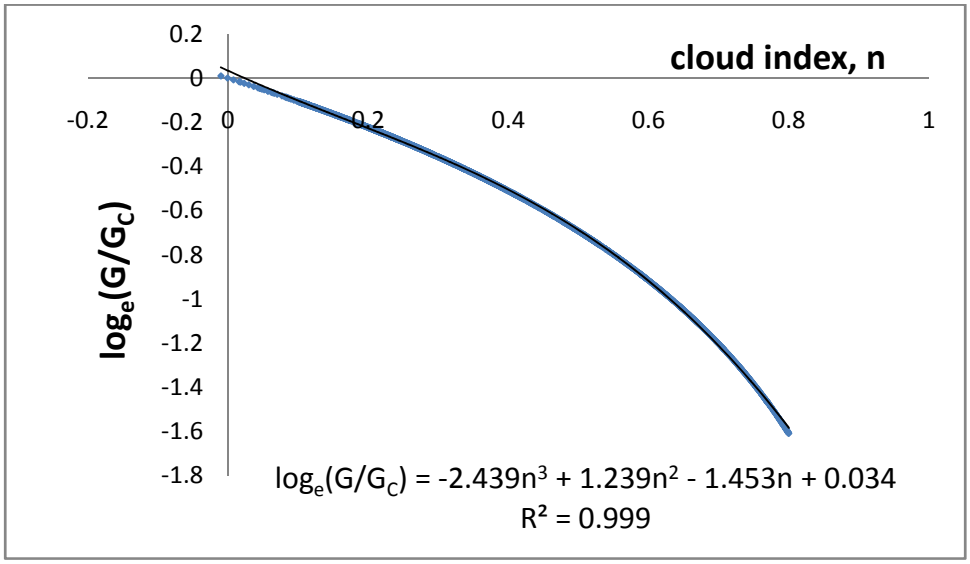


Figure 4.11 Variation of $\log_e(G / G_C)$ with cloud index for all locations in the range $0 < n \leq 0.8$

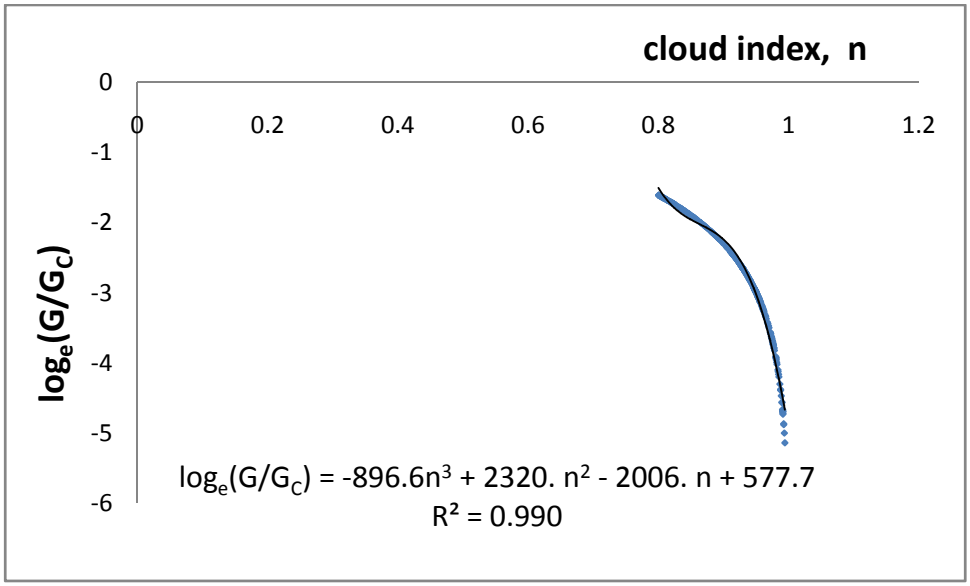


Figure 4.12 Variation of $\log_e(G / G_C)$ with cloud index for all locations in the range $0.8 < n$

From Figures 4.11 and 4.12, the expression for the estimation of f(n) becomes:

$f(n) = -2.439n^3 + 1.239n^2 - 1.453n + 0.034$ (for $0 < n \leq 0.9$)

and

$f(n) = -896.6n^3 + 2320.\ n^2 - 2006.\ n + 577.7$ (for $n > 0.9$) (4.2)

An evaluation of the terms of the clear-sky model (in equation (3.39)) was carried out. The value of α through a process of curve fitting was obtained as 0.13 while $\exp(f(n_g(\min))$ from Figure 4.9 is 0.83; equation (3.39) becomes:

$$.G = 0.83.I_O.\varepsilon.(0.13 + \sin\theta) \quad (4.3)$$

Figures 4.13 and 4.14 show the plots obtained for equation (4.3) along with the WMO1 model. These are for typical clear days. The closeness observed between the proposed model and the measured irradiance shows that the proposed model is a good representation for this location. The percentage relative error for the proposed model and the WMO1 model are 7.50% and 21.78% respectively for 30/11/2011 while for 26/04/2012, they are 1.19% and 10.08% respectively.

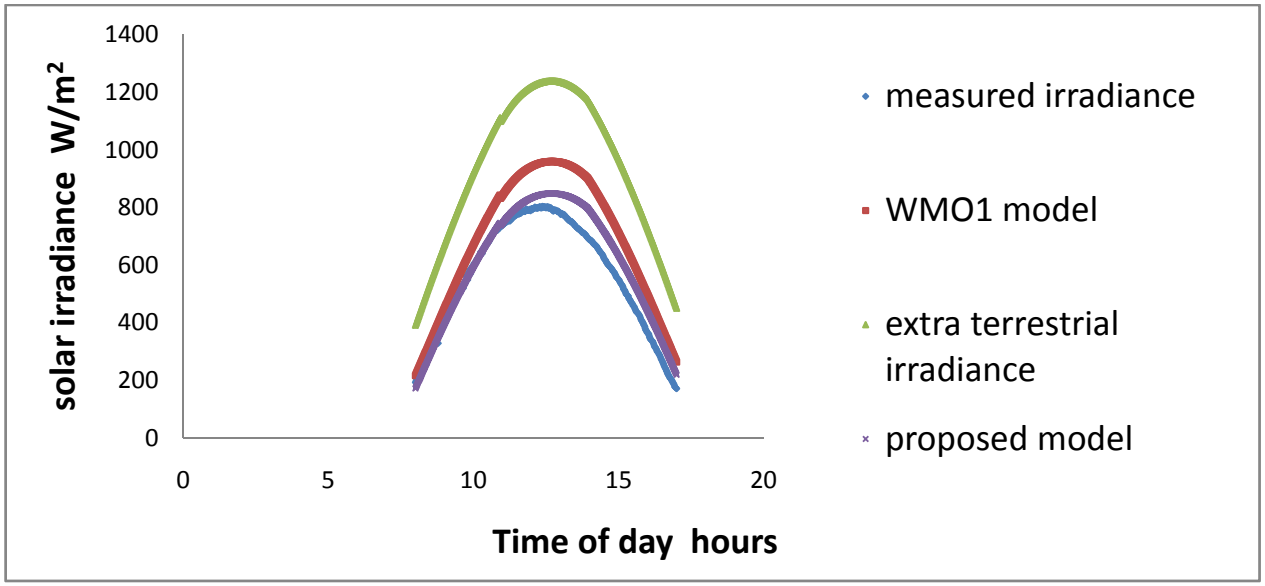


Figure 4.13 Comparison of clear-sky model of equation (3.39) with WMO1 model for Akoka on 30/11/2011.

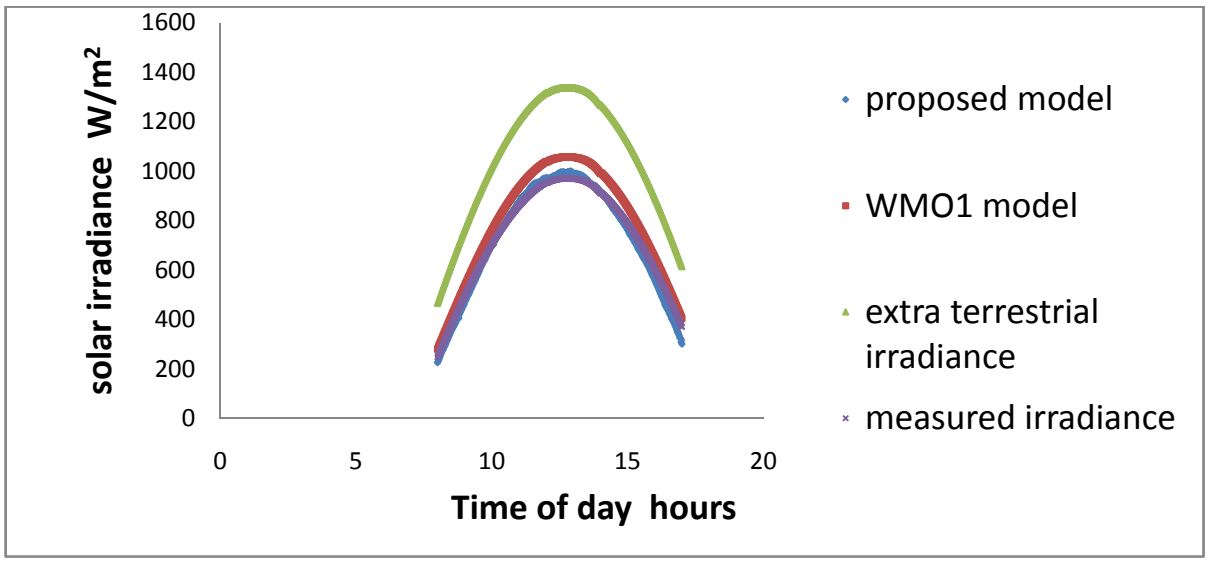


Figure 4.14 Comparison of clear-sky model of equation (3.39) with WMO1 model for Akoka on 26/04/2012.

4.2 Satellite derived solar irradiance

The methods described under sub-section 3.1 were applied in calculating reflectance. Equation (1.2) was first applied for the conversion of satellite counts to radiance and the radiance was converted to bi-directional reflectance factor (BRF) with equation (1.3). Equation (2.7) proposed by Rigollier *et. al.* (2004) was adopted and modified for this work as presented in equation (2.15) (which requires a redefinition of ρ_{atm}). The cloud index for each image was calculated from the reflectance. The cloud indices were used to characterise the atmosphere in a similar way as presented in sub-section 4.1.1 to obtain curves for the satellite derived cloud index. This is as shown in the following figure:

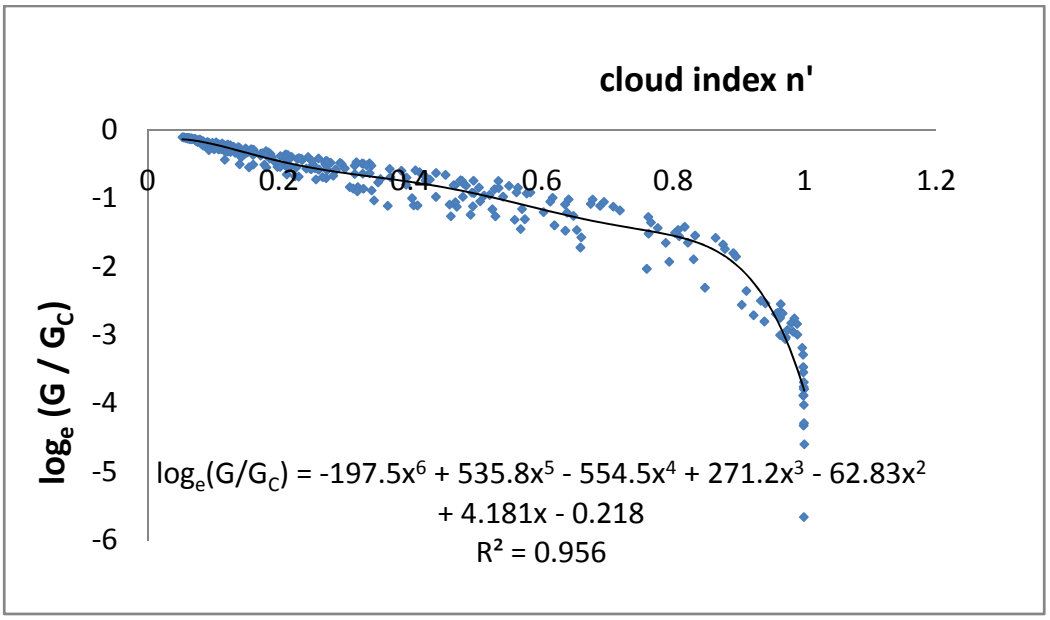


Figure 4.15 Variation of $\log_e(G / G_C)$ with satellite derived cloud index (n') for all locations

This was used for estimating ground–reaching solar radiation. A number of days within the period of April, 2011 to July, 2012 were used for the assessment for Akoka and other locations. The result is presented in Table 4.1. The mean bias error (MBE) shows that there are more over estimated values. The errors are much lower for the days in the dry season than for the day in the

wet season. The accuracy for the assessment of ground-reaching solar radiation is affected significantly by the presence of cloud. The variation of ground measured irradiance with satellite derived irradiance is shown in the following;

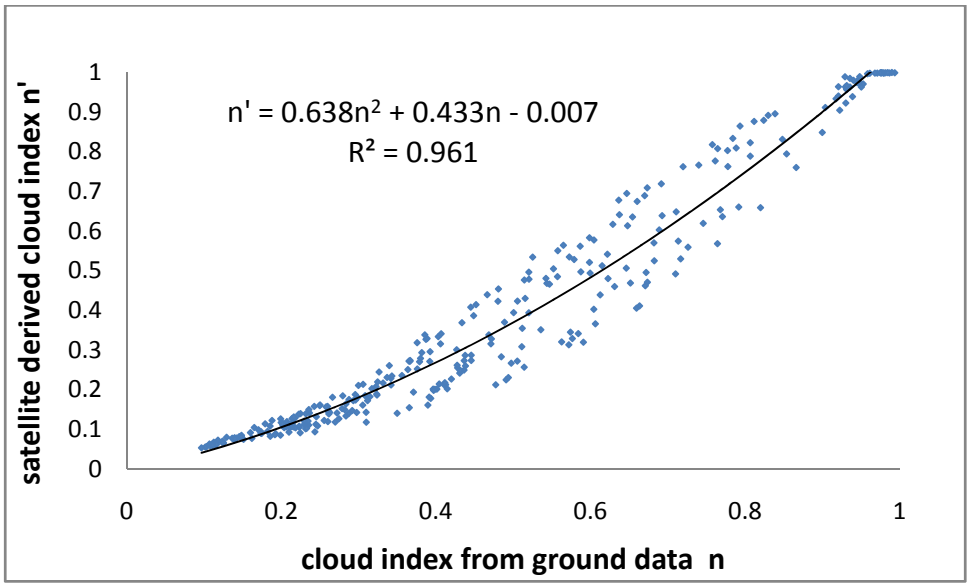


Figure 4.16 Variation of satellite derived cloud index (n') with cloud index from ground data

It was however observed that the RMSE may not give an impressive outlook. This was illustrated with the result for Akoka on 3/12/2011 and Owerri on 3/3/2012; the RMSE are 0.2306 (23.06%) and 0.3868 (38.68%) respectively. The profile of measured and estimated values in Figures 4.13 and 4.14 show the closeness when considered from this point of view.

Table 4.1 Normalized values of mean bias error (NMBE) and root mean square error (NRMSE) for radiation estimated from satellite images

Place	Date	NMBE	NRMSE
Akoka	07/04/2011	0.0323	0.3220
Akoka	26/04/2011	-0.0861	0.1082
Akoka	21/06/2011	0.1819	1.2833
Akoka	23/08/2011	-0.1273	1.3330
Akoka	13/09/2011	3.7936	7.6252
Akoka	30/11/2011	-0.0280	0.0718
Akoka	03/12/2011	-0.0104	0.2306
Akoka	14/01/2012	-0.0454	0.1102
Akoka	26/04/2012	-0.0624	0.0764
Owerri	02/03/2012	0.0733	0.2934
Owerri	03/03/2012	0.1377	0.3868
Abuja	28/04/2012	0.1154	0.4454
Abuja	29/04/2012	-0.0197	0.0667
Sokoto	15/06/2012	-0.0404	0.1167
Sokoto	16/06/2012	0.0618	0.2913
Sokoto	17/06/2012	0.1197	0.1796
Sokoto	13/07/2012	0.0145	0.4405

Table 4.2. Comparison of results obtained with HCL-2 (HelioClim 2) result for Faculty of Science UNILAG (lat. 6.515^{0}N; long. 3.400^{0}E)

DATE	26 / 04 / 2011			21 / 06 / 2011			23 / 08 / 2011			13 / 09 / 2011			30 / 11 / 2011		
TIME	measured G (W/m^2)	HCL-2 (W/m^2)	Our Model (W/m^2)	measured G (W/m^2)	HCL-2 (W/m^2)	Our Model (W/m^2)	measured G (W/m^2)	HCL-2 (W/m^2)	Our Model (W/m^2)	measured G (W/m^2)	HCL-2 (W/m^2)	Our Model (W/m^2)	measured G (W/m^2)	HCL-2 (W/m^2)	Our Model (W/m^2)
8:00 - 8:15	254	246	241	141	211	149	79	167	48	77	117	86	176	194	176
8:15 - 8:30	309	308	302	249	272	243	89	199	76	111	176	51	217	255	219
8:30 - 8:45	251	370	236	220	335	240	109	255	113	95	186	50	276	312	250
8:45 - 9:00	293	422	318	273	362	285	100	312	88	42	229	62	333	366	303
9:00 - 9:15	499	451	440	255	270	255	119	329	40	17	360	56	394	419	394
9:15 - 9:30	494	527	469	416	374	402	132	368	160	23	475	55	450	471	439
9:30 - 9:45	622	602	576	327	480	306	192	424	170	8	458	59	503	522	483
9:45 - 10:00	602	659	625	305	507	140	235	462	157	13	511	69	556	572	545
10:00 - 10:15	619	704	662	156	478	209	239	461	299	56	461	72	605	616	593
10:15 - 10:30	818	747	723	129	380	114	240	512	335	47	434	69	654	657	635
10:30 - 10:45	780	790	757	226	342	137	461	592	341	76	250	72	696	696	674
10:45 - 11:00	755	829	808	327	398	247	439	594	431	59	215	74	728	732	714
11:00 - 11:15	774	866	844	221	69	275	317	585	259	70	109	76	750	765	665
11:15 - 11:30	889	898	873	226	65	179	406	574	403	58	231	78	770	788	713
11:30 - 11:45	913	931	897	210	54	244	188	489	384	56	320	80	791	810	754
11:45 - 12:00	959	928	918	150	32	164	28	362	337	52	439	80	806	827	762
12:00 - 12:15	960	889	930	100	26	110	74	311	209	55	490	81	816	841	819
12:15 - 12:30	967	862	938	83	25	77	160	336	183	87	635	81	830	846	784
12:30 - 12:45	982	921	900	86	26	82	128	372	148	68	809	81	830	845	830
12:45 - 13:00	986	959	899	72	26	73	119	353	157	78	875	209	823	841	755
13:00 - 13:15	979	973	898	67	26	74	121	307	166	112	867	212	814	834	601
13:15 - 13:30	965	952	890	71	26	70	148	277	172	148	853	222	799	825	664
13:30 - 13:45	938	938	880	70	28	61	120	280	197	196	924	236	785	812	748
13:45 - 14:00	918	916	855	71	26	75	93	306	242	252	916	254	769	790	785
14:00 - 14:15	890	892	829	53	26	15	159	335	298	341	891	254	745	763	737
14:15 - 14:30	831	859	799	6	24	45	211	333	410	354	862	298	716	731	703
14:30 - 14:45	776	825	764	12	24	21	147	271	368	312	830	346	669	698	663
14:45 - 15:00	757	786	727	19	23	20	157	254	346	357	788	419	632	660	620
15:00 - 15:15	714	743	688	18	22	15	121	238	99	288	745	363	587	615	581
15:15 - 15:30	687	697	643	15	22	15	190	281	162	345	697	252	536	566	535
15:30 - 15:45	642	649	592	18	22	15	157	296	257	307	652	282	490	514	485
15:45 - 16:00	589	597	530	21	20	24	151	305	289	344	599	274	435	463	436
16:00 - 16:15	533	541	465	29	20	32	136	192	95	430	540	272	378	412	388
16:15 - 16:30	443	481	413	16	18	24	59	212	36	427	476	282	320	358	337
16:30 - 16:45	375	424	352	14	18	34	89	240	98	305	410	314	258	300	282
16:45 - 17:00	300	365	278	21	18	17	68	186	101	233	348	334	204	236	232
	MBE	**0.0193**	**-0.0440**	**MBE**	**0.0160**	**-0.0081**	**MBE**	**0.2548**	**0.0675**	**MBE**	**0.5298**	**0.0101**	**MBE**	**0.0324**	**-0.0334**
	RMSE	**0.0744**	**0.0689**	**RMSE**	**0.1470**	**0.0560**	**RMSE**	**0.2671**	**0.1506**	**RMSE**	**0.6120**	**0.0896**	**RMSE**	**0.0347**	**0.0713**
	Rel. Error	**0.0193**	**-0.0440**	**Rel. Error**	**0.0857**	**-0.0432**	**Rel. Error**	**1.0676**	**0.2827**	**Rel. Error**	**2.2500**	**0.0428**	**Rel. Error**	**0.0384**	**-0.0396**

The NMBE in Table 4.1 shows that the occurrence of over estimation and under estimation is approximately the same for all locations. The amount with which the estimated irradiance varies from the measured values is small when compared with the mean day solar irradiance for the days considered. The normalized RMSE varies from 0.0667 to 1.4546. This is in line with expected trends where cloud presence introduces large error in the estimated irradiance. In this situation, the estimated irradiance is set to a fixed value just as in equation (3.24) (Rigollier *et. al.*, 2004). The results obtained for Akoka was compared with available results obtained using the Heliosat II method provided by HelioClim - data derived from *meteosat 9* satellite. This is presented in Table 4.2. The results obtained from this work compare favourable with those from Heliosat II. The day profile of solar irradiance is shown in Figures 4.17, 4.18 and 4.19.

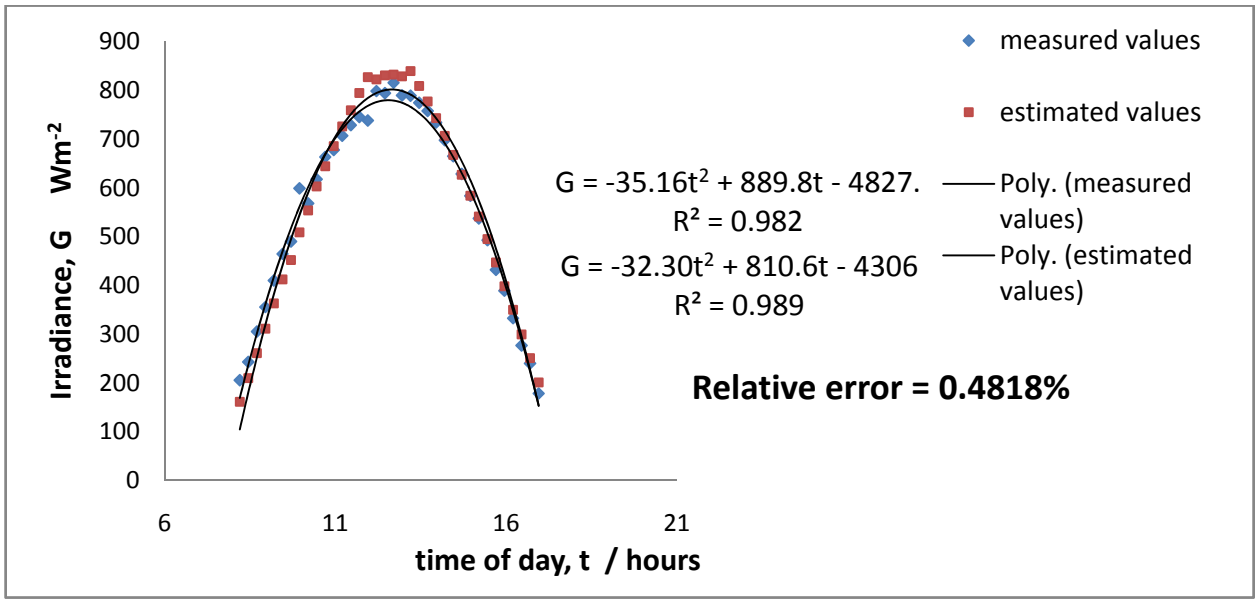


Figure 4.17 Solar irradiance day profile for Akoka on 3/12/2011

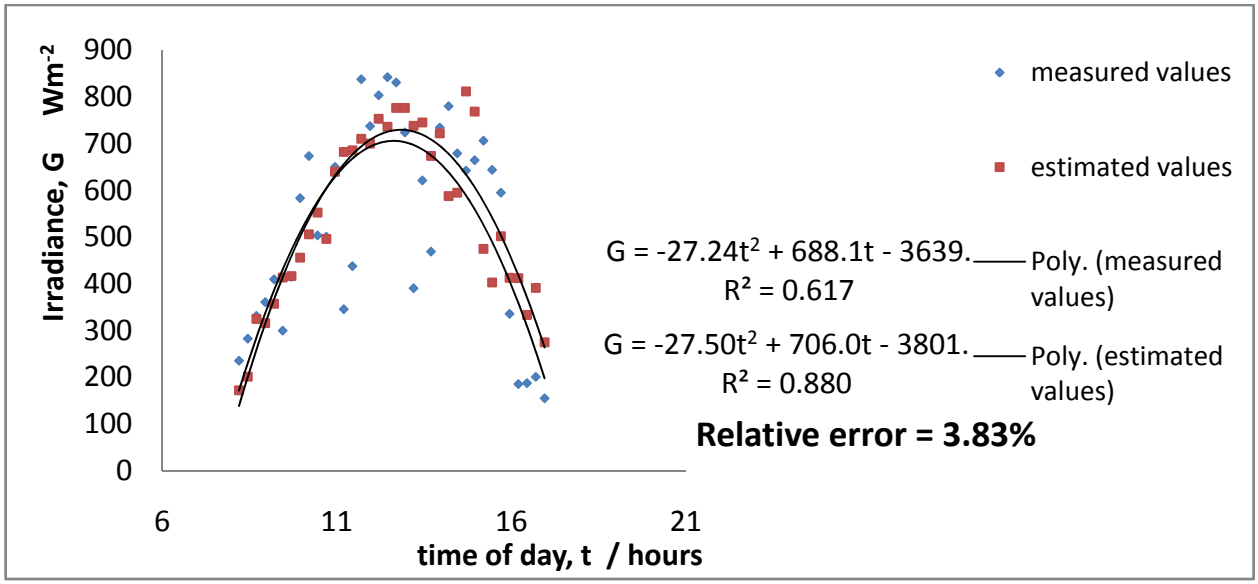


Figure 4.18 Solar irradiance day profile for Owerri on 3/3/2012

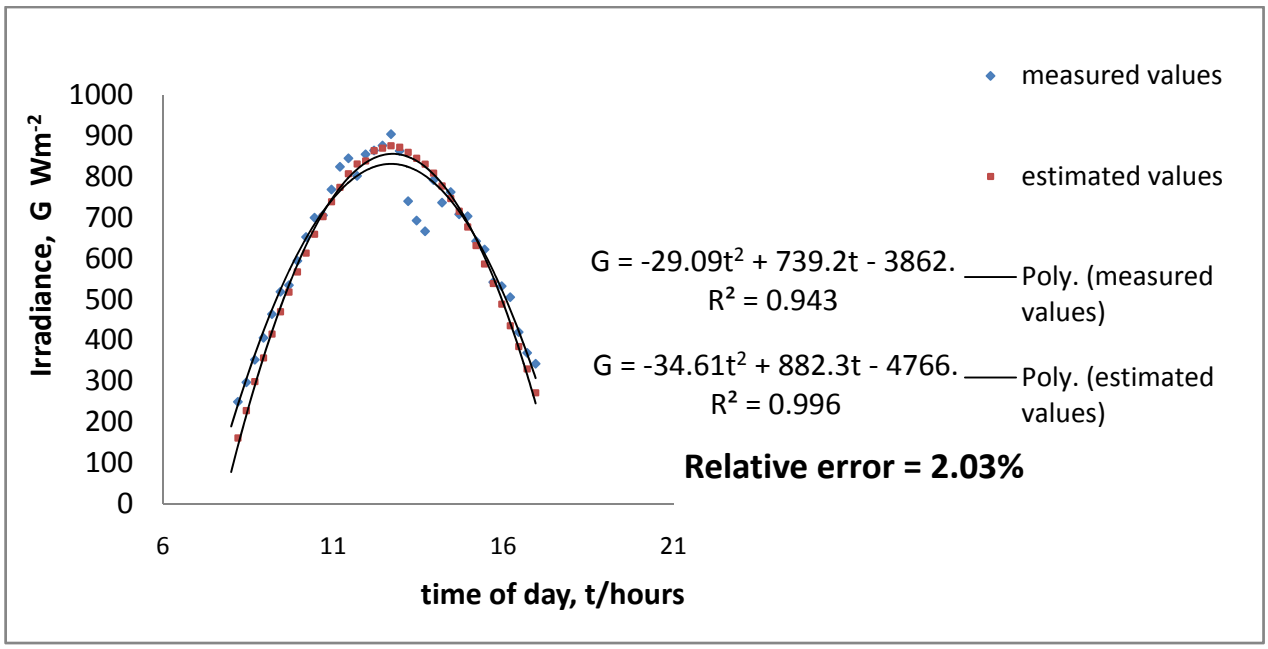


Figure 4.19 Solar irradiance day profile for Sokoto on 15/6/2012

The result in Table 4.2 compare favourably with the Heliosat method, based only on the figures presented; the same can be said with respect to results obtained by other authors. A few days spread across the seasons in the year have been considered in this work. This corresponds to about

600 observations for all the days: therefore, some caution guided the comparison with the works of other authors. Rigollier *et. al.* (2004) obtained results for hourly radiation for thirty-five stations spread across some nations in Europe. The best result they obtained for linearity between estimated and measured values was 0.90 for 8248 observations in the month of April 1995 while the best percentage RMSE was 18% for 8105 observations in the month of July 1994. Polo *et. al.* (2008) carried out a review of the works of various authors and showed that Zarzalejo had the lowest percentage RMSE of 18.25%. Mueller *et. al.* (2004) obtained a RMSE of 4% for 4320 observations. When the error indices in table 4.1 is considered (especially for the days in the dry season) along with Figures 4.11, 4.12, 4.17, 4.18 and 4.19 it can be deduced that solar irradiance estimated from satellite images is a good representation of ground-reaching solar radiation.

4.2.1 Estimation of visible/near infra-red (V/NIR) and photosynthetically active radiation (PAR)

The assessment of spectral components of global solar radiation from satellite images is similar to that for solar global radiation. It was observed from data for Akoka that V/NIR and PAR vary linearly with global solar radiation. This is shown in Figures 4.20 and 4.21.

The formulation obtained in section 3.2 was applied for the estimation of global solar radiation using the relationship in each case. They were applied to data available for Akoka. The results obtained are as shown in figures 4.20 and 4.21. The MBE and RMSE for V/NIR and PAR are 0.0620, 0.0812 and -0.0750, 0.2568 respectively.

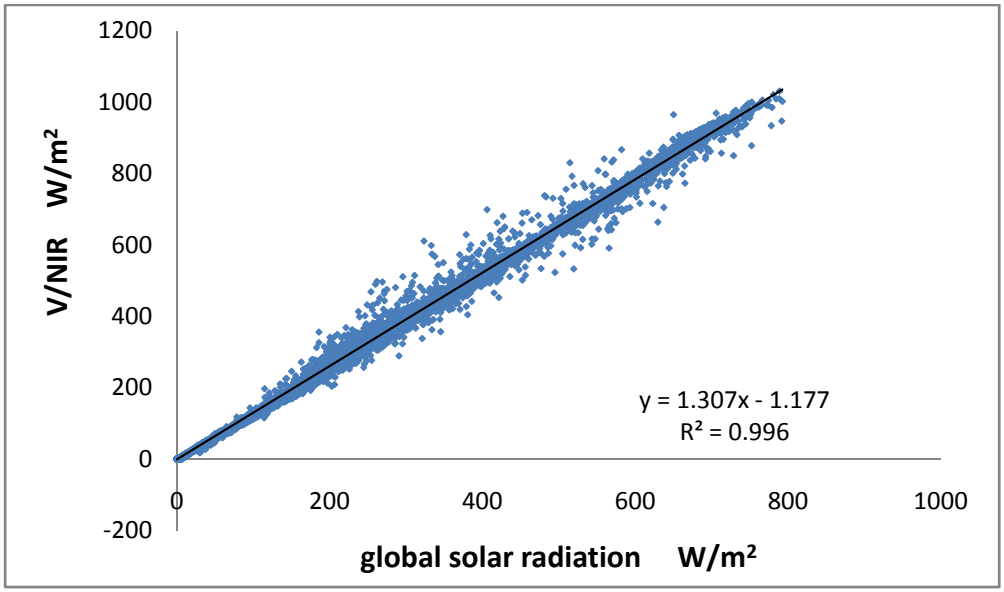


Figure 4.20 Variation of measured values of both V/NIR with global solar radiation (14th – 21st September, 2011)

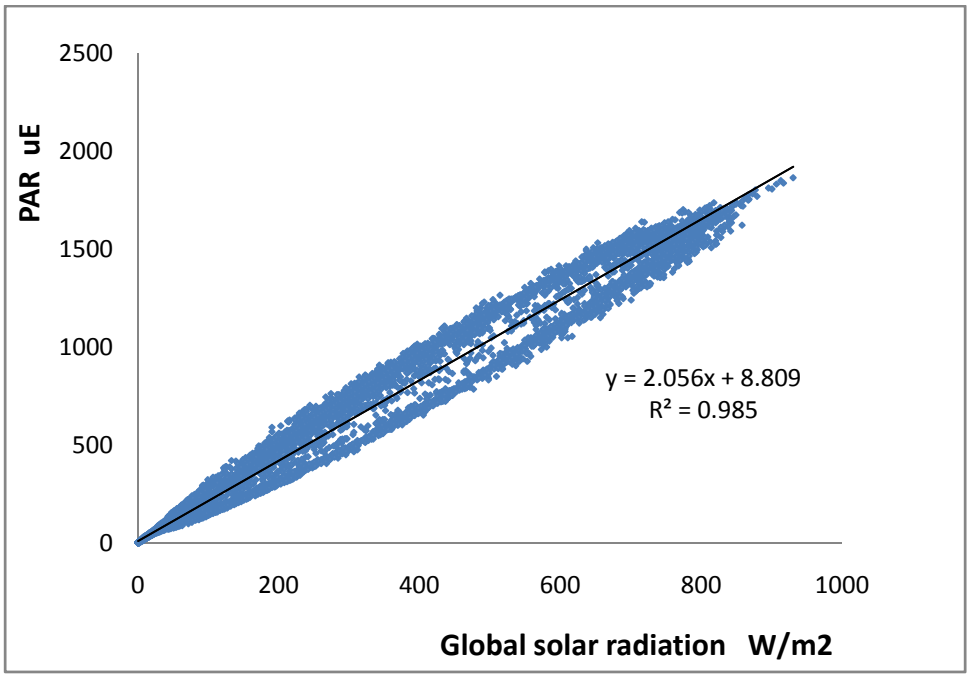


Figure 4.21 Variation of measured values of both PAR with global solar radiation (20th – 30th November, 2011)

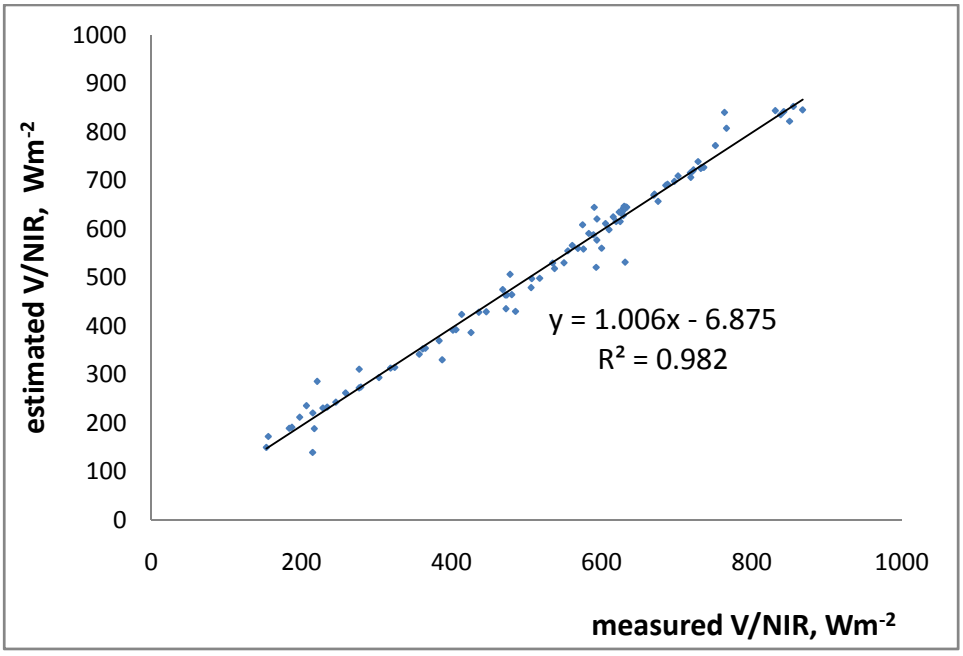


Figure 4.22 Relationship between estimated and measured V/NIR

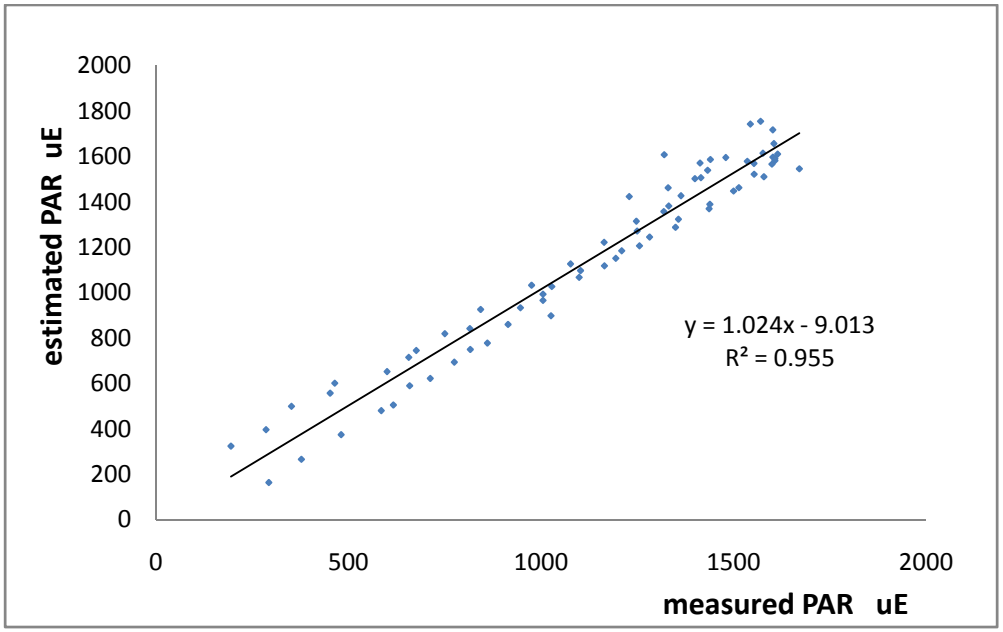


Figure 4.23 Relationship between estimated and measured PAR for 30/11/2011

The results presented in Figures 4.22 and 4.23 show how the estimated values vary with measured values for V/NIR and PAR. The relationship between estimated and measured values for V/NIR

and PAR is linear with correlation coefficients 0.982 and 0.955 respectively.. The relative error for V/NIR and PAR from Figures 4.22 and 4.23 are 0.0057(0.57%) and -0.0160(-1.6%) respectively.

4.3 Estimating Linke turbidity factor

A knowledge of the function f(n') as stated for equation (4.3), is necessary to determine T_L. The results are as shown below: A graphic presentation of the result is shown in Figures 4.24 and 4.25. Figure 4.24 shows the observed variation of Linke turbidity with cloud index while figure 4.25 shows linear variation of estimated with measured Linke turbidity. The MBE and RMSE are 0.0013 and 0.2453 respectively.

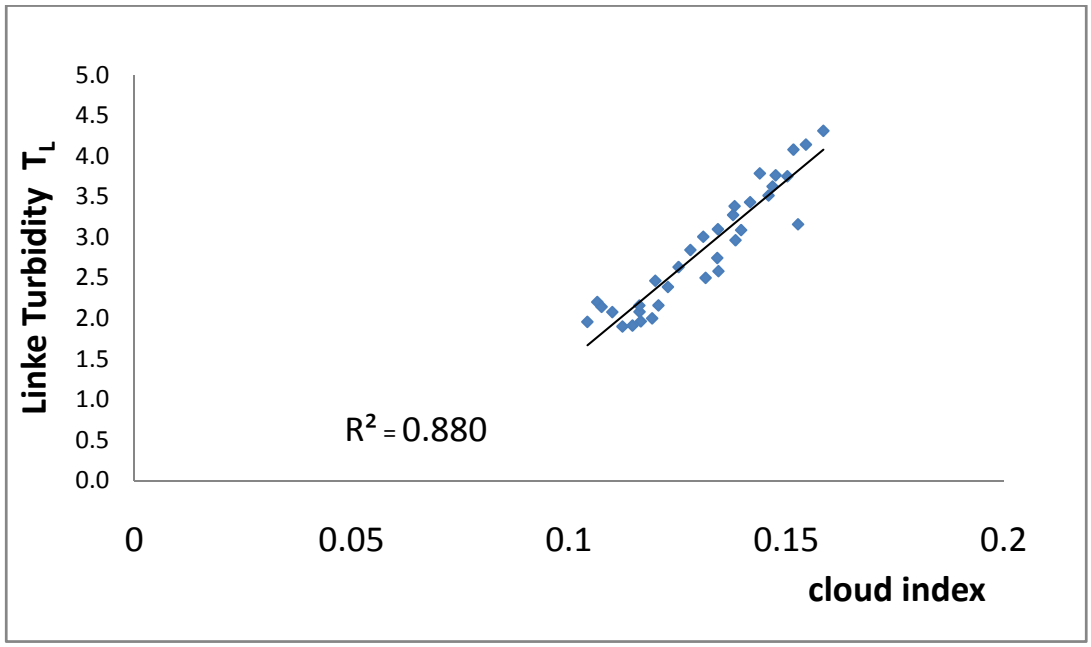


Figure 4.24 Variation of Linke factor with cloud index observed under clear sky

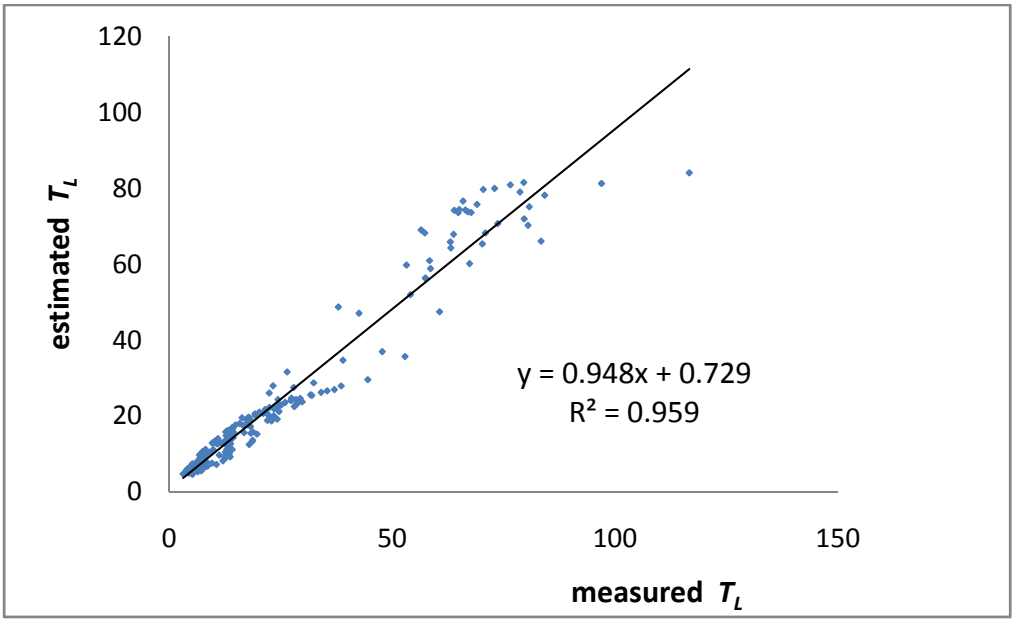


Figure 4.25 Graphical presentation of measured and estimated Linke turbidity factor for Akoka.

The use of other clear-sky models (such as the Lambert- Beer model) may offer better result. This option has not been explored here because the direct solar radiation data required for the Lambert-Beer model are not part of the data gathered for this work.

The results obtained in this study provide the answer to our research questions. The cloud index can play the role of an attenuating term in a Beer- Lambert type of equation as expressed in the model in equations (3.28) and (3.33). This has been used to characterise the atmosphere in four locations in Nigeria. The curves obtained in Figures 4.10 and 4.15 can be applied to any other location in Nigeria.

The results obtained from the introduction of equation (3.33) into the process of estimating ground-reaching radiation from satellite images show agreement with results obtained from other method and agree with results in literature from different authors which show that the RMSE for hourly assessments range from 18.25% to 36.1% (Polo *et. al.*, 2008). The method used in this

study has the advantage of not requiring Linke turbidity factor in the process unlike the methods of these other authors. A comparison is show in Table 4.2. The *Solar Data*© (SoDa) data is based on the method developed by Rigollier *et. al.* (2004) which requires the use of Linke turbidity factor. The pattern of the error from clear days to cloudy days is similar. The overall day error is very small especially for clear days. This is important when daily global solar radiation is considered. The issue to be addressed in applying the method proposed here is the determination of the transmittance for operational application. This can be accomplished in two main ways: the first is to estimate the transmittance from ground data for visibility – this data is available in most meteorological stations – while the second involves deriving it from satellite data such as that shown in Figure 2.10. The limitation of these sources is that the data are daily records. It will be necessary to consider the use of the thermal channels along with these sources to estimate hourly values of atmospheric transmittance.

The results from the estimation of Linke turbidity factor show that satellite images can be exploited for the assessment of this parameter. The mean bias error is 0.13% implying that it is suitable for extended period of use such as a day.

A direct relationship between V/NIR and PAR with global solar radiation can be exploited for the assessment of these components of solar radiation from satellite images. The correlation observed from the assessment from satellite image is however not as strong as that from the measured data. This can easily be explained as being the result of the error in determination of the global solar radiation from satellite images. An estimation approach that involves a derivation of these components of solar radiation from satellite images will be preferred for long term application.

This will be more beneficial for the estimation of the spectral components of global solar radiation.

4.4 Summary of Findings

The following is a summary of our findings:

(a) **Objective:** Develop a site-independent cloud index model for the characterisation of the atmosphere

Finding: The cloud index model that was used for the characterisation of the atmosphere showed site-independence with respect to the four locations where it was applied (i.e. Akoka, Owerri, Abuja and Sokoto). A characteristic curve was obtained to which the best fit was a fifth degree polynomial with coefficient of determination of 0.993. The fit was improved by setting the ranges $0 < n \leq 0.8$ and $n > 0.8$. The coefficients of determination for these ranges were 0.999 and 0.990 respectively. This model served as the basis for formulating a clear sky model.

(b) **Objective:** Determine the amount of ground-reaching solar radiation from satellite images.

Finding: A method for estimating ground-reaching solar irradiance from satellite image was developed and applied in the estimation of ground-reaching solar radiation from satellite images by introducing the cloud index model for characterising the atmosphere. The results obtained agree with expected results in literature (Polo ***et. al.***, 2008) and they compare favourably with results from *Solar Data*. The results obtained from the introduction of our model into the process for global solar irradiance assessment from satellite images, show that the root mean square error (RMSE) and mean bias error (MBE) ranges from 0.0667 to 1.4546 and –0.0104 to 0.1819 respectively. Also, photosynthetically active radiation (PAR) and visible / near infra-

red (V/NIR) radiation have been estimated from global solar irradiation derived from satellite images. This was achieved through the use of the relationship between PAR and V/NIR with global solar radiation. This was applied to data for Akoka. The results show that the MBE and RMSE for V/NIR and PAR are 0.0620, 0.0812 and -0.0750, 0.2568 respectively

(c) **Objective:** Develop a method for estimating Linke turbidity factor (T_L) from satellite images

Finding: A method for estimating Linke turbidity factor from satellite images has been developed. The method exploits the correlation that exists between Linke turbidity factor and cloud–index and it involves inverting the Kasten's clear-sky model to calculate Linke turbidity factor. An important product of this method is the formulation of a clear sky model. The normalized MBE and RMSE for the estimated Linke turbidity coefficients are 0.0013 and 0.2453 respectively

CHAPTER 5

CONCLUSION

5.1 Contributions to Knowledge

This work contributes to the body of knowledge in the field of solar physics by establishing the following facts:

(a) A novel model for utilising cloud index derived from satellite images for estimating ground-reaching solar radiation such as global solar radiation, photosynthetic active radiation (PAR) and visible/near infra-red radiation (V/NIR). This method is based on characterising the sky with respect to cloud index. The theoretical framework and the results show that cloud index is the sole basis for the assessment. This approach allows for the characterisation of the atmosphere with respect to the observation made by the satellite's sensor.

(b) This work established a relationship between Linke turbidity factor and satellite images of the Earth. A novel approach for estimating Linke turbidity from satellite images of the Earth was proposed: this will make the assessment of direct and global solar radiation wholly from satellite images possible. This is contrary to the present methods that make use of a solar radiation atlas for estimating the clear-sky radiation. The method we have proposed will require calibration of satellites images with respect to reference images which will serve as standards.

(c) A generalized site-independent clear-sky model for determining the appropriate transmittance of solar radiation of a given location was developed. This is a departure

from the solar elevation dependent models which usually have a suggested transmittance in their formula.

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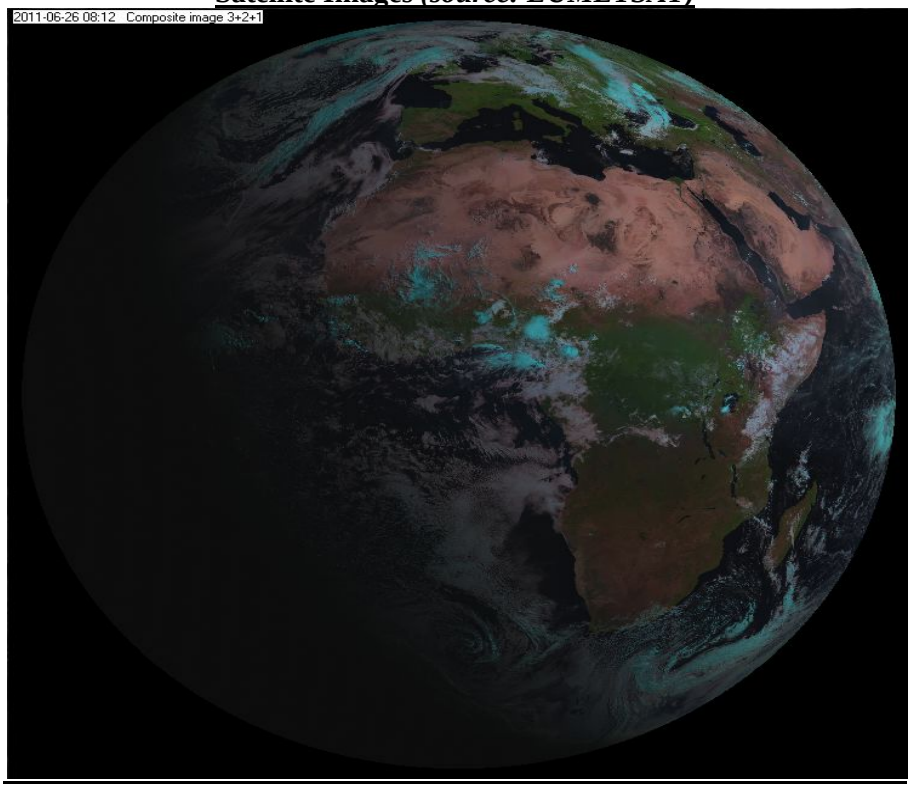
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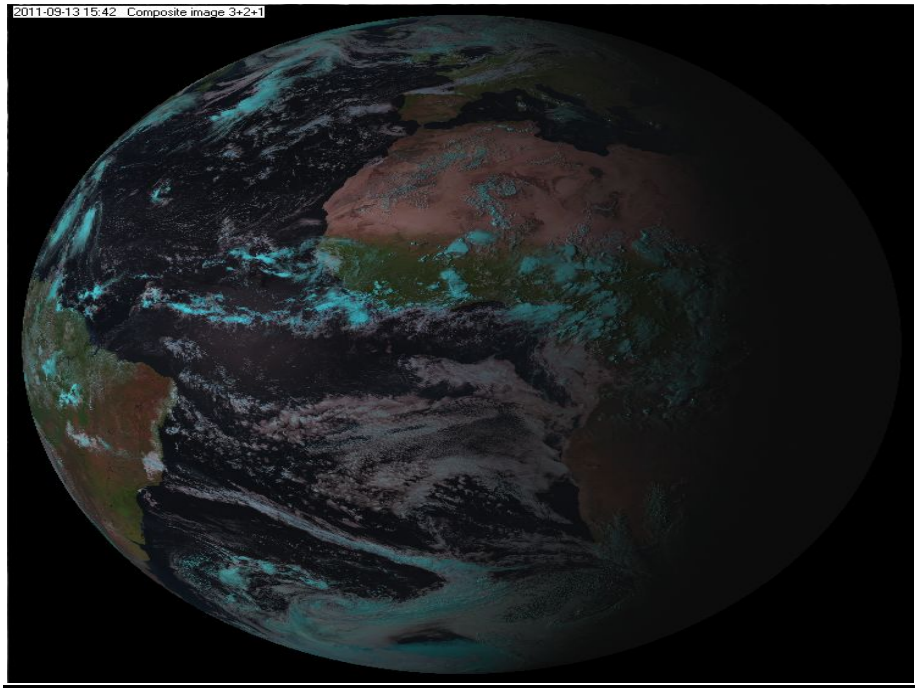
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APPENDIX A

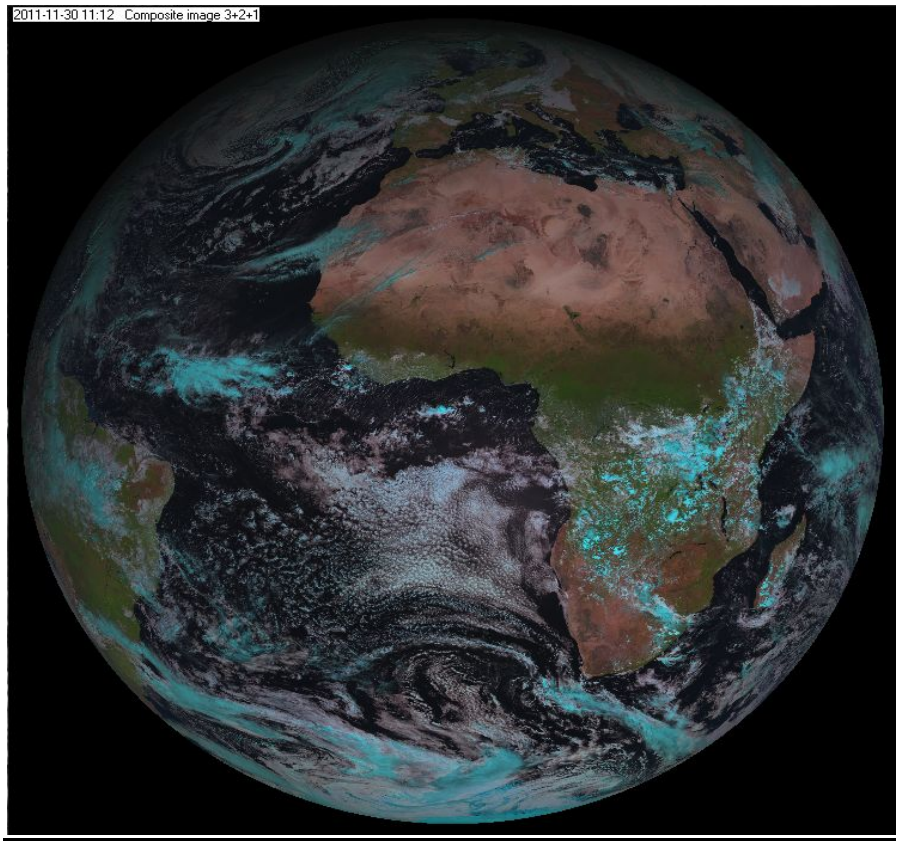
Satellite Images *(source: EUMETSAT)*



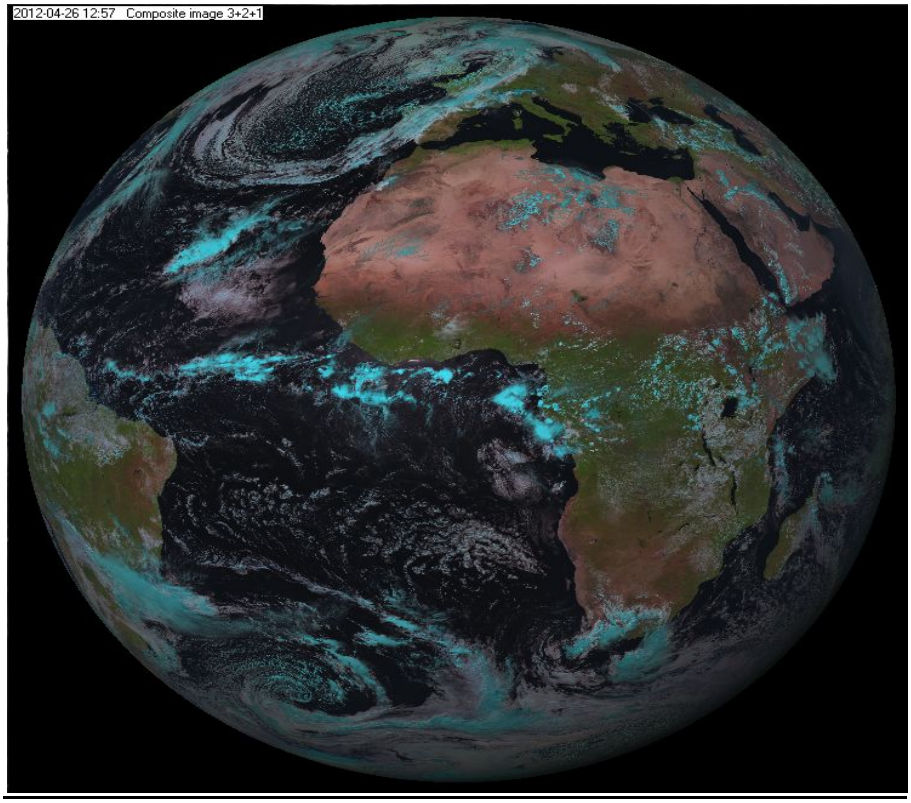
Date and Time: 26 06 2011 8:12UT



Date and Time: 13 09 2011 15:42UT



Date and Time: 30 11 2011 11.12UT



Date and Time: 26 04 2012 12.57UT

APPENDIX B

Approximate albedos for various features in the visible satellite imagery (expressed as percentage of light reflected by the surface)(Conway *et. al.*. 1997)

CLOUDS

Cumulus large and tall	92
Cumulus small, tops at 6Km	86
Cirrostratus, thick with lower cloud	74
Cumulus with stratocumulus	69
Stratocumulus	68
Stratus, thick (0.5Km) over ocean	64
Stratocumulus masses with cloud sheet over ocean	60
Stratus, thin over ocean	42
Cirrus, alone over land	36
Cirrostratus, alone over land	32
Cumulus, fair weather	29

WATER FEATURES

Sunlight on Gulf of Mexico	17
Lake Great Salt lake, Utah	9
Ocean, Gulf of Mexico	9
Ocean Pacific	7

SURFACE FEATURES - BARE AREAS / SOILS

Snow, freshly fallen	75 - 90
Snow, 3 to 7 days old	40 - 70
White sand, New Mexico	60
Sand dune, dry	35 - 45
Soil, dry light sand	25 - 45
Soil, dry clay or gray	20 - 35
Sand dune, wet	20 - 30
Concrete, dry	17 - 20
Soil, moist gray	10 - 20
Soil, dark	5 - 15
Road, black top	5 - 10

VEGETATIVE ZONES

Deseart	25 - 30
Savanna, dry season	25 - 30
Crops	15 - 25
Savanna, wet season	15 - 20
Tundra	15 - 20
Chaparral	15 - 20
Meadows, green	10 - 20
Forrest, deciduous	10 - 20
Forest, coniferous	5 - 15

APPENDIX C
Spectral calculation for 30/11/2011 12:57pm using SMARTS2

Wavelength (nm)	Extraterrestrial irradiance (Wm^{-2} nm)	Global horizontal irradiance (Wm^{-2} nm)	Direct horizontal irradiance (Wm^{-2} nm)	Diffuse horizontal irradiance (Wm^{-2} nm)	RayleighScat_trnsmittnce	WaterVapor_transmittance	Aerosol_total_transmittnce
280	0.049410	0.000000	0.000000	0.000000	0.155600	1.000000	0.509800
281	0.047270	0.000000	0.000000	0.000000	0.157900	1.000000	0.510300
281	0.157500	0.000000	0.000000	0.000000	0.160200	1.000000	0.510800
282	0.251700	0.000000	0.000000	0.000000	0.162500	1.000000	0.511400
282	0.362700	0.000000	0.000000	0.000000	0.164800	1.000000	0.511900
283	0.384000	0.000000	0.000000	0.000000	0.167100	1.000000	0.512400
283	0.430400	0.000000	0.000000	0.000000	0.169400	1.000000	0.512900
284	0.328100	0.000000	0.000000	0.000000	0.171700	1.000000	0.513500
284	0.336000	0.000000	0.000000	0.000000	0.174000	1.000000	0.514000
285	0.191400	0.000000	0.000000	0.000000	0.176400	1.000000	0.514500
285	0.084180	0.000000	0.000000	0.000000	0.178700	1.000000	0.515000
286	0.062300	0.000000	0.000000	0.000000	0.181100	1.000000	0.515500
286	0.210300	0.000000	0.000000	0.000000	0.183500	1.000000	0.516000
287	0.318000	0.000000	0.000000	0.000000	0.185800	1.000000	0.516600
287	0.420500	0.000000	0.000000	0.000000	0.188200	1.000000	0.517100
288	0.474000	0.000000	0.000000	0.000000	0.190600	1.000000	0.517600
288	0.347900	0.000000	0.000000	0.000000	0.193000	1.000000	0.518100
289	0.435000	0.000000	0.000000	0.000000	0.195400	1.000000	0.518600
289	0.546200	0.000000	0.000000	0.000000	0.197800	1.000000	0.519100
290	0.524300	0.000001	0.000000	0.000001	0.200200	1.000000	0.519600
290	0.706400	0.000002	0.000001	0.000001	0.202700	1.000000	0.520100
291	0.722000	0.000004	0.000001	0.000002	0.205100	1.000000	0.520600
291	0.657300	0.000007	0.000002	0.000004	0.207500	1.000000	0.521100
292	0.700100	0.000016	0.000006	0.000010	0.210000	1.000000	0.521600
292	0.796700	0.000035	0.000012	0.000022	0.212400	1.000000	0.522100
293	0.577900	0.000036	0.000013	0.000022	0.214900	1.000000	0.522600
293	0.570700	0.000055	0.000021	0.000034	0.217300	1.000000	0.523100
294	0.724100	0.000132	0.000052	0.000080	0.219800	1.000000	0.523600
294	0.533700	0.000118	0.000060	0.000058	0.222200	1.000000	0.524100
295	0.611700	0.000203	0.000097	0.000106	0.224700	1.000000	0.524600
295	0.456900	0.000238	0.000111	0.000127	0.227200	1.000000	0.525100
296	0.700500	0.000638	0.000286	0.000352	0.229600	1.000000	0.525600
296	0.708700	0.000952	0.000417	0.000535	0.232100	1.000000	0.526100
297	0.570500	0.001109	0.000473	0.000636	0.234600	1.000000	0.526600
297	0.414200	0.001081	0.000452	0.000629	0.237100	1.000000	0.527100
298	0.526200	0.002076	0.000839	0.001237	0.239600	1.000000	0.527600
298	0.648100	0.003577	0.001406	0.002171	0.242100	1.000000	0.528100
299	0.343500	0.002440	0.000939	0.001501	0.244500	1.000000	0.528600

299	0.583200	0.005246	0.001978	0.003268	0.247000	1.000000	0.529000
300	0.486500	0.006382	0.002314	0.004069	0.249500	1.000000	0.529500
300	0.462300	0.007496	0.002663	0.004834	0.252000	1.000000	0.530000
301	0.450600	0.008867	0.003093	0.005774	0.254500	1.000000	0.530500
301	0.458600	0.011450	0.004050	0.007405	0.257000	1.000000	0.531000
302	0.545100	0.016530	0.005917	0.010610	0.259500	1.000000	0.531500
302	0.310000	0.010310	0.003727	0.006586	0.262000	1.000000	0.531900
303	0.494600	0.019570	0.007097	0.012470	0.264500	1.000000	0.532400
303	0.670300	0.032920	0.011930	0.021000	0.267100	1.000000	0.532900
304	0.779300	0.043300	0.015710	0.027590	0.269600	1.000000	0.533400
304	0.531700	0.031360	0.011430	0.019930	0.272100	1.000000	0.533900
305	0.682800	0.046460	0.016930	0.029530	0.274600	1.000000	0.534300
305	0.581200	0.047720	0.017340	0.030380	0.277100	1.000000	0.534800
306	0.751100	0.069110	0.025110	0.044000	0.279600	1.000000	0.535300
306	0.470300	0.045290	0.016520	0.028780	0.282100	1.000000	0.535700
307	0.627900	0.064830	0.023700	0.041140	0.284600	1.000000	0.536200
307	0.642100	0.083160	0.027870	0.055290	0.287100	1.000000	0.536700
308	0.630600	0.091000	0.031070	0.059930	0.289600	1.000000	0.537200
308	0.703300	0.103700	0.035690	0.068030	0.292100	1.000000	0.537600
309	0.694600	0.107900	0.037540	0.070330	0.294600	1.000000	0.538100
309	0.589000	0.095380	0.033500	0.061870	0.297100	1.000000	0.538600
310	0.536200	0.097400	0.034720	0.062680	0.299600	1.000000	0.539000
310	0.400900	0.076820	0.027640	0.049180	0.302200	1.000000	0.539500
311	0.682400	0.134400	0.048730	0.085720	0.304700	1.000000	0.539900
311	0.908200	0.186800	0.068240	0.118600	0.307200	1.000000	0.540400
312	0.898500	0.188900	0.069410	0.119500	0.309700	1.000000	0.540900
312	0.609700	0.139500	0.051730	0.087770	0.312100	1.000000	0.541300
313	0.674700	0.163200	0.060950	0.102200	0.314600	1.000000	0.541800
313	0.783200	0.195300	0.073390	0.121900	0.317100	1.000000	0.542200
314	0.716600	0.175100	0.066110	0.109000	0.319600	1.000000	0.542700
314	0.870100	0.226300	0.086020	0.140300	0.322100	1.000000	0.543200
315	0.543600	0.153100	0.058520	0.094530	0.324600	1.000000	0.543600
315	0.783800	0.224600	0.086300	0.138300	0.327100	1.000000	0.544100
316	0.843000	0.234100	0.090400	0.143700	0.329600	1.000000	0.544500
316	0.444300	0.131400	0.050990	0.080370	0.332000	1.000000	0.545000
317	0.626500	0.195200	0.076100	0.119100	0.334500	1.000000	0.545400
317	0.777500	0.242600	0.095090	0.147500	0.337000	1.000000	0.545900
318	0.967200	0.298800	0.117700	0.181100	0.339500	1.000000	0.546300
318	0.718600	0.230200	0.091070	0.139100	0.341900	1.000000	0.546800
319	0.568400	0.194000	0.076980	0.117000	0.344400	1.000000	0.547200
319	0.882400	0.311100	0.123900	0.187200	0.346900	1.000000	0.547700
320	0.611200	0.206400	0.082760	0.123700	0.349300	1.000000	0.548100
320	0.870000	0.292600	0.117900	0.174700	0.351800	1.000000	0.548600
321	0.889000	0.317800	0.128400	0.189500	0.354200	1.000000	0.549000

321	0.782000	0.296000	0.119100	0.176900	0.356700	1.000000	0.549400
322	0.710900	0.280200	0.109700	0.170500	0.359100	1.000000	0.549900
322	0.824700	0.298300	0.122200	0.176100	0.361500	1.000000	0.550300
323	0.714000	0.259800	0.106800	0.152900	0.364000	1.000000	0.550800
323	0.558800	0.211900	0.087000	0.124900	0.366400	1.000000	0.551200
324	0.723600	0.301800	0.119500	0.182300	0.368800	1.000000	0.551600
324	0.760400	0.320800	0.127400	0.193400	0.371200	1.000000	0.552100
325	0.930700	0.385100	0.154200	0.230900	0.373700	1.000000	0.552500
325	0.800900	0.309300	0.129100	0.180200	0.376100	1.000000	0.552900
326	0.900400	0.369800	0.149800	0.220000	0.378500	1.000000	0.553400
326	1.043000	0.446800	0.180500	0.266200	0.380900	1.000000	0.553800
327	1.112000	0.489900	0.197900	0.292000	0.383300	1.000000	0.554200
327	0.996700	0.436800	0.177500	0.259300	0.385700	1.000000	0.554700
328	1.119000	0.486100	0.198800	0.287300	0.388100	1.000000	0.555100
328	0.978000	0.410300	0.169600	0.240700	0.390400	1.000000	0.555500
329	0.958900	0.421400	0.173600	0.247800	0.392800	1.000000	0.556000
329	1.047000	0.475000	0.195400	0.279500	0.395200	1.000000	0.556400
330	1.214000	0.556400	0.229500	0.326800	0.397600	1.000000	0.556800
330	1.297000	0.592000	0.245600	0.346400	0.399900	1.000000	0.557200
331	0.978000	0.438000	0.183200	0.254800	0.402300	1.000000	0.557700
331	1.029000	0.458100	0.192700	0.265400	0.404600	1.000000	0.558100
332	0.957500	0.435100	0.183200	0.251900	0.407000	1.000000	0.558500
332	1.139000	0.530800	0.223300	0.307500	0.409300	1.000000	0.558900
333	1.106000	0.521200	0.219700	0.301500	0.411600	1.000000	0.559400
333	1.020000	0.479200	0.203100	0.276100	0.414000	1.000000	0.559800
334	1.007000	0.466600	0.199200	0.267400	0.416300	1.000000	0.560200
334	1.031000	0.477700	0.204900	0.272900	0.418600	1.000000	0.560600
335	1.084000	0.512900	0.219900	0.292900	0.420900	1.000000	0.561000
335	0.995700	0.502200	0.204700	0.297500	0.423200	1.000000	0.561500
336	1.227000	0.612400	0.254800	0.357600	0.425500	1.000000	0.561900
336	0.676000	0.338200	0.141200	0.197000	0.427800	1.000000	0.562300
337	1.044000	0.501300	0.218000	0.283300	0.430100	1.000000	0.562700
337	0.773500	0.369600	0.161600	0.208000	0.432400	1.000000	0.563100
338	0.955500	0.456300	0.200300	0.256000	0.434700	1.000000	0.563500
338	1.002000	0.486100	0.213500	0.272500	0.436900	1.000000	0.564000
339	1.085000	0.544200	0.233200	0.311000	0.439200	1.000000	0.564400
339	1.104000	0.552400	0.239000	0.313400	0.441500	1.000000	0.564800
340	0.886000	0.446400	0.193000	0.253400	0.443700	1.000000	0.565200
340	1.339000	0.689100	0.291900	0.397200	0.446000	1.000000	0.565600
341	1.046000	0.537400	0.229500	0.307900	0.448200	1.000000	0.566000
341	1.030000	0.521200	0.228500	0.292800	0.450400	1.000000	0.566400
342	0.891200	0.448200	0.199100	0.249100	0.452700	1.000000	0.566800
342	1.198000	0.602600	0.269200	0.333400	0.454900	1.000000	0.567200
343	0.959400	0.483000	0.216900	0.266100	0.457100	1.000000	0.567600

343	1.146000	0.580700	0.260300	0.320400	0.459300	1.000000	0.568000
344	1.071000	0.544800	0.244100	0.300700	0.461500	1.000000	0.568400
344	0.865400	0.449500	0.197300	0.252200	0.463700	1.000000	0.568800
345	0.805600	0.414600	0.185400	0.229200	0.465900	1.000000	0.569200
345	1.210000	0.618800	0.281000	0.337800	0.468000	1.000000	0.569600
346	1.021000	0.522100	0.238700	0.283400	0.470200	1.000000	0.570000
346	1.031000	0.527400	0.242500	0.284900	0.472400	1.000000	0.570400
347	0.984300	0.503900	0.232800	0.271100	0.474500	1.000000	0.570800
347	1.070000	0.550500	0.254200	0.296400	0.476700	1.000000	0.571200
348	0.872700	0.450600	0.208300	0.242200	0.478800	1.000000	0.571600
348	1.003000	0.517000	0.241000	0.276000	0.481000	1.000000	0.572000
349	1.167000	0.601200	0.281800	0.319400	0.483100	1.000000	0.572400
349	1.043000	0.538100	0.253200	0.284900	0.485200	1.000000	0.572800
350	0.978300	0.506300	0.238800	0.267500	0.487300	1.000000	0.573200
350	1.025000	0.531400	0.251400	0.279900	0.489400	1.000000	0.573600
351	1.242000	0.645100	0.306200	0.338900	0.491600	1.000000	0.574000
351	1.116000	0.581500	0.276300	0.305200	0.493600	1.000000	0.574400
352	0.933100	0.489300	0.231800	0.257500	0.495700	1.000000	0.574800
352	1.248000	0.653900	0.311900	0.342000	0.497800	1.000000	0.575200
353	0.861300	0.451100	0.216300	0.234800	0.499900	1.000000	0.575600
353	1.166000	0.611400	0.294500	0.317000	0.502000	1.000000	0.576000
354	1.147000	0.601600	0.290900	0.310700	0.504000	1.000000	0.576300
354	1.198000	0.628300	0.304900	0.323400	0.506100	1.000000	0.576700
355	1.278000	0.671000	0.326600	0.344400	0.508100	1.000000	0.577100
355	1.221000	0.642900	0.313600	0.329300	0.510200	1.000000	0.577500
356	1.102000	0.581900	0.284700	0.297200	0.512200	1.000000	0.577900
356	1.182000	0.625300	0.306800	0.318500	0.514200	1.000000	0.578300
357	1.038000	0.549800	0.270500	0.279300	0.516200	1.000000	0.578600
357	0.846900	0.449000	0.221500	0.227400	0.518200	1.000000	0.579000
358	1.023000	0.543100	0.268800	0.274300	0.520200	1.000000	0.579400
358	0.887200	0.471300	0.234000	0.237400	0.522200	1.000000	0.579800
359	0.632100	0.336200	0.167400	0.168900	0.524200	1.000000	0.580200
359	0.867000	0.461800	0.230400	0.231300	0.526200	1.000000	0.580600
360	1.238000	0.660500	0.330200	0.330300	0.528200	1.000000	0.580900
360	1.405000	0.750400	0.376200	0.374200	0.530200	1.000000	0.581300
361	0.962000	0.514400	0.258700	0.255700	0.532100	1.000000	0.581700
361	0.907500	0.486200	0.245200	0.241000	0.534100	1.000000	0.582100
362	1.213000	0.651900	0.329500	0.322400	0.536000	1.000000	0.582400
362	0.846300	0.456300	0.231200	0.225100	0.538000	1.000000	0.582800
363	1.297000	0.701200	0.356100	0.345200	0.539900	1.000000	0.583200
363	1.159000	0.628700	0.320000	0.308800	0.541800	1.000000	0.583600
364	1.018000	0.553500	0.282300	0.271200	0.543700	1.000000	0.583900
364	1.291000	0.703300	0.359600	0.343800	0.545600	1.000000	0.584300
365	0.988500	0.539400	0.276400	0.263000	0.547500	1.000000	0.584700

365	1.008000	0.551100	0.283100	0.268000	0.549400	1.000000	0.585100
366	1.416000	0.775200	0.399100	0.376100	0.551300	1.000000	0.585400
366	1.554000	0.852700	0.440000	0.412700	0.553200	1.000000	0.585800
367	1.327000	0.729600	0.377400	0.352300	0.555100	1.000000	0.586200
367	1.183000	0.651300	0.337700	0.313600	0.556900	1.000000	0.586500
368	1.426000	0.785500	0.408200	0.377300	0.558800	1.000000	0.586900
368	1.172000	0.646700	0.336900	0.309900	0.560700	1.000000	0.587300
369	1.195000	0.660800	0.344900	0.315900	0.562500	1.000000	0.587600
369	1.130000	0.626200	0.327600	0.298600	0.564300	1.000000	0.588000
370	1.392000	0.772700	0.405100	0.367600	0.566200	1.000000	0.588400
370	1.393000	0.774900	0.407100	0.367800	0.568000	1.000000	0.588700
371	1.100000	0.612900	0.322700	0.290200	0.569800	1.000000	0.589100
371	1.014000	0.566400	0.298800	0.267600	0.571600	1.000000	0.589500
372	1.611000	0.900500	0.476200	0.424300	0.573400	1.000000	0.589800
372	1.021000	0.571100	0.302700	0.268400	0.575200	1.000000	0.590200
373	1.120000	0.627700	0.333400	0.294300	0.577000	1.000000	0.590500
373	1.185000	0.665400	0.354100	0.311300	0.578800	1.000000	0.590900
374	0.714700	0.402100	0.214400	0.187700	0.580500	1.000000	0.591300
374	1.018000	0.573700	0.306500	0.267100	0.582300	1.000000	0.591600
375	0.912800	0.515300	0.275900	0.239400	0.584100	1.000000	0.592000
375	0.650800	0.367900	0.197400	0.170500	0.585800	1.000000	0.592300
376	1.475000	0.834300	0.448600	0.385700	0.587600	1.000000	0.592700
376	0.995500	0.563800	0.303800	0.260000	0.589300	1.000000	0.593000
377	1.149000	0.651200	0.351600	0.299500	0.591000	1.000000	0.593400
377	1.050000	0.596600	0.322800	0.273800	0.592800	1.000000	0.593700
378	1.475000	0.838800	0.454700	0.384100	0.594500	1.000000	0.594100
378	1.651000	0.939500	0.510400	0.429100	0.596200	1.000000	0.594500
379	1.567000	0.892700	0.486000	0.406800	0.597900	1.000000	0.594800
379	1.066000	0.607700	0.331500	0.276200	0.599600	1.000000	0.595200
380	1.106000	0.630900	0.344900	0.286000	0.601300	1.000000	0.595500
380	1.010000	0.576900	0.316000	0.260900	0.603000	1.000000	0.595900
381	1.432000	0.819300	0.449500	0.369700	0.604600	1.000000	0.596200
381	1.303000	0.747200	0.410700	0.336500	0.606300	1.000000	0.596600
382	0.949300	0.545500	0.300300	0.245100	0.608000	1.000000	0.596900
382	0.953300	0.548900	0.302700	0.246100	0.609600	1.000000	0.597300
383	0.792000	0.457100	0.252500	0.204600	0.611300	1.000000	0.597600
383	0.791300	0.457400	0.253200	0.204300	0.612900	1.000000	0.597900
384	0.601000	0.348000	0.192900	0.155100	0.614500	1.000000	0.598300
384	0.613700	0.355800	0.197600	0.158200	0.616200	1.000000	0.598600
385	1.078000	0.626200	0.348400	0.277800	0.617800	1.000000	0.599000
385	1.043000	0.606500	0.338000	0.268500	0.619400	1.000000	0.599300
386	1.041000	0.606500	0.338600	0.267900	0.621000	1.000000	0.599700
386	0.660100	0.385200	0.215400	0.169800	0.622600	1.000000	0.600000
387	1.182000	0.691000	0.387100	0.303900	0.624200	1.000000	0.600400

387	0.953100	0.557900	0.313100	0.244800	0.625800	1.000000	0.600700
388	1.005000	0.588800	0.331000	0.257800	0.627300	1.000000	0.601000
388	0.895700	0.525700	0.296000	0.229700	0.628900	1.000000	0.601400
389	0.905200	0.532100	0.300100	0.232000	0.630500	1.000000	0.601700
389	0.944700	0.556000	0.314100	0.241900	0.632000	1.000000	0.602100
390	1.353000	0.797500	0.451300	0.346200	0.633600	1.000000	0.602400
390	1.440000	0.850200	0.481900	0.368300	0.635100	1.000000	0.602700
391	1.181000	0.698100	0.396300	0.301700	0.636700	1.000000	0.603100
391	1.492000	0.883200	0.502300	0.380900	0.638200	1.000000	0.603400
392	1.628000	0.964500	0.549500	0.415100	0.639700	1.000000	0.603700
392	1.266000	0.751000	0.428600	0.322500	0.641200	1.000000	0.604100
393	1.201000	0.713300	0.407700	0.305700	0.642800	1.000000	0.604400
393	0.662500	0.394200	0.225600	0.168600	0.644300	1.000000	0.604700
394	0.259200	0.154400	0.088540	0.065900	0.645800	1.000000	0.605100
394	0.838800	0.500400	0.287300	0.213100	0.647200	1.000000	0.605400
395	1.137000	0.679400	0.390700	0.288600	0.648700	1.000000	0.605700
395	1.391000	0.831900	0.479200	0.352700	0.650200	1.000000	0.606100
396	1.455000	0.870500	0.502300	0.368200	0.651700	1.000000	0.606400
396	1.393000	0.834400	0.482200	0.352200	0.653200	1.000000	0.606700
397	0.778700	0.467500	0.270500	0.196900	0.654600	1.000000	0.607100
397	0.317800	0.191000	0.110700	0.080300	0.656100	1.000000	0.607400
398	0.998200	0.600600	0.348700	0.251900	0.657500	1.000000	0.607700
398	1.616000	0.972500	0.565500	0.406900	0.659000	1.000000	0.608100
399	1.579000	0.951600	0.554300	0.397400	0.660400	1.000000	0.608400
399	1.759000	1.062000	0.619600	0.442800	0.661800	1.000000	0.608700
400	1.822000	1.102000	0.643500	0.458200	0.663200	1.000000	0.609000
400	1.702000	1.029000	0.602000	0.426900	0.664700	1.000000	0.609400
401	1.742000	1.057000	0.619500	0.437200	0.667500	1.000000	0.610000
402	1.825000	1.111000	0.653000	0.457700	0.670200	1.000000	0.610700
403	1.722000	1.051000	0.619700	0.431400	0.673000	1.000000	0.611300
404	1.836000	1.123000	0.663800	0.458800	0.675700	1.000000	0.611900
405	1.687000	1.033000	0.612500	0.420300	0.678500	1.000000	0.612600
406	1.679000	1.031000	0.613100	0.417900	0.681200	1.000000	0.613200
407	1.612000	0.992600	0.591800	0.400800	0.683800	1.000000	0.613900
408	1.742000	1.074000	0.642200	0.431800	0.686500	1.000000	0.614500
409	1.911000	1.180000	0.707600	0.472500	0.689100	1.000000	0.615100
410	1.603000	0.992400	0.596600	0.395700	0.691700	1.000000	0.615800
411	1.875000	1.163000	0.701200	0.462000	0.694200	1.000000	0.616400
412	1.953000	1.215000	0.734000	0.480600	0.696800	1.000000	0.617000
413	1.799000	1.120000	0.678800	0.441300	0.699300	1.000000	0.617600
414	1.796000	1.121000	0.680800	0.439800	0.701800	1.000000	0.618300
415	1.881000	1.177000	0.716700	0.460000	0.704300	1.000000	0.618900
416	1.900000	1.191000	0.727400	0.464000	0.706800	1.000000	0.619500
417	1.807000	1.135000	0.694700	0.440200	0.709200	1.000000	0.620100

418	1.779000	1.119000	0.687000	0.432500	0.711600	1.000000	0.620700
419	1.802000	1.136000	0.698600	0.437000	0.714000	1.000000	0.621300
420	1.527000	0.964200	0.594600	0.369600	0.716400	1.000000	0.621900
421	1.909000	1.208000	0.746500	0.461100	0.718700	1.000000	0.622500
422	1.824000	1.156000	0.716000	0.439500	0.721000	1.000000	0.623100
423	1.551000	0.984400	0.611400	0.373000	0.723300	1.000000	0.623700
424	1.671000	1.062000	0.661100	0.400700	0.725600	1.000000	0.624300
425	1.725000	1.098000	0.685400	0.413000	0.727900	1.000000	0.624900
426	1.666000	1.064000	0.665400	0.398700	0.730100	1.000000	0.625500
427	1.602000	1.025000	0.642200	0.382400	0.732300	1.000000	0.626100
428	1.604000	1.027000	0.645100	0.381800	0.734600	1.000000	0.626700
429	1.464000	0.939500	0.591400	0.348100	0.736700	1.000000	0.627300
430	1.176000	0.756300	0.477100	0.279200	0.738900	1.000000	0.627900
431	1.041000	0.669700	0.423500	0.246200	0.741000	1.000000	0.628500
432	1.878000	1.211000	0.767400	0.443800	0.743200	1.000000	0.629100
433	1.662000	1.074000	0.681800	0.392000	0.745300	1.000000	0.629600
434	1.587000	1.026000	0.652900	0.373200	0.747300	1.000000	0.630200
435	1.708000	1.105000	0.704800	0.400400	0.749400	1.000000	0.630800
436	1.898000	1.231000	0.786600	0.444500	0.751500	1.000000	0.631400
437	1.897000	1.234000	0.789600	0.443900	0.753500	1.000000	0.631900
438	1.720000	1.121000	0.718900	0.401900	0.755500	1.000000	0.632500
439	1.635000	1.064000	0.684000	0.379800	0.757500	1.000000	0.633100
440	1.832000	1.195000	0.769500	0.425100	0.759500	1.000000	0.633700
441	1.836000	1.200000	0.774500	0.425600	0.761400	0.999900	0.634200
442	1.917000	1.254000	0.811100	0.443200	0.763300	0.999200	0.634800
443	1.940000	1.266000	0.820600	0.445100	0.765300	0.996200	0.635300
444	1.908000	1.250000	0.811600	0.438300	0.767200	0.998600	0.635900
445	2.017000	1.321000	0.859500	0.461300	0.769000	0.998100	0.636500
446	1.787000	1.173000	0.764500	0.408300	0.770900	0.998000	0.637000
447	2.026000	1.334000	0.871100	0.463200	0.772800	0.999500	0.637600
448	2.055000	1.353000	0.885300	0.468000	0.774600	0.999800	0.638100
449	2.076000	1.371000	0.898600	0.472900	0.776400	1.000000	0.638700
450	2.108000	1.395000	0.915800	0.479500	0.778200	1.000000	0.639200
451	2.272000	1.506000	0.990200	0.515700	0.780000	1.000000	0.639800
452	2.115000	1.403000	0.924500	0.479000	0.781700	1.000000	0.640300
453	1.944000	1.291000	0.852100	0.439200	0.783500	1.000000	0.640900
454	2.080000	1.384000	0.915000	0.469400	0.785200	1.000000	0.641400
455	2.085000	1.389000	0.919400	0.469100	0.786900	1.000000	0.642000
456	2.139000	1.427000	0.946500	0.480500	0.788600	1.000000	0.642500
457	2.151000	1.436000	0.954100	0.481900	0.790300	1.000000	0.643000
458	2.092000	1.397000	0.929800	0.466900	0.792000	1.000000	0.643600
459	2.110000	1.411000	0.940500	0.470000	0.793600	1.000000	0.644100
460	2.079000	1.391000	0.928900	0.461700	0.795300	1.000000	0.644600
461	2.151000	1.441000	0.963800	0.476700	0.796900	1.000000	0.645200

462	2.105000	1.412000	0.946500	0.466000	0.798500	1.000000	0.645700
463	2.102000	1.410000	0.946600	0.463600	0.800100	1.000000	0.646200
464	2.116000	1.422000	0.956200	0.466200	0.801700	1.000000	0.646700
465	2.074000	1.397000	0.940200	0.456500	0.803300	1.000000	0.647300
466	2.134000	1.440000	0.970500	0.469100	0.804800	1.000000	0.647800
467	2.064000	1.392000	0.939900	0.451900	0.806300	0.999900	0.648300
468	2.170000	1.465000	0.990800	0.474100	0.807900	0.999800	0.648800
469	2.141000	1.446000	0.979700	0.466500	0.809400	0.999500	0.649300
470	2.121000	1.432000	0.971800	0.460300	0.810900	0.998600	0.649800
471	2.102000	1.421000	0.965500	0.455200	0.812400	0.999200	0.650400
472	2.144000	1.450000	0.986700	0.462900	0.813800	0.999300	0.650900
473	2.117000	1.432000	0.976200	0.455800	0.815300	0.999200	0.651400
474	2.120000	1.433000	0.978700	0.454600	0.816700	0.999800	0.651900
475	2.198000	1.485000	1.015000	0.469200	0.818100	1.000000	0.652400
476	2.149000	1.450000	0.993300	0.456400	0.819600	1.000000	0.652900
477	2.132000	1.437000	0.986400	0.450900	0.821000	1.000000	0.653400
478	2.230000	1.506000	1.035000	0.471300	0.822400	1.000000	0.653900
479	2.104000	1.425000	0.980000	0.444500	0.823700	1.000000	0.654400
480	2.156000	1.463000	1.008000	0.455400	0.825100	1.000000	0.654900
481	2.127000	1.448000	0.998200	0.449400	0.826400	1.000000	0.655400
482	2.178000	1.486000	1.026000	0.460100	0.827800	1.000000	0.655900
483	2.157000	1.475000	1.019000	0.455600	0.829100	1.000000	0.656400
484	2.083000	1.426000	0.986500	0.439100	0.830400	1.000000	0.656900
485	2.080000	1.424000	0.987000	0.437400	0.831700	0.999200	0.657400
486	1.693000	1.161000	0.805300	0.355500	0.833000	0.999300	0.657900
487	1.900000	1.305000	0.906600	0.398700	0.834300	0.999500	0.658400
488	2.050000	1.409000	0.980000	0.429100	0.835600	0.999500	0.658800
489	1.921000	1.320000	0.919000	0.400500	0.836800	0.999400	0.659300
490	2.170000	1.494000	1.042000	0.452200	0.838100	0.999700	0.659800
491	2.014000	1.389000	0.969600	0.419400	0.839300	0.999900	0.660300
492	1.934000	1.335000	0.932800	0.401800	0.840500	0.999900	0.660800
493	2.101000	1.450000	1.015000	0.435400	0.841800	1.000000	0.661300
494	2.019000	1.395000	0.977500	0.417500	0.843000	1.000000	0.661700
495	2.159000	1.493000	1.047000	0.445500	0.844100	1.000000	0.662200
496	2.091000	1.446000	1.016000	0.430200	0.845300	1.000000	0.662700
497	2.036000	1.409000	0.991000	0.418100	0.846500	1.000000	0.663200
498	1.976000	1.368000	0.963500	0.404800	0.847700	1.000000	0.663600
499	1.972000	1.367000	0.963500	0.403100	0.848800	1.000000	0.664100
500	1.968000	1.363000	0.962100	0.400700	0.849900	0.999600	0.664600
501	1.918000	1.328000	0.939100	0.389400	0.851100	0.999400	0.665200
502	1.921000	1.326000	0.939100	0.387000	0.852200	0.996900	0.665900
503	2.018000	1.388000	0.984800	0.403200	0.853300	0.993900	0.666600
504	1.867000	1.256000	0.895100	0.361300	0.854400	0.975200	0.667200
505	2.028000	1.395000	0.992400	0.402500	0.855500	0.993800	0.667900

506	2.164000	1.484000	1.058000	0.426500	0.856600	0.990100	0.668600
507	2.014000	1.380000	0.985100	0.395300	0.857600	0.988400	0.669200
508	1.931000	1.330000	0.949800	0.380100	0.858700	0.991000	0.669900
509	2.063000	1.426000	1.019000	0.406700	0.859700	0.993500	0.670500
510	2.005000	1.390000	0.994200	0.395400	0.860800	0.995300	0.671200
511	2.014000	1.401000	1.003000	0.398000	0.861800	0.998100	0.671800
512	2.087000	1.455000	1.043000	0.412300	0.862800	0.999200	0.672500
513	1.918000	1.340000	0.961400	0.378600	0.863900	0.999500	0.673100
514	1.898000	1.328000	0.953500	0.374100	0.864900	1.000000	0.673800
515	1.913000	1.339000	0.963100	0.376300	0.865900	1.000000	0.674400
516	2.003000	1.403000	1.010000	0.393000	0.866800	1.000000	0.675000
517	1.496000	1.049000	0.755800	0.293000	0.867800	1.000000	0.675700
518	1.812000	1.271000	0.917100	0.354000	0.868800	1.000000	0.676300
519	1.744000	1.224000	0.883800	0.339700	0.869800	1.000000	0.676900
520	1.897000	1.332000	0.963100	0.368600	0.870700	1.000000	0.677600
521	1.910000	1.341000	0.970900	0.370100	0.871700	1.000000	0.678200
522	1.980000	1.391000	1.008000	0.382600	0.872600	1.000000	0.678800
523	1.856000	1.304000	0.946300	0.357800	0.873500	1.000000	0.679400
524	1.989000	1.396000	1.014000	0.381800	0.874400	0.999100	0.680100
525	1.993000	1.397000	1.017000	0.380900	0.875300	0.998900	0.680700
526	1.885000	1.323000	0.963600	0.359700	0.876300	0.999900	0.681300
527	1.665000	1.167000	0.850900	0.316100	0.877100	0.999000	0.681900
528	1.952000	1.368000	0.998700	0.369600	0.878000	0.999800	0.682500
529	2.049000	1.435000	1.049000	0.386500	0.878900	0.999500	0.683100
530	1.925000	1.349000	0.986800	0.362100	0.879800	0.999600	0.683700
531	2.089000	1.465000	1.073000	0.392100	0.880700	0.999700	0.684300
532	1.991000	1.397000	1.024000	0.372800	0.881500	1.000000	0.684900
533	1.780000	1.249000	0.916800	0.332500	0.882400	1.000000	0.685500
534	1.888000	1.326000	0.974200	0.352000	0.883200	1.000000	0.686100
535	1.950000	1.371000	1.008000	0.363000	0.884000	1.000000	0.686700
536	2.050000	1.443000	1.062000	0.380900	0.884900	1.000000	0.687300
537	1.897000	1.336000	0.984400	0.351800	0.885700	1.000000	0.687900
538	2.016000	1.421000	1.048000	0.373200	0.886500	0.999700	0.688500
539	1.980000	1.396000	1.031000	0.365600	0.887300	0.999200	0.689100
540	1.918000	1.351000	0.998400	0.352400	0.888100	0.997300	0.689700
541	1.799000	1.260000	0.932900	0.327100	0.888900	0.991800	0.690300
542	1.969000	1.378000	1.021000	0.356600	0.889700	0.991300	0.690900
543	1.907000	1.344000	0.996400	0.347600	0.890500	0.996900	0.691500
544	1.998000	1.402000	1.041000	0.360900	0.891300	0.992700	0.692000
545	1.971000	1.386000	1.030000	0.355900	0.892000	0.994800	0.692600
546	1.936000	1.354000	1.008000	0.346200	0.892800	0.990400	0.693200
547	1.986000	1.396000	1.040000	0.356400	0.893500	0.995000	0.693800
548	1.867000	1.316000	0.980400	0.335200	0.894300	0.997200	0.694300
549	1.943000	1.372000	1.023000	0.348900	0.895000	0.998200	0.694900

550	1.921000	1.358000	1.014000	0.344500	0.895800	0.998300	0.695500
551	1.909000	1.352000	1.010000	0.341900	0.896500	0.999100	0.696000
552	1.975000	1.400000	1.047000	0.353100	0.897200	0.999600	0.696600
553	1.908000	1.352000	1.012000	0.340100	0.897900	0.999700	0.697200
554	1.965000	1.393000	1.043000	0.349300	0.898600	1.000000	0.697700
555	1.965000	1.392000	1.044000	0.348100	0.899300	1.000000	0.698300
556	1.918000	1.359000	1.020000	0.338800	0.900000	1.000000	0.698900
557	1.884000	1.335000	1.003000	0.331700	0.900700	1.000000	0.699400
558	1.920000	1.359000	1.022000	0.336700	0.901400	1.000000	0.700000
559	1.828000	1.293000	0.973400	0.319300	0.902100	1.000000	0.700500
560	1.857000	1.313000	0.990000	0.323500	0.902800	1.000000	0.701100
561	2.008000	1.421000	1.072000	0.348800	0.903500	1.000000	0.701600
562	1.853000	1.310000	0.989200	0.320700	0.904100	1.000000	0.702200
563	1.947000	1.376000	1.040000	0.335700	0.904800	0.999900	0.702700
564	1.915000	1.352000	1.023000	0.328900	0.905400	0.999800	0.703300
565	1.944000	1.372000	1.039000	0.332600	0.906100	0.999800	0.703800
566	1.795000	1.265000	0.959600	0.305900	0.906700	0.999600	0.704300
567	1.919000	1.350000	1.025000	0.325300	0.907400	0.998800	0.704900
568	1.928000	1.346000	1.024000	0.322500	0.908000	0.993000	0.705400
569	1.901000	1.301000	0.992100	0.308400	0.908600	0.976200	0.706000
570	1.905000	1.314000	1.003000	0.311700	0.909200	0.984300	0.706500
571	1.837000	1.281000	0.976800	0.304000	0.909900	0.995500	0.707000
572	1.947000	1.343000	1.026000	0.316600	0.910500	0.987100	0.707600
573	1.969000	1.359000	1.040000	0.319500	0.911100	0.989000	0.708100
574	1.955000	1.350000	1.033000	0.316300	0.911700	0.990500	0.708600
575	1.909000	1.315000	1.008000	0.307100	0.912300	0.989900	0.709100
576	1.886000	1.302000	0.998400	0.303200	0.912900	0.991900	0.709700
577	1.939000	1.340000	1.029000	0.311400	0.913400	0.993200	0.710200
578	1.891000	1.313000	1.008000	0.304700	0.914000	0.996600	0.710700
579	1.872000	1.306000	1.003000	0.302900	0.914600	0.998300	0.711200
580	1.928000	1.353000	1.040000	0.313400	0.915200	0.998500	0.711700
581	1.896000	1.336000	1.027000	0.309100	0.915700	0.999000	0.712200
582	1.917000	1.356000	1.043000	0.313200	0.916300	0.998600	0.712800
583	1.930000	1.369000	1.054000	0.315700	0.916900	0.998500	0.713300
584	1.924000	1.367000	1.052000	0.314400	0.917400	0.997500	0.713800
585	1.903000	1.353000	1.042000	0.310300	0.918000	0.996900	0.714300
586	1.832000	1.299000	1.002000	0.296900	0.918500	0.993900	0.714800
587	1.897000	1.334000	1.031000	0.302900	0.919100	0.986400	0.715300
588	1.892000	1.286000	0.998100	0.287900	0.919600	0.957400	0.715800
589	1.718000	1.097000	0.856600	0.240600	0.920100	0.904800	0.716300
590	1.776000	1.138000	0.889300	0.249000	0.920700	0.907300	0.716800
591	1.870000	1.237000	0.964800	0.272100	0.921200	0.933400	0.717300
592	1.855000	1.207000	0.943300	0.264000	0.921700	0.918500	0.717800
593	1.847000	1.234000	0.962500	0.271500	0.922200	0.940000	0.718300

594	1.872000	1.242000	0.969700	0.272000	0.922700	0.933000	0.718800
595	1.856000	1.210000	0.947700	0.262200	0.923200	0.919300	0.719300
596	1.867000	1.272000	0.993300	0.278900	0.923700	0.958000	0.719800
597	1.885000	1.278000	0.999200	0.278900	0.924200	0.953600	0.720300
598	1.838000	1.262000	0.986200	0.275600	0.924700	0.963600	0.720800
599	1.839000	1.273000	0.995300	0.278100	0.925200	0.970900	0.721300
600	1.838000	1.292000	1.009000	0.282700	0.925700	0.983200	0.721700
601	1.807000	1.283000	1.002000	0.281100	0.926200	0.992500	0.722200
602	1.795000	1.278000	0.998200	0.279300	0.926700	0.994800	0.722700
603	1.810000	1.292000	1.010000	0.281900	0.927100	0.997800	0.723200
604	1.860000	1.329000	1.040000	0.289500	0.927600	0.999000	0.723700
605	1.854000	1.327000	1.039000	0.288400	0.928100	1.000000	0.724200
606	1.834000	1.316000	1.031000	0.285500	0.928500	1.000000	0.724600
607	1.819000	1.309000	1.026000	0.283400	0.929000	1.000000	0.725100
608	1.812000	1.307000	1.025000	0.282500	0.929500	1.000000	0.725600
609	1.792000	1.294000	1.015000	0.279100	0.929900	1.000000	0.726100
610	1.778000	1.285000	1.009000	0.276400	0.930400	1.000000	0.726500
611	1.779000	1.287000	1.011000	0.276200	0.930800	1.000000	0.727000
612	1.769000	1.280000	1.007000	0.274000	0.931200	1.000000	0.727500
613	1.736000	1.257000	0.988800	0.268200	0.931700	1.000000	0.727900
614	1.680000	1.218000	0.958500	0.259200	0.932100	1.000000	0.728400
615	1.751000	1.271000	1.001000	0.269900	0.932600	1.000000	0.728900
616	1.665000	1.210000	0.953900	0.256400	0.933000	1.000000	0.729300
617	1.677000	1.219000	0.961800	0.257700	0.933400	1.000000	0.729800
618	1.759000	1.280000	1.010000	0.269600	0.933800	1.000000	0.730300
619	1.738000	1.264000	0.998700	0.265700	0.934300	1.000000	0.730700
620	1.764000	1.282000	1.014000	0.268600	0.934700	1.000000	0.731200
621	1.783000	1.292000	1.023000	0.269700	0.935100	1.000000	0.731600
622	1.710000	1.229000	0.974300	0.255000	0.935500	1.000000	0.732100
623	1.718000	1.225000	0.972500	0.252700	0.935900	1.000000	0.732500
624	1.703000	1.220000	0.968700	0.251400	0.936300	1.000000	0.733000
625	1.671000	1.203000	0.955500	0.247800	0.936700	0.999600	0.733400
626	1.676000	1.206000	0.958600	0.247700	0.937100	0.997700	0.733900
627	1.715000	1.224000	0.974200	0.249900	0.937500	0.990500	0.734300
628	1.738000	1.178000	0.942900	0.235200	0.937900	0.982500	0.734800
629	1.750000	1.227000	0.979700	0.247600	0.938300	0.986200	0.735200
630	1.693000	1.193000	0.952400	0.240300	0.938700	0.993100	0.735700
631	1.733000	1.244000	0.992400	0.251800	0.939000	0.996800	0.736100
632	1.629000	1.165000	0.930000	0.234800	0.939400	0.985900	0.736600
633	1.725000	1.247000	0.995700	0.251800	0.939800	0.990400	0.737000
634	1.670000	1.217000	0.971500	0.245800	0.940200	0.993900	0.737400
635	1.699000	1.240000	0.990100	0.249800	0.940500	0.992600	0.737900
636	1.647000	1.205000	0.963000	0.242500	0.940900	0.994000	0.738300
637	1.687000	1.236000	0.988000	0.248100	0.941300	0.993500	0.738700

638	1.711000	1.260000	1.007000	0.252800	0.941600	0.996800	0.739200
639	1.690000	1.247000	0.997300	0.249700	0.942000	0.996200	0.739600
640	1.648000	1.219000	0.975700	0.243800	0.942300	0.996600	0.740000
641	1.664000	1.233000	0.986800	0.245900	0.942700	0.996000	0.740500
642	1.639000	1.218000	0.975000	0.242500	0.943000	0.996900	0.740900
643	1.672000	1.239000	0.993200	0.246000	0.943400	0.993800	0.741300
644	1.648000	1.224000	0.981800	0.242700	0.943700	0.994900	0.741800
645	1.665000	1.232000	0.988500	0.243000	0.944100	0.989400	0.742200
646	1.629000	1.181000	0.950200	0.230800	0.944400	0.970900	0.742600
647	1.632000	1.146000	0.924900	0.220900	0.944800	0.941800	0.743000
648	1.655000	1.146000	0.926000	0.219700	0.945100	0.928100	0.743400
649	1.659000	1.150000	0.930200	0.220300	0.945400	0.929100	0.743900
650	1.543000	1.119000	0.902100	0.216700	0.945800	0.967100	0.744300
651	1.656000	1.211000	0.976500	0.234500	0.946100	0.974300	0.744700
652	1.636000	1.126000	0.912900	0.213600	0.946400	0.921000	0.745100
653	1.648000	1.202000	0.970500	0.231600	0.946700	0.970900	0.745500
654	1.633000	1.197000	0.966600	0.230100	0.947100	0.974800	0.746000
655	1.592000	1.136000	0.919300	0.216500	0.947400	0.950000	0.746400
656	1.370000	0.994000	0.804500	0.189600	0.947700	0.965200	0.746800
657	1.419000	1.028000	0.832200	0.195500	0.948000	0.963500	0.747200
658	1.594000	1.170000	0.946700	0.223100	0.948300	0.975500	0.747600
659	1.602000	1.182000	0.956600	0.224900	0.948600	0.982100	0.748000
660	1.600000	1.178000	0.954800	0.223600	0.948900	0.985000	0.748400
661	1.608000	1.182000	0.958700	0.223600	0.949200	0.993200	0.748800
662	1.631000	1.192000	0.967700	0.224400	0.949500	0.997400	0.749200
663	1.605000	1.179000	0.956800	0.221700	0.949800	0.996200	0.749600
664	1.584000	1.178000	0.955500	0.222100	0.950100	0.997300	0.750000
665	1.595000	1.195000	0.969400	0.225500	0.950400	0.998000	0.750400
666	1.596000	1.203000	0.975700	0.226900	0.950700	0.998600	0.750800
667	1.586000	1.201000	0.974200	0.226300	0.951000	0.998800	0.751200
668	1.582000	1.202000	0.975400	0.226400	0.951300	1.000000	0.751600
669	1.605000	1.221000	0.991300	0.229500	0.951600	0.999700	0.752000
670	1.580000	1.204000	0.978000	0.225900	0.951900	1.000000	0.752400
671	1.575000	1.201000	0.975800	0.224900	0.952200	1.000000	0.752800
672	1.556000	1.187000	0.965100	0.221900	0.952500	1.000000	0.753200
673	1.571000	1.200000	0.975800	0.223800	0.952700	1.000000	0.753600
674	1.573000	1.202000	0.978600	0.223900	0.953000	1.000000	0.754000
675	1.551000	1.187000	0.966100	0.220500	0.953300	1.000000	0.754400
676	1.575000	1.206000	0.982100	0.223500	0.953600	1.000000	0.754800
677	1.547000	1.185000	0.965500	0.219200	0.953800	1.000000	0.755200
678	1.564000	1.198000	0.976700	0.221100	0.954100	1.000000	0.755600
679	1.547000	1.185000	0.967000	0.218400	0.954400	1.000000	0.755900
680	1.540000	1.180000	0.963500	0.217000	0.954600	0.999800	0.756300
681	1.536000	1.178000	0.962000	0.216100	0.954900	0.999300	0.756700

682	1.538000	1.180000	0.963700	0.215900	0.955200	0.998800	0.757100
683	1.541000	1.182000	0.966200	0.215800	0.955400	0.998300	0.757500
684	1.519000	1.164000	0.952100	0.212000	0.955700	0.997200	0.757900
685	1.532000	1.176000	0.962400	0.213900	0.955900	0.998200	0.758200
686	1.476000	1.132000	0.926400	0.205200	0.956200	0.997100	0.758600
687	1.536000	0.882600	0.740300	0.142200	0.956400	0.995100	0.759000
688	1.523000	0.984100	0.818200	0.166000	0.956700	0.998000	0.759400
689	1.523000	0.987800	0.821400	0.166400	0.956900	0.997000	0.759700
690	1.525000	1.026000	0.850800	0.175000	0.957200	0.995700	0.760100
691	1.515000	1.055000	0.873200	0.182200	0.957400	0.989400	0.760500
692	1.493000	1.054000	0.871700	0.182700	0.957700	0.966900	0.760900
693	1.497000	1.001000	0.830300	0.170400	0.957900	0.897200	0.761200
694	1.509000	0.973000	0.807900	0.165100	0.958100	0.852200	0.761600
695	1.481000	1.011000	0.836500	0.174100	0.958400	0.890400	0.762000
696	1.493000	1.011000	0.837000	0.174000	0.958600	0.882200	0.762300
697	1.492000	1.110000	0.915800	0.194500	0.958900	0.964000	0.762700
698	1.463000	1.085000	0.895800	0.189600	0.959100	0.960500	0.763100
699	1.495000	1.043000	0.863800	0.178900	0.959300	0.905900	0.763400
700	1.474000	1.027000	0.851200	0.175600	0.959600	0.904300	0.763800
701	1.453000	0.992900	0.825100	0.167900	0.959800	0.888300	0.764200
702	1.435000	1.003000	0.832200	0.170400	0.960000	0.906700	0.764500
703	1.449000	1.013000	0.840400	0.172500	0.960200	0.905700	0.764900
704	1.458000	1.056000	0.874900	0.181300	0.960500	0.936600	0.765200
705	1.473000	1.059000	0.878400	0.180300	0.960700	0.930000	0.765600
706	1.453000	1.063000	0.881100	0.181600	0.960900	0.945200	0.766000
707	1.432000	1.051000	0.871200	0.179300	0.961100	0.947200	0.766300
708	1.466000	1.076000	0.893000	0.183200	0.961300	0.947400	0.766700
709	1.424000	1.069000	0.885800	0.183200	0.961600	0.967000	0.767000
710	1.451000	1.077000	0.893600	0.183300	0.961800	0.956400	0.767400
711	1.436000	1.074000	0.891100	0.183300	0.962000	0.963200	0.767700
712	1.421000	1.073000	0.889600	0.183700	0.962200	0.971300	0.768100
713	1.410000	1.056000	0.876200	0.179900	0.962400	0.963400	0.768400
714	1.433000	1.075000	0.892000	0.183200	0.962600	0.963800	0.768800
715	1.384000	1.011000	0.840800	0.170600	0.962800	0.940000	0.769100
716	1.418000	1.025000	0.852800	0.172200	0.963000	0.930200	0.769500
717	1.393000	0.779700	0.658000	0.121700	0.963200	0.729800	0.769800
718	1.387000	0.707400	0.599500	0.107900	0.963400	0.667600	0.770200
719	1.359000	0.647500	0.548600	0.098910	0.963600	0.623000	0.770500
720	1.388000	0.671800	0.570800	0.101000	0.963800	0.633900	0.770900
721	1.370000	0.792700	0.666900	0.125800	0.964000	0.749700	0.771200
722	1.387000	0.971800	0.810800	0.161000	0.964200	0.899700	0.771600
723	1.389000	0.869800	0.729300	0.140500	0.964400	0.807500	0.771900
724	1.398000	0.762800	0.643400	0.119400	0.964600	0.707300	0.772300
725	1.385000	0.731000	0.618900	0.112200	0.964800	0.686000	0.772600

726	1.382000	0.771100	0.650900	0.120200	0.965000	0.722600	0.772900
727	1.397000	0.805800	0.678700	0.127100	0.965200	0.744900	0.773300
728	1.377000	0.734500	0.620700	0.113800	0.965400	0.690500	0.773600
729	1.317000	0.774900	0.651400	0.123500	0.965600	0.757000	0.774000
730	1.372000	0.824800	0.694900	0.130000	0.965800	0.775000	0.774300
731	1.348000	0.776200	0.654300	0.121900	0.966000	0.742300	0.774600
732	1.369000	0.875600	0.734000	0.141600	0.966100	0.819100	0.775000
733	1.346000	0.944400	0.788500	0.155900	0.966300	0.894100	0.775300
734	1.376000	0.988000	0.823600	0.164400	0.966500	0.913600	0.775600
735	1.364000	0.968100	0.807800	0.160300	0.966700	0.902800	0.776000
736	1.341000	0.953200	0.795900	0.157300	0.966900	0.904300	0.776300
737	1.355000	0.960700	0.801900	0.158700	0.967000	0.901100	0.776600
738	1.355000	1.009000	0.840100	0.169200	0.967200	0.943800	0.776900
739	1.301000	0.967100	0.804900	0.162200	0.967400	0.941200	0.777300
740	1.326000	1.008000	0.837300	0.170200	0.967600	0.959600	0.777600
741	1.305000	1.004000	0.833700	0.170300	0.967700	0.970300	0.777900
742	1.286000	1.002000	0.831000	0.170600	0.967900	0.981200	0.778300
743	1.326000	1.037000	0.860400	0.177000	0.968100	0.984700	0.778600
744	1.332000	1.050000	0.870400	0.179700	0.968300	0.991500	0.778900
745	1.303000	1.034000	0.856800	0.177400	0.968400	0.996900	0.779200
746	1.326000	1.053000	0.872400	0.180700	0.968600	0.996800	0.779500
747	1.331000	1.059000	0.877300	0.181800	0.968800	0.998200	0.779900
748	1.316000	1.048000	0.868400	0.180100	0.968900	0.998900	0.780200
749	1.315000	1.048000	0.868400	0.180100	0.969100	0.999200	0.780500
750	1.296000	1.035000	0.856800	0.177700	0.969300	0.999300	0.780800
751	1.294000	1.033000	0.855900	0.177300	0.969400	0.999300	0.781100
752	1.312000	1.048000	0.868600	0.179800	0.969600	0.999600	0.781500
753	1.295000	1.035000	0.857600	0.177400	0.969700	0.999900	0.781800
754	1.318000	1.054000	0.873300	0.180300	0.969900	0.999500	0.782100
755	1.312000	1.048000	0.869200	0.179300	0.970100	0.999200	0.782400
756	1.284000	1.028000	0.852100	0.175600	0.970200	1.000000	0.782700
757	1.293000	1.035000	0.858100	0.176600	0.970400	1.000000	0.783000
758	1.292000	1.034000	0.857900	0.176300	0.970500	1.000000	0.783400
759	1.277000	1.010000	0.838800	0.171200	0.970700	1.000000	0.783700
760	1.289000	0.304000	0.274000	0.029980	0.970800	1.000000	0.784000
761	1.283000	0.197800	0.181900	0.015940	0.971000	1.000000	0.784300
762	1.251000	0.635600	0.547000	0.088610	0.971100	1.000000	0.784600
763	1.289000	0.404700	0.359400	0.045370	0.971300	1.000000	0.784900
764	1.291000	0.536100	0.468000	0.068110	0.971400	1.000000	0.785200
765	1.288000	0.654100	0.563200	0.090810	0.971600	1.000000	0.785500
766	1.215000	0.730400	0.621300	0.109100	0.971700	1.000000	0.785800
767	1.231000	0.848300	0.714000	0.134300	0.971900	1.000000	0.786100
768	1.268000	0.961700	0.803200	0.158500	0.972000	1.000000	0.786400
769	1.261000	0.976700	0.814400	0.162300	0.972200	1.000000	0.786700

770	1.246000	0.988500	0.822800	0.165700	0.972300	1.000000	0.787000
771	1.248000	1.000000	0.831800	0.168100	0.972500	1.000000	0.787300
772	1.240000	0.997200	0.829500	0.167700	0.972600	1.000000	0.787700
773	1.237000	0.995600	0.828300	0.167200	0.972700	1.000000	0.788000
774	1.254000	1.010000	0.840800	0.169600	0.972900	0.999900	0.788300
775	1.199000	0.966900	0.804900	0.162100	0.973000	0.999900	0.788600
776	1.251000	1.009000	0.840100	0.168900	0.973200	1.000000	0.788800
777	1.244000	1.004000	0.836000	0.167900	0.973300	1.000000	0.789100
778	1.235000	0.996700	0.830300	0.166400	0.973400	0.999700	0.789400
779	1.240000	1.000000	0.833600	0.166800	0.973600	0.999600	0.789700
780	1.226000	0.990000	0.825100	0.164900	0.973700	0.999800	0.790000
781	1.224000	0.988200	0.823800	0.164300	0.973800	0.999700	0.790300
782	1.236000	0.998600	0.832800	0.165800	0.974000	0.999600	0.790600
783	1.216000	0.982300	0.819400	0.162900	0.974100	0.999600	0.790900
784	1.209000	0.977400	0.815500	0.161800	0.974200	0.999700	0.791200
785	1.220000	0.982400	0.820200	0.162200	0.974400	0.995900	0.791500
786	1.199000	0.963100	0.804600	0.158500	0.974500	0.992900	0.791800
787	1.220000	0.954700	0.799500	0.155200	0.974600	0.969100	0.792100
788	1.205000	0.929900	0.779700	0.150200	0.974800	0.956500	0.792400
789	1.213000	0.925000	0.776400	0.148600	0.974900	0.945800	0.792700
790	1.204000	0.883900	0.743500	0.140400	0.975000	0.912000	0.793000
791	1.195000	0.910000	0.764200	0.145800	0.975100	0.943700	0.793200
792	1.176000	0.900400	0.756000	0.144400	0.975300	0.948500	0.793500
793	1.178000	0.897800	0.754300	0.143500	0.975400	0.943800	0.793800
794	1.152000	0.922800	0.773100	0.149800	0.975500	0.988800	0.794100
795	1.156000	0.915100	0.767600	0.147500	0.975600	0.977300	0.794400
796	1.179000	0.878800	0.740100	0.138700	0.975800	0.923600	0.794700
797	1.185000	0.882700	0.744000	0.138700	0.975900	0.923400	0.795000
798	1.182000	0.928100	0.779800	0.148300	0.976000	0.969900	0.795200
799	1.183000	0.917700	0.771900	0.145900	0.976100	0.959100	0.795500
800	1.155000	0.882100	0.742900	0.139200	0.976200	0.944600	0.795800
801	1.174000	0.888900	0.749300	0.139700	0.976400	0.936700	0.796100
802	1.173000	0.889100	0.749900	0.139300	0.976500	0.937700	0.796400
803	1.154000	0.868600	0.733300	0.135400	0.976600	0.931800	0.796600
804	1.165000	0.882600	0.744900	0.137700	0.976700	0.937200	0.796900
805	1.131000	0.871500	0.734900	0.136600	0.976800	0.952400	0.797200
806	1.163000	0.918200	0.773300	0.145000	0.976900	0.974100	0.797500
807	1.154000	0.906000	0.763500	0.142500	0.977000	0.968500	0.797800
808	1.146000	0.903700	0.761700	0.142000	0.977200	0.972600	0.798000
809	1.129000	0.873700	0.737600	0.136000	0.977300	0.955500	0.798300
810	1.124000	0.847500	0.717000	0.130500	0.977400	0.933000	0.798600
811	1.145000	0.853000	0.722000	0.131000	0.977500	0.921500	0.798900
812	1.142000	0.808200	0.687100	0.121200	0.977600	0.879500	0.799100
813	1.141000	0.784000	0.667000	0.117000	0.977700	0.854100	0.799400

814	1.141000	0.653500	0.560400	0.093120	0.977800	0.717200	0.799700
815	1.132000	0.651500	0.558300	0.093170	0.977900	0.719600	0.799900
816	1.129000	0.596100	0.513000	0.083120	0.978000	0.662800	0.800200
817	1.128000	0.614200	0.528100	0.086130	0.978100	0.682400	0.800500
818	1.116000	0.588700	0.507500	0.081160	0.978300	0.663100	0.800800
819	1.101000	0.691400	0.591500	0.099880	0.978400	0.783000	0.801000
820	1.075000	0.627500	0.538700	0.088760	0.978500	0.729800	0.801300
821	1.094000	0.795900	0.676800	0.119100	0.978600	0.900000	0.801600
822	1.083000	0.753600	0.642500	0.111100	0.978700	0.863000	0.801800
823	1.097000	0.438700	0.381800	0.056940	0.978800	0.505800	0.802100
824	1.099000	0.710400	0.609000	0.101400	0.978900	0.804800	0.802400
825	1.098000	0.778400	0.663200	0.115200	0.979000	0.876600	0.802600
826	1.105000	0.730500	0.624400	0.106100	0.979100	0.820100	0.802900
827	1.106000	0.790700	0.674300	0.116400	0.979200	0.884100	0.803200
828	1.104000	0.624400	0.538200	0.086140	0.979300	0.706500	0.803400
829	1.100000	0.735800	0.629400	0.106400	0.979400	0.828900	0.803700
830	1.086000	0.711700	0.609900	0.101900	0.979500	0.813200	0.803900
831	1.067000	0.705200	0.604400	0.100800	0.979600	0.819800	0.804200
832	1.086000	0.683800	0.587200	0.096560	0.979700	0.782400	0.804500
833	1.054000	0.756700	0.646800	0.109900	0.979800	0.887700	0.804700
834	1.065000	0.718700	0.615800	0.102800	0.979900	0.836200	0.805000
835	1.067000	0.816500	0.695400	0.121200	0.980000	0.941800	0.805200
836	1.080000	0.760600	0.651300	0.109200	0.980100	0.871400	0.805500
837	1.072000	0.822700	0.701200	0.121400	0.980200	0.944700	0.805800
838	1.074000	0.797800	0.681800	0.116000	0.980300	0.916100	0.806000
839	1.038000	0.800600	0.683200	0.117400	0.980300	0.949400	0.806300
840	1.067000	0.830600	0.708600	0.122000	0.980400	0.957600	0.806500
841	1.071000	0.820900	0.701200	0.119700	0.980500	0.943900	0.806800
842	1.056000	0.827300	0.705800	0.121400	0.980600	0.962900	0.807000
843	1.054000	0.844100	0.719300	0.124800	0.980700	0.982600	0.807300
844	1.035000	0.816800	0.697000	0.119800	0.980800	0.969500	0.807500
845	1.050000	0.844300	0.719700	0.124600	0.980900	0.986900	0.807800
846	1.055000	0.851500	0.725900	0.125600	0.981000	0.990000	0.808000
847	1.025000	0.833100	0.710100	0.123100	0.981100	0.996700	0.808300
848	1.052000	0.847000	0.722600	0.124300	0.981200	0.987500	0.808500
849	1.050000	0.844900	0.721100	0.123800	0.981300	0.987200	0.808800
850	0.916600	0.739200	0.631000	0.108200	0.981300	0.989100	0.809000
851	1.034000	0.824900	0.704800	0.120100	0.981400	0.979100	0.809300
852	1.012000	0.810700	0.692700	0.118000	0.981500	0.983200	0.809500
853	1.015000	0.821800	0.701900	0.119900	0.981600	0.992800	0.809800
854	0.835400	0.669700	0.572500	0.097170	0.981700	0.983400	0.810000
855	0.881300	0.715700	0.611400	0.104200	0.981800	0.995100	0.810300
856	1.017000	0.821100	0.702000	0.119100	0.981900	0.989700	0.810500
857	1.033000	0.840600	0.718500	0.122100	0.981900	0.996800	0.810800

858	1.020000	0.827400	0.707500	0.119900	0.982000	0.993600	0.811000
859	1.008000	0.820400	0.701600	0.118900	0.982100	0.996700	0.811300
860	1.008000	0.823400	0.704100	0.119300	0.982200	0.999800	0.811500
861	1.009000	0.823000	0.704000	0.118900	0.982300	0.998400	0.811800
862	1.001000	0.818300	0.700100	0.118200	0.982400	1.000000	0.812000
863	1.018000	0.832400	0.712400	0.120000	0.982400	0.999700	0.812200
864	1.018000	0.831800	0.712000	0.119800	0.982500	0.999500	0.812500
865	1.000000	0.818000	0.700300	0.117600	0.982600	1.000000	0.812700
866	0.856400	0.700500	0.600000	0.100600	0.982700	1.000000	0.813000
867	0.873300	0.714500	0.612100	0.102400	0.982800	1.000000	0.813200
868	0.969500	0.793400	0.679800	0.113600	0.982800	1.000000	0.813400
869	0.955100	0.781800	0.670000	0.111700	0.982900	1.000000	0.813700
870	0.992100	0.812200	0.696300	0.115900	0.983000	1.000000	0.813900
871	0.990300	0.810500	0.695100	0.115500	0.983100	0.999600	0.814200
872	0.990800	0.811400	0.696000	0.115500	0.983200	1.000000	0.814400
873	0.992300	0.812700	0.697200	0.115500	0.983200	1.000000	0.814600
874	0.976100	0.799600	0.686100	0.113400	0.983300	1.000000	0.814900
875	0.962500	0.788000	0.676400	0.111600	0.983400	0.999300	0.815100
876	0.964800	0.789200	0.677600	0.111500	0.983500	0.998500	0.815300
877	0.984000	0.805800	0.692100	0.113800	0.983500	0.999500	0.815600
878	0.979000	0.799800	0.687200	0.112600	0.983600	0.997100	0.815800
879	0.972600	0.795000	0.683200	0.111800	0.983700	0.997600	0.816100
880	0.972200	0.795400	0.683600	0.111700	0.983800	0.998200	0.816300
881	0.921900	0.749300	0.644600	0.104800	0.983800	0.992100	0.816500
882	0.967300	0.785700	0.676100	0.109600	0.983900	0.991500	0.816700
883	0.955400	0.778200	0.669600	0.108600	0.984000	0.993900	0.817000
884	0.957600	0.780000	0.671400	0.108600	0.984100	0.993900	0.817200
885	0.968400	0.789100	0.679400	0.109700	0.984100	0.994200	0.817400
886	0.941000	0.751900	0.648300	0.103600	0.984200	0.976000	0.817700
887	0.924700	0.749200	0.645600	0.103600	0.984300	0.988700	0.817900
888	0.955800	0.764200	0.659200	0.105000	0.984300	0.976300	0.818100
889	0.959900	0.784200	0.675800	0.108400	0.984400	0.996300	0.818400
890	0.961300	0.767700	0.662700	0.104900	0.984500	0.975200	0.818600
891	0.959400	0.773000	0.667100	0.105900	0.984500	0.983300	0.818800
892	0.949300	0.747800	0.646400	0.101400	0.984600	0.962500	0.819000
893	0.929800	0.705000	0.610400	0.094620	0.984700	0.927700	0.819300
894	0.951800	0.673800	0.585700	0.088150	0.984800	0.869300	0.819500
895	0.926300	0.597600	0.522000	0.075640	0.984800	0.795900	0.819700
896	0.955900	0.557800	0.488800	0.068940	0.984900	0.722100	0.819900
897	0.935000	0.447100	0.394700	0.052450	0.985000	0.595700	0.820200
898	0.937400	0.505100	0.444300	0.060750	0.985000	0.668800	0.820400
899	0.939700	0.360500	0.319600	0.040860	0.985100	0.479700	0.820600
900	0.915500	0.540800	0.473800	0.067040	0.985200	0.729700	0.820800
901	0.896200	0.376500	0.334700	0.041780	0.985200	0.526400	0.821100

902	0.879000	0.472800	0.416100	0.056700	0.985300	0.667000	0.821300
903	0.921800	0.474600	0.418600	0.055940	0.985400	0.639600	0.821500
904	0.934000	0.655100	0.571700	0.083430	0.985400	0.861800	0.821700
905	0.933600	0.626900	0.548100	0.078770	0.985500	0.826300	0.821900
906	0.914500	0.581000	0.508700	0.072260	0.985500	0.782600	0.822200
907	0.918200	0.428800	0.379500	0.049330	0.985600	0.581200	0.822400
908	0.904300	0.445100	0.393500	0.051540	0.985700	0.611800	0.822600
909	0.884800	0.494700	0.435800	0.058910	0.985700	0.692100	0.822800
910	0.896700	0.405100	0.359300	0.045790	0.985800	0.562900	0.823000
911	0.901300	0.462000	0.407200	0.054810	0.985900	0.634400	0.823300
912	0.889100	0.474700	0.419400	0.055300	0.985900	0.662200	0.823500
913	0.918100	0.411700	0.365600	0.046150	0.986000	0.558800	0.823700
914	0.911700	0.411600	0.366000	0.045570	0.986000	0.563200	0.823900
915	0.894800	0.444000	0.394100	0.049910	0.986100	0.617700	0.824100
916	0.904600	0.369900	0.329500	0.040360	0.986200	0.510700	0.824300
917	0.890900	0.506200	0.447100	0.059080	0.986200	0.703400	0.824600
918	0.888600	0.371100	0.331100	0.039910	0.986300	0.522100	0.824800
919	0.895900	0.525600	0.463600	0.062070	0.986300	0.724700	0.825000
920	0.887000	0.548000	0.481700	0.066320	0.986400	0.760300	0.825200
921	0.866300	0.579100	0.508600	0.070520	0.986500	0.821700	0.825400
922	0.861400	0.492700	0.434800	0.057960	0.986500	0.706200	0.825600
923	0.829700	0.556000	0.488200	0.067750	0.986600	0.823100	0.825800
924	0.858300	0.494200	0.437100	0.057060	0.986600	0.712200	0.826100
925	0.866500	0.490200	0.433500	0.056620	0.986700	0.699400	0.826300
926	0.842000	0.483100	0.427900	0.055240	0.986800	0.710200	0.826500
927	0.874200	0.567300	0.500700	0.066570	0.986800	0.800300	0.826700
928	0.880100	0.351400	0.315300	0.036090	0.986900	0.500300	0.826900
929	0.868200	0.303700	0.273800	0.029910	0.986900	0.440400	0.827100
930	0.868100	0.211700	0.193100	0.018590	0.987000	0.310400	0.827300
931	0.871200	0.201100	0.183900	0.017250	0.987000	0.294500	0.827500
932	0.864400	0.120400	0.111700	0.008733	0.987100	0.180300	0.827700
933	0.868800	0.088560	0.082690	0.005869	0.987100	0.132700	0.827900
934	0.867800	0.031100	0.029760	0.001341	0.987200	0.047800	0.828100
935	0.857500	0.098340	0.091490	0.006843	0.987300	0.148700	0.828300
936	0.850500	0.048830	0.046050	0.002787	0.987300	0.075420	0.828600
937	0.858800	0.049410	0.046560	0.002848	0.987400	0.075520	0.828800
938	0.857300	0.064870	0.060930	0.003940	0.987400	0.098970	0.829000
939	0.851600	0.194700	0.178300	0.016380	0.987500	0.291400	0.829200
940	0.847500	0.254900	0.231900	0.023060	0.987500	0.380800	0.829400
941	0.818600	0.169200	0.155600	0.013640	0.987600	0.264400	0.829600
942	0.810900	0.201400	0.184600	0.016860	0.987600	0.316600	0.829800
943	0.842600	0.119200	0.110400	0.008811	0.987700	0.182200	0.830000
944	0.823600	0.142000	0.130200	0.011750	0.987700	0.219800	0.830200
945	0.832000	0.177500	0.162900	0.014580	0.987800	0.272100	0.830400

946	0.837300	0.068720	0.064360	0.004358	0.987800	0.106800	0.830600
947	0.837500	0.172100	0.158400	0.013710	0.987900	0.262700	0.830800
948	0.839900	0.125100	0.115300	0.009776	0.987900	0.190600	0.831000
949	0.839800	0.254500	0.232300	0.022180	0.988000	0.383900	0.831200
950	0.836900	0.038910	0.036750	0.002168	0.988000	0.060920	0.831400
951	0.828700	0.252700	0.230900	0.021780	0.988100	0.386500	0.831600
952	0.831800	0.102000	0.094710	0.007298	0.988100	0.157900	0.831800
953	0.826600	0.159000	0.146400	0.012580	0.988200	0.245500	0.832000
954	0.813700	0.219300	0.200600	0.018720	0.988200	0.341600	0.832200
955	0.770600	0.150200	0.138300	0.011860	0.988300	0.248700	0.832400
956	0.816300	0.181000	0.164300	0.016740	0.988300	0.278700	0.832600
957	0.813000	0.105600	0.098270	0.007328	0.988400	0.167400	0.832800
958	0.817900	0.279000	0.252400	0.026580	0.988400	0.427200	0.833000
959	0.822200	0.194400	0.177800	0.016650	0.988500	0.299200	0.833200
960	0.813400	0.218700	0.199800	0.018860	0.988500	0.339800	0.833400
961	0.809200	0.265600	0.241100	0.024500	0.988600	0.412100	0.833600
962	0.812100	0.253600	0.230200	0.023390	0.988600	0.391900	0.833800
963	0.803000	0.310700	0.280500	0.030210	0.988700	0.482800	0.834000
964	0.800200	0.278100	0.251500	0.026580	0.988700	0.434300	0.834200
965	0.804300	0.310100	0.280500	0.029670	0.988800	0.481700	0.834300
966	0.788600	0.296500	0.268800	0.027760	0.988800	0.470600	0.834500
967	0.804400	0.293600	0.266400	0.027240	0.988900	0.457200	0.834700
968	0.797200	0.484500	0.431400	0.053140	0.988900	0.746900	0.834900
969	0.799400	0.497200	0.443800	0.053400	0.989000	0.766000	0.835100
970	0.802400	0.441200	0.395100	0.046050	0.989000	0.679200	0.835300
971	0.794400	0.547100	0.486300	0.060770	0.989000	0.844100	0.835500
972	0.800200	0.520100	0.462700	0.057430	0.989100	0.797200	0.835700
973	0.794000	0.407900	0.366800	0.041170	0.989100	0.636700	0.835900
974	0.781100	0.392100	0.351700	0.040370	0.989200	0.620400	0.836100
975	0.787500	0.416700	0.373200	0.043520	0.989200	0.652700	0.836300
976	0.791700	0.372500	0.335700	0.036720	0.989300	0.584000	0.836500
977	0.780300	0.464700	0.415000	0.049620	0.989300	0.732300	0.836600
978	0.789800	0.429300	0.385200	0.044140	0.989400	0.671200	0.836800
979	0.773000	0.451100	0.404000	0.047180	0.989400	0.719100	0.837000
980	0.781500	0.422500	0.378600	0.043840	0.989400	0.666500	0.837200
981	0.785400	0.551900	0.490900	0.061070	0.989500	0.859500	0.837400
982	0.784800	0.514900	0.459000	0.055880	0.989500	0.804200	0.837600
983	0.779300	0.487000	0.434800	0.052200	0.989600	0.766900	0.837800
984	0.775700	0.586700	0.520400	0.066260	0.989600	0.922000	0.838000
985	0.777600	0.511300	0.456200	0.055040	0.989700	0.806100	0.838100
986	0.773100	0.606300	0.537200	0.069030	0.989700	0.954400	0.838300
987	0.770600	0.585900	0.519600	0.066270	0.989700	0.925800	0.838500
988	0.772200	0.586300	0.520000	0.066360	0.989800	0.924400	0.838700
989	0.760400	0.613800	0.543300	0.070470	0.989800	0.980700	0.838900

990	0.762100	0.581500	0.516000	0.065530	0.989900	0.929100	0.839100
991	0.766300	0.617100	0.546500	0.070590	0.989900	0.978600	0.839300
992	0.765800	0.620000	0.549000	0.070960	0.989900	0.983400	0.839400
993	0.765900	0.596500	0.529100	0.067460	0.990000	0.947200	0.839600
994	0.765800	0.623500	0.552200	0.071330	0.990000	0.988500	0.839800
995	0.762500	0.624900	0.553300	0.071590	0.990100	0.994500	0.840000
996	0.761000	0.618500	0.548000	0.070480	0.990100	0.986500	0.840200
997	0.761400	0.621400	0.550500	0.070830	0.990100	0.990300	0.840400
998	0.759400	0.619000	0.548600	0.070440	0.990200	0.989100	0.840500
999	0.756100	0.616900	0.546800	0.070090	0.990200	0.989900	0.840700
1000	0.753300	0.607600	0.539000	0.068590	0.990300	0.979100	0.840900
1001	0.756100	0.617800	0.547700	0.070030	0.990300	0.991200	0.841100
1002	0.755100	0.589600	0.524100	0.065510	0.990300	0.949400	0.841300
1003	0.746800	0.608300	0.539600	0.068640	0.990400	0.988100	0.841400
1004	0.738500	0.594800	0.528100	0.066730	0.990400	0.977600	0.841600
1005	0.697200	0.571100	0.506700	0.064400	0.990500	0.993400	0.841800
1006	0.722000	0.586200	0.520400	0.065760	0.990500	0.985000	0.842000
1007	0.740900	0.604800	0.537000	0.067890	0.990500	0.990100	0.842100
1008	0.743300	0.600900	0.533800	0.067080	0.990600	0.981000	0.842300
1009	0.740800	0.593900	0.527900	0.065950	0.990600	0.973200	0.842500
1010	0.741800	0.591500	0.526100	0.065440	0.990600	0.968200	0.842700
1011	0.738200	0.603300	0.536000	0.067320	0.990700	0.991200	0.842900
1012	0.737200	0.597000	0.530800	0.066270	0.990700	0.982600	0.843000
1013	0.734400	0.602100	0.535100	0.067070	0.990800	0.994000	0.843200
1014	0.734700	0.602400	0.535400	0.066990	0.990800	0.994200	0.843400
1015	0.724900	0.593400	0.527500	0.065830	0.990800	0.992600	0.843600
1016	0.726400	0.594200	0.528400	0.065820	0.990900	0.991900	0.843700
1017	0.722900	0.590200	0.525000	0.065200	0.990900	0.990200	0.843900
1018	0.727200	0.597400	0.531400	0.066080	0.990900	0.996000	0.844100
1019	0.712200	0.574600	0.511600	0.062970	0.991000	0.979100	0.844300
1020	0.716800	0.587400	0.522700	0.064680	0.991000	0.993600	0.844400
1021	0.720300	0.592100	0.526900	0.065180	0.991000	0.996600	0.844600
1022	0.709300	0.579500	0.516000	0.063510	0.991100	0.990900	0.844800
1023	0.722300	0.589100	0.524700	0.064430	0.991100	0.989300	0.844900
1024	0.719800	0.575600	0.513300	0.062320	0.991100	0.971200	0.845100
1025	0.718300	0.590000	0.525500	0.064500	0.991200	0.996100	0.845300
1026	0.718500	0.587600	0.523600	0.064010	0.991200	0.992100	0.845500
1027	0.715200	0.585200	0.521500	0.063680	0.991300	0.992700	0.845600
1028	0.716500	0.585500	0.522000	0.063570	0.991300	0.991500	0.845800
1029	0.706700	0.576700	0.514200	0.062450	0.991300	0.990300	0.846000
1030	0.710300	0.584100	0.520800	0.063380	0.991400	0.997700	0.846100
1031	0.708500	0.580800	0.518000	0.062830	0.991400	0.994800	0.846300
1032	0.708300	0.582600	0.519500	0.063010	0.991400	0.998000	0.846500
1033	0.694500	0.570900	0.509300	0.061640	0.991500	0.997800	0.846700

1034	0.699000	0.575300	0.513300	0.062050	0.991500	0.999200	0.846800
1035	0.694100	0.571700	0.510200	0.061580	0.991500	0.999900	0.847000
1036	0.702800	0.577700	0.515700	0.062070	0.991600	0.998300	0.847200
1037	0.693500	0.570800	0.509600	0.061270	0.991600	1.000000	0.847300
1038	0.690200	0.568000	0.507200	0.060860	0.991600	0.999800	0.847500
1039	0.696900	0.573100	0.511800	0.061280	0.991600	0.999400	0.847700
1040	0.689100	0.567000	0.506400	0.060540	0.991700	1.000000	0.847800
1041	0.693800	0.570200	0.509500	0.060760	0.991700	0.999400	0.848000
1042	0.693100	0.570000	0.509300	0.060650	0.991700	1.000000	0.848200
1043	0.685500	0.563500	0.503700	0.059860	0.991800	1.000000	0.848300
1044	0.690600	0.567600	0.507400	0.060180	0.991800	1.000000	0.848500
1045	0.686200	0.563700	0.504000	0.059660	0.991800	1.000000	0.848700
1046	0.671200	0.551200	0.492900	0.058230	0.991900	1.000000	0.848800
1047	0.679500	0.557800	0.499000	0.058820	0.991900	1.000000	0.849000
1048	0.684800	0.561800	0.502700	0.059130	0.991900	0.999900	0.849100
1049	0.683200	0.559900	0.501100	0.058810	0.992000	0.999900	0.849300
1050	0.679900	0.556800	0.498400	0.058360	0.992000	0.999900	0.849500
1051	0.679700	0.556600	0.498300	0.058240	0.992000	0.999900	0.849600
1052	0.676800	0.553700	0.495900	0.057820	0.992100	0.999900	0.849800
1053	0.674600	0.551600	0.494100	0.057490	0.992100	0.999900	0.850000
1054	0.672700	0.549600	0.492500	0.057170	0.992100	0.999900	0.850100
1055	0.675600	0.551500	0.494200	0.057240	0.992100	0.999700	0.850300
1056	0.674500	0.549900	0.492900	0.056950	0.992200	0.999400	0.850400
1057	0.673200	0.548500	0.491800	0.056690	0.992200	0.999600	0.850600
1058	0.664900	0.541200	0.485400	0.055820	0.992200	0.999500	0.850800
1059	0.650500	0.528600	0.474200	0.054390	0.992300	0.998800	0.850900
1060	0.664300	0.539800	0.484400	0.055450	0.992300	0.999500	0.851100
1061	0.652800	0.530000	0.475700	0.054330	0.992300	0.999100	0.851300
1062	0.664000	0.537700	0.482800	0.054960	0.992400	0.997100	0.851400
1063	0.655100	0.529700	0.475700	0.054000	0.992400	0.996300	0.851600
1064	0.663400	0.537900	0.483100	0.054820	0.992400	0.999600	0.851700
1065	0.663300	0.533900	0.479700	0.054120	0.992400	0.992800	0.851900
1066	0.649600	0.526200	0.472800	0.053410	0.992500	0.998800	0.852000
1067	0.651800	0.526200	0.473000	0.053250	0.992500	0.994900	0.852200
1068	0.651400	0.523100	0.470400	0.052710	0.992500	0.990900	0.852400
1069	0.619700	0.497100	0.447100	0.050000	0.992500	0.987500	0.852500
1070	0.637800	0.506100	0.455500	0.050600	0.992600	0.976100	0.852700
1071	0.646100	0.523400	0.470700	0.052680	0.992600	0.994500	0.852800
1072	0.648000	0.515000	0.463700	0.051330	0.992600	0.976000	0.853000
1073	0.630500	0.504000	0.453700	0.050280	0.992700	0.980300	0.853100
1074	0.645400	0.524900	0.472200	0.052660	0.992700	0.995600	0.853300
1075	0.628900	0.483400	0.435700	0.047620	0.992700	0.941700	0.853500
1076	0.640300	0.516700	0.465200	0.051490	0.992700	0.986600	0.853600
1077	0.642100	0.502400	0.452800	0.049590	0.992800	0.956700	0.853800

1078	0.640600	0.494900	0.446400	0.048460	0.992800	0.944600	0.853900
1079	0.622600	0.505200	0.455000	0.050220	0.992800	0.989700	0.854100
1080	0.639200	0.488700	0.441100	0.047670	0.992800	0.933800	0.854200
1081	0.624800	0.473400	0.427600	0.045820	0.992900	0.925500	0.854400
1082	0.617700	0.488700	0.440900	0.047820	0.992900	0.964500	0.854500
1083	0.606700	0.485100	0.437400	0.047690	0.992900	0.973800	0.854700
1084	0.628700	0.465100	0.420600	0.044530	0.993000	0.903000	0.854900
1085	0.629400	0.487200	0.440100	0.047030	0.993000	0.943200	0.855000
1086	0.631800	0.435800	0.395100	0.040720	0.993000	0.843100	0.855200
1087	0.601000	0.455300	0.411800	0.043580	0.993000	0.923000	0.855300
1088	0.618700	0.486100	0.439100	0.047040	0.993100	0.955700	0.855500
1089	0.611900	0.456800	0.413500	0.043310	0.993100	0.909700	0.855600
1090	0.621400	0.441900	0.400400	0.041500	0.993100	0.866900	0.855800
1091	0.623700	0.480200	0.434300	0.045890	0.993100	0.936400	0.855900
1092	0.614600	0.482300	0.435900	0.046380	0.993200	0.953400	0.856100
1093	0.607100	0.385600	0.350700	0.034920	0.993200	0.776100	0.856200
1094	0.564200	0.427800	0.387300	0.040420	0.993200	0.922100	0.856400
1095	0.594900	0.392900	0.357500	0.035360	0.993200	0.806800	0.856500
1096	0.597900	0.370000	0.337200	0.032740	0.993300	0.757000	0.856700
1097	0.595100	0.465900	0.421700	0.044200	0.993300	0.950600	0.856800
1098	0.592500	0.360200	0.328800	0.031370	0.993300	0.744200	0.857000
1099	0.597300	0.374500	0.341700	0.032780	0.993300	0.767000	0.857100
1100	0.607000	0.340300	0.311300	0.029050	0.993400	0.687300	0.857300
1101	0.603600	0.351600	0.321200	0.030340	0.993400	0.713100	0.857400
1102	0.586600	0.322100	0.294900	0.027160	0.993400	0.673300	0.857600
1103	0.601400	0.314800	0.288700	0.026070	0.993400	0.642800	0.857700
1104	0.601000	0.317000	0.290600	0.026320	0.993500	0.647400	0.857900
1105	0.599100	0.360700	0.330100	0.030520	0.993500	0.737500	0.858000
1106	0.598500	0.234200	0.216600	0.017600	0.993500	0.484100	0.858100
1107	0.595800	0.339200	0.310600	0.028630	0.993500	0.697200	0.858300
1108	0.596100	0.260100	0.239700	0.020350	0.993500	0.537800	0.858400
1109	0.595200	0.254300	0.235000	0.019360	0.993600	0.527600	0.858600
1110	0.596000	0.311600	0.286900	0.024650	0.993600	0.643300	0.858700
1111	0.592900	0.188300	0.175100	0.013270	0.993600	0.394500	0.858900
1112	0.587400	0.247800	0.229100	0.018770	0.993600	0.520800	0.859000
1113	0.586100	0.135400	0.126600	0.008819	0.993700	0.288400	0.859200
1114	0.590600	0.152100	0.142300	0.009863	0.993700	0.321600	0.859300
1115	0.588000	0.123900	0.116200	0.007735	0.993700	0.263700	0.859500
1116	0.584700	0.082300	0.077870	0.004429	0.993700	0.177700	0.859600
1117	0.590600	0.018170	0.017520	0.000649	0.993800	0.039590	0.859700
1118	0.587400	0.094130	0.089010	0.005122	0.993800	0.202200	0.859900
1119	0.575700	0.034330	0.032900	0.001428	0.993800	0.076210	0.860000
1120	0.576400	0.041480	0.039850	0.001631	0.993800	0.092170	0.860200
1121	0.579500	0.060750	0.058180	0.002576	0.993800	0.133800	0.860300

1122	0.583500	0.017310	0.016820	0.000486	0.993900	0.038410	0.860500
1123	0.582700	0.038090	0.036590	0.001491	0.993900	0.083690	0.860600
1124	0.581900	0.032140	0.030890	0.001247	0.993900	0.070730	0.860700
1125	0.569300	0.045240	0.043340	0.001899	0.993900	0.101400	0.860900
1126	0.562700	0.007992	0.007825	0.000167	0.993900	0.018520	0.861000
1127	0.576400	0.051480	0.049310	0.002173	0.994000	0.113900	0.861200
1128	0.570800	0.021430	0.020790	0.000642	0.994000	0.048490	0.861300
1129	0.569500	0.023670	0.022950	0.000720	0.994000	0.053640	0.861500
1130	0.564200	0.014250	0.013800	0.000452	0.994000	0.032540	0.861600
1131	0.570400	0.125800	0.119100	0.006735	0.994100	0.277700	0.861700
1132	0.571100	0.092730	0.088090	0.004641	0.994100	0.205200	0.861900
1133	0.563700	0.044040	0.042360	0.001680	0.994100	0.099920	0.862000
1134	0.563300	0.006006	0.005882	0.000124	0.994100	0.013880	0.862200
1135	0.568900	0.002669	0.002604	0.000065	0.994100	0.006086	0.862300
1136	0.565500	0.031960	0.030900	0.001057	0.994200	0.072610	0.862400
1137	0.566000	0.118300	0.112300	0.006083	0.994200	0.263600	0.862600
1138	0.554100	0.079790	0.075930	0.003854	0.994200	0.182100	0.862700
1139	0.555900	0.155700	0.146200	0.009552	0.994200	0.349300	0.862900
1140	0.554700	0.116300	0.109900	0.006455	0.994200	0.263100	0.863000
1141	0.549600	0.076280	0.072570	0.003706	0.994300	0.175300	0.863100
1142	0.556500	0.094520	0.089670	0.004851	0.994300	0.213900	0.863300
1143	0.555100	0.149600	0.141000	0.008658	0.994300	0.337200	0.863400
1144	0.551600	0.037610	0.036000	0.001611	0.994300	0.086600	0.863500
1145	0.554100	0.042210	0.040670	0.001547	0.994300	0.097380	0.863700
1146	0.558700	0.045380	0.043720	0.001660	0.994400	0.103800	0.863800
1147	0.559600	0.008927	0.008748	0.000178	0.994400	0.020740	0.864000
1148	0.556000	0.127800	0.120800	0.007066	0.994400	0.288100	0.864100
1149	0.553800	0.092000	0.087340	0.004658	0.994400	0.209100	0.864200
1150	0.552700	0.043910	0.041820	0.002085	0.994400	0.100300	0.864400
1151	0.552300	0.079390	0.075610	0.003775	0.994500	0.181500	0.864500
1152	0.548200	0.109900	0.104100	0.005777	0.994500	0.251600	0.864600
1153	0.549200	0.116300	0.109700	0.006564	0.994500	0.264800	0.864800
1154	0.552000	0.041380	0.039770	0.001608	0.994500	0.095450	0.864900
1155	0.550700	0.162600	0.152900	0.009736	0.994500	0.367700	0.865000
1156	0.546100	0.138000	0.130100	0.007883	0.994600	0.315600	0.865200
1157	0.547600	0.172100	0.161100	0.010970	0.994600	0.389500	0.865300
1158	0.546400	0.169600	0.158800	0.010770	0.994600	0.384800	0.865400
1159	0.537200	0.192000	0.179600	0.012380	0.994600	0.442600	0.865600
1160	0.533300	0.153100	0.143600	0.009537	0.994600	0.356300	0.865700
1161	0.524900	0.204500	0.190700	0.013860	0.994600	0.480600	0.865800
1162	0.533800	0.199800	0.186400	0.013410	0.994700	0.461900	0.866000
1163	0.539600	0.332800	0.307300	0.025550	0.994700	0.753300	0.866100
1164	0.530700	0.251500	0.233600	0.017920	0.994700	0.582000	0.866200
1165	0.534600	0.239300	0.222400	0.016880	0.994700	0.550100	0.866400

1166	0.528600	0.240400	0.223300	0.017180	0.994700	0.558400	0.866500
1167	0.532100	0.264200	0.245100	0.019100	0.994800	0.608900	0.866600
1168	0.535800	0.280600	0.259700	0.020870	0.994800	0.640600	0.866800
1169	0.523900	0.290900	0.269100	0.021730	0.994800	0.678700	0.866900
1170	0.529200	0.327000	0.301800	0.025160	0.994800	0.753600	0.867000
1171	0.534100	0.320700	0.296000	0.024650	0.994800	0.732100	0.867200
1172	0.533300	0.330000	0.304500	0.025570	0.994800	0.753900	0.867300
1173	0.531100	0.328200	0.303000	0.025160	0.994900	0.753400	0.867400
1174	0.530800	0.205700	0.191400	0.014350	0.994900	0.476000	0.867500
1175	0.518600	0.332400	0.306300	0.026040	0.994900	0.779700	0.867700
1176	0.516000	0.372700	0.342600	0.030160	0.994900	0.876200	0.867800
1177	0.524800	0.354200	0.326200	0.027980	0.994900	0.820200	0.867900
1178	0.517000	0.242400	0.224400	0.017950	0.995000	0.572800	0.868100
1179	0.519100	0.380500	0.349700	0.030790	0.995000	0.888800	0.868200
1180	0.525100	0.320400	0.296000	0.024460	0.995000	0.743500	0.868300
1181	0.521400	0.333500	0.307800	0.025690	0.995000	0.778600	0.868400
1182	0.518800	0.205800	0.191400	0.014350	0.995000	0.486500	0.868600
1183	0.497000	0.330400	0.304800	0.025600	0.995000	0.808400	0.868700
1184	0.510600	0.300500	0.277900	0.022620	0.995100	0.717500	0.868800
1185	0.517200	0.282400	0.261700	0.020610	0.995100	0.667000	0.869000
1186	0.517500	0.363600	0.335100	0.028530	0.995100	0.853300	0.869100
1187	0.517100	0.337100	0.311200	0.025850	0.995100	0.792900	0.869200
1188	0.507100	0.208100	0.194000	0.014020	0.995100	0.504100	0.869300
1189	0.491800	0.307800	0.284500	0.023330	0.995100	0.761900	0.869500
1190	0.508300	0.354700	0.327000	0.027710	0.995200	0.847200	0.869600
1191	0.515500	0.321200	0.297200	0.024070	0.995200	0.759000	0.869700
1192	0.513800	0.365100	0.336300	0.028740	0.995200	0.861800	0.869800
1193	0.512000	0.342100	0.315700	0.026380	0.995200	0.811600	0.870000
1194	0.512200	0.358300	0.330300	0.027990	0.995200	0.848800	0.870100
1195	0.507200	0.327200	0.302400	0.024750	0.995200	0.784600	0.870200
1196	0.505000	0.306700	0.283900	0.022780	0.995200	0.739700	0.870300
1197	0.499200	0.367300	0.338500	0.028800	0.995300	0.891900	0.870500
1198	0.489600	0.327300	0.302100	0.025220	0.995300	0.811600	0.870600
1199	0.480100	0.251600	0.233600	0.018080	0.995300	0.639700	0.870700
1200	0.497000	0.335000	0.309200	0.025760	0.995300	0.818000	0.870800
1201	0.505100	0.317400	0.293700	0.023740	0.995300	0.764300	0.871000
1202	0.504600	0.325400	0.300500	0.024970	0.995300	0.782700	0.871100
1203	0.487900	0.318900	0.295100	0.023890	0.995400	0.797800	0.871200
1204	0.486000	0.255800	0.237500	0.018300	0.995400	0.658600	0.871300
1205	0.499300	0.333300	0.307800	0.025500	0.995400	0.821000	0.871500
1206	0.498500	0.381200	0.351200	0.029980	0.995400	0.930700	0.871600
1207	0.500300	0.317100	0.293300	0.023790	0.995400	0.777900	0.871700
1208	0.483600	0.325300	0.300500	0.024840	0.995400	0.825200	0.871800
1209	0.472900	0.319000	0.294800	0.024230	0.995500	0.824500	0.872000

1210	0.489600	0.349600	0.322700	0.026940	0.995500	0.869200	0.872100
1211	0.484000	0.321300	0.296800	0.024440	0.995500	0.807400	0.872200
1212	0.492400	0.304900	0.282700	0.022170	0.995500	0.755000	0.872300
1213	0.493400	0.367000	0.338700	0.028280	0.995500	0.901600	0.872400
1214	0.492600	0.318400	0.294900	0.023420	0.995500	0.786100	0.872600
1215	0.493400	0.311900	0.289000	0.022910	0.995500	0.768600	0.872700
1216	0.492600	0.368000	0.339500	0.028450	0.995600	0.904400	0.872800
1217	0.491500	0.353700	0.326700	0.027040	0.995600	0.872000	0.872900
1218	0.489800	0.362300	0.334400	0.027810	0.995600	0.901900	0.873000
1219	0.487200	0.350700	0.324200	0.026530	0.995600	0.887600	0.873200
1220	0.487900	0.362200	0.334500	0.027760	0.995600	0.905600	0.873300
1221	0.487300	0.371500	0.342700	0.028790	0.995600	0.925500	0.873400
1222	0.485400	0.358400	0.330900	0.027520	0.995600	0.900500	0.873500
1223	0.482900	0.352000	0.325200	0.026860	0.995700	0.889500	0.873600
1224	0.485000	0.346000	0.320000	0.025990	0.995700	0.869400	0.873800
1225	0.483500	0.368500	0.340200	0.028290	0.995700	0.924800	0.873900
1226	0.482800	0.376600	0.347400	0.029190	0.995700	0.944900	0.874000
1227	0.473900	0.334300	0.309300	0.024980	0.995700	0.856800	0.874100
1228	0.476300	0.376400	0.347300	0.029140	0.995700	0.956600	0.874200
1229	0.481100	0.376800	0.347700	0.029150	0.995700	0.947400	0.874400
1230	0.479000	0.368300	0.340000	0.028270	0.995800	0.930600	0.874500
1231	0.477700	0.387900	0.357700	0.030250	0.995800	0.981600	0.874600
1232	0.474600	0.384800	0.354900	0.029950	0.995800	0.979900	0.874700
1233	0.475600	0.359800	0.332500	0.027320	0.995800	0.916200	0.874800
1234	0.474500	0.390800	0.360200	0.030540	0.995800	0.995000	0.874900
1235	0.472700	0.385100	0.355200	0.029910	0.995800	0.984800	0.875100
1236	0.474400	0.390100	0.359700	0.030390	0.995800	0.993500	0.875200
1237	0.474200	0.380800	0.351300	0.029430	0.995800	0.970700	0.875300
1238	0.473800	0.390000	0.359700	0.030320	0.995900	0.994600	0.875400
1239	0.469100	0.385900	0.356000	0.029960	0.995900	0.994200	0.875500
1240	0.466200	0.385200	0.355200	0.029920	0.995900	0.998200	0.875600
1241	0.470100	0.382200	0.352800	0.029450	0.995900	0.983000	0.875800
1242	0.466800	0.385200	0.355400	0.029830	0.995900	0.997400	0.875900
1243	0.461600	0.381700	0.352200	0.029550	0.995900	0.999400	0.876000
1244	0.462700	0.380900	0.351500	0.029380	0.995900	0.995400	0.876100
1245	0.467000	0.385800	0.356100	0.029780	0.996000	0.999300	0.876200
1246	0.464300	0.383800	0.354200	0.029590	0.996000	0.999500	0.876300
1247	0.462800	0.381400	0.352100	0.029330	0.996000	0.997600	0.876500
1248	0.464200	0.379600	0.350500	0.029040	0.996000	0.991300	0.876600
1249	0.464300	0.382900	0.353600	0.029380	0.996000	0.999000	0.876700
1250	0.463100	0.381000	0.351900	0.029170	0.996000	0.998300	0.876800
1251	0.460600	0.377600	0.348800	0.028820	0.996000	0.998700	0.876900
1252	0.456200	0.375400	0.346700	0.028660	0.996000	0.997000	0.877000
1253	0.457300	0.373500	0.345100	0.028380	0.996100	0.998600	0.877100

1254	0.458000	0.369000	0.341200	0.027830	0.996100	0.989600	0.877300
1255	0.457100	0.374500	0.346100	0.028430	0.996100	0.994300	0.877400
1256	0.455400	0.367800	0.340100	0.027690	0.996100	0.996900	0.877500
1257	0.453600	0.365500	0.338000	0.027450	0.996100	0.998100	0.877600
1258	0.453900	0.369000	0.341200	0.027800	0.996100	0.992600	0.877700
1259	0.452800	0.360000	0.333200	0.026800	0.996100	0.997800	0.877800
1260	0.453800	0.360700	0.333900	0.026820	0.996100	0.992900	0.877900
1261	0.452200	0.347000	0.321700	0.025340	0.996200	0.992600	0.878000
1262	0.448700	0.339200	0.314600	0.024550	0.996200	0.997400	0.878200
1263	0.451700	0.339300	0.314900	0.024470	0.996200	0.990500	0.878300
1264	0.447600	0.320900	0.298300	0.022590	0.996200	0.990700	0.878400
1265	0.446700	0.337200	0.312900	0.024310	0.996200	0.996000	0.878500
1266	0.449000	0.330600	0.307100	0.023510	0.996200	0.998300	0.878600
1267	0.444800	0.331000	0.307400	0.023640	0.996200	0.988100	0.878700
1268	0.441200	0.319600	0.297100	0.022510	0.996200	0.993200	0.878800
1269	0.443400	0.232300	0.218300	0.013970	0.996300	0.994100	0.878900
1270	0.446400	0.331800	0.308200	0.023590	0.996300	0.995900	0.879000
1271	0.446300	0.342300	0.317600	0.024730	0.996300	0.983500	0.879200
1272	0.444700	0.343000	0.318200	0.024750	0.996300	0.987300	0.879300
1273	0.443300	0.341100	0.316600	0.024570	0.996300	0.989600	0.879400
1274	0.440500	0.338300	0.313900	0.024330	0.996300	0.981300	0.879500
1275	0.441500	0.345000	0.320000	0.024960	0.996300	0.994700	0.879600
1276	0.442300	0.346000	0.321000	0.025030	0.996300	0.987000	0.879700
1277	0.441300	0.342100	0.317500	0.024670	0.996300	0.965000	0.879800
1278	0.439500	0.353600	0.327800	0.025850	0.996400	0.995800	0.879900
1279	0.436300	0.345400	0.320300	0.025100	0.996400	0.972500	0.880000
1280	0.432400	0.340000	0.315500	0.024540	0.996400	0.966200	0.880100
1281	0.417500	0.331900	0.307800	0.024060	0.996400	0.968200	0.880200
1282	0.383700	0.313000	0.290100	0.022920	0.996400	0.990900	0.880400
1283	0.404700	0.328500	0.304500	0.023960	0.996400	0.986700	0.880500
1284	0.424800	0.338200	0.313800	0.024430	0.996400	0.964500	0.880600
1285	0.428100	0.344000	0.319100	0.024940	0.996400	0.974400	0.880700
1286	0.429300	0.348000	0.322700	0.025280	0.996400	0.978300	0.880800
1287	0.431400	0.338100	0.313900	0.024200	0.996500	0.950300	0.880900
1288	0.429500	0.338500	0.314200	0.024260	0.996500	0.951200	0.881000
1289	0.429600	0.322500	0.299800	0.022640	0.996500	0.909700	0.881100
1290	0.424700	0.335100	0.311100	0.023930	0.996500	0.952700	0.881200
1291	0.425400	0.340200	0.315800	0.024420	0.996500	0.966600	0.881300
1292	0.428100	0.306100	0.285100	0.021060	0.996500	0.865300	0.881400
1293	0.427600	0.328700	0.305500	0.023190	0.996500	0.928400	0.881500
1294	0.424300	0.320600	0.298200	0.022460	0.996500	0.912800	0.881600
1295	0.426500	0.322800	0.300300	0.022520	0.996500	0.914700	0.881800
1296	0.426900	0.298200	0.278000	0.020230	0.996600	0.845400	0.881900
1297	0.424700	0.276200	0.257900	0.018340	0.996600	0.787900	0.882000

1298	0.421400	0.311000	0.289500	0.021510	0.996600	0.891400	0.882100
1299	0.424500	0.332000	0.308600	0.023480	0.996600	0.942800	0.882200
1300	0.423600	0.258900	0.241800	0.017070	0.996600	0.740300	0.882300
1301	0.421600	0.262500	0.245400	0.017020	0.996600	0.754700	0.882400
1302	0.418700	0.311300	0.289800	0.021510	0.996600	0.897400	0.882500
1303	0.416100	0.250100	0.234000	0.016180	0.996600	0.728700	0.882600
1304	0.415000	0.196800	0.184800	0.011930	0.996600	0.577100	0.882700
1305	0.417900	0.298500	0.278300	0.020240	0.996700	0.862600	0.882800
1306	0.418800	0.296400	0.276600	0.019860	0.996700	0.855300	0.882900
1307	0.417800	0.200300	0.188300	0.012070	0.996700	0.583700	0.883000
1308	0.416800	0.262400	0.245000	0.017360	0.996700	0.761300	0.883100
1309	0.417300	0.295800	0.276100	0.019680	0.996700	0.856600	0.883200
1310	0.415200	0.200400	0.188300	0.012070	0.996700	0.587100	0.883300
1311	0.414200	0.241700	0.226200	0.015540	0.996700	0.706900	0.883400
1312	0.408200	0.240000	0.224500	0.015500	0.996700	0.711900	0.883500
1313	0.402600	0.217400	0.204000	0.013340	0.996700	0.656400	0.883600
1314	0.410900	0.194700	0.183000	0.011660	0.996700	0.577900	0.883700
1315	0.401600	0.181600	0.171300	0.010380	0.996800	0.553500	0.883800
1316	0.402400	0.228400	0.214200	0.014180	0.996800	0.690000	0.883900
1317	0.410200	0.219000	0.205400	0.013640	0.996800	0.648000	0.884000
1318	0.406900	0.246800	0.231000	0.015840	0.996800	0.735300	0.884100
1319	0.410000	0.162100	0.153100	0.008986	0.996800	0.483900	0.884200
1320	0.409100	0.170300	0.160400	0.009869	0.996800	0.507800	0.884300
1321	0.406500	0.204100	0.191900	0.012250	0.996800	0.610900	0.884500
1322	0.406300	0.197700	0.186300	0.011410	0.996800	0.593100	0.884600
1323	0.406200	0.133500	0.126500	0.006957	0.996800	0.402700	0.884700
1324	0.406400	0.159800	0.151000	0.008861	0.996800	0.480100	0.884800
1325	0.405500	0.226600	0.212700	0.013850	0.996800	0.677800	0.884900
1326	0.403300	0.180900	0.170600	0.010370	0.996900	0.546300	0.885000
1327	0.401300	0.167600	0.158100	0.009436	0.996900	0.508900	0.885100
1328	0.401000	0.143700	0.135900	0.007792	0.996900	0.437500	0.885200
1329	0.393200	0.090260	0.086100	0.004161	0.996900	0.282700	0.885300
1330	0.397200	0.124400	0.118400	0.006009	0.996900	0.384900	0.885400
1331	0.399600	0.059730	0.057350	0.002382	0.996900	0.185300	0.885500
1332	0.393600	0.065970	0.063230	0.002743	0.996900	0.207400	0.885600
1333	0.397700	0.094350	0.090270	0.004078	0.996900	0.292900	0.885700
1334	0.400100	0.092240	0.087650	0.004584	0.996900	0.282700	0.885800
1335	0.398400	0.131400	0.124800	0.006562	0.996900	0.404200	0.885900
1336	0.396900	0.093290	0.089070	0.004215	0.997000	0.289600	0.886000
1337	0.397200	0.080410	0.076770	0.003642	0.997000	0.249500	0.886100
1338	0.395200	0.085780	0.081970	0.003810	0.997000	0.267800	0.886200
1339	0.390200	0.087890	0.083950	0.003935	0.997000	0.277700	0.886300
1340	0.389900	0.089610	0.085400	0.004213	0.997000	0.282500	0.886400
1341	0.393900	0.075920	0.072850	0.003078	0.997000	0.238600	0.886500

1342	0.392800	0.069500	0.066750	0.002750	0.997000	0.219200	0.886600
1343	0.392600	0.037890	0.036730	0.001157	0.997000	0.120700	0.886700
1344	0.392800	0.024490	0.023710	0.000788	0.997000	0.077830	0.886700
1345	0.392300	0.033780	0.032800	0.000982	0.997000	0.107800	0.886800
1346	0.389700	0.009558	0.009394	0.000164	0.997000	0.031080	0.886900
1347	0.390200	0.008614	0.008486	0.000128	0.997000	0.028020	0.887000
1348	0.390100	0.000187	0.000186	0.000001	0.997100	0.000613	0.887100
1349	0.388300	0.000855	0.000849	0.000006	0.997100	0.002817	0.887200
1350	0.384500	0.001059	0.001052	0.000007	0.997100	0.003524	0.887300
1351	0.385300	0.000089	0.000089	0.000000	0.997100	0.000298	0.887400
1352	0.387600	0.000005	0.000005	0.000000	0.997100	0.000018	0.887500
1353	0.386900	0.000000	0.000000	0.000000	0.997100	0.000000	0.887600
1354	0.385200	0.000001	0.000001	0.000000	0.997100	0.000003	0.887700
1355	0.381200	0.000000	0.000000	0.000000	0.997100	0.000000	0.887800
1356	0.379700	0.000000	0.000000	0.000000	0.997100	0.000000	0.887900
1357	0.378000	0.000000	0.000000	0.000000	0.997100	0.000000	0.888000
1358	0.381500	0.000000	0.000000	0.000000	0.997100	0.000000	0.888100
1359	0.380100	0.000000	0.000000	0.000000	0.997200	0.000000	0.888200
1360	0.377500	0.000000	0.000000	0.000000	0.997200	0.000000	0.888300
1361	0.380900	0.000000	0.000000	0.000000	0.997200	0.000000	0.888400
1362	0.379600	0.000000	0.000000	0.000000	0.997200	0.000000	0.888500
1363	0.375200	0.000000	0.000000	0.000000	0.997200	0.000000	0.888600
1364	0.376900	0.000000	0.000000	0.000000	0.997200	0.000000	0.888700
1365	0.377600	0.000000	0.000000	0.000000	0.997200	0.000000	0.888800
1366	0.376900	0.000000	0.000000	0.000000	0.997200	0.000000	0.888900
1367	0.374400	0.000000	0.000000	0.000000	0.997200	0.000000	0.889000
1368	0.374300	0.000000	0.000000	0.000000	0.997200	0.000000	0.889100
1369	0.370900	0.000000	0.000000	0.000000	0.997200	0.000000	0.889200
1370	0.370600	0.000000	0.000000	0.000000	0.997200	0.000000	0.889300
1371	0.370400	0.000000	0.000000	0.000000	0.997300	0.000000	0.889300
1372	0.373300	0.000000	0.000000	0.000000	0.997300	0.000000	0.889400
1373	0.374100	0.000000	0.000000	0.000000	0.997300	0.000000	0.889500
1374	0.372300	0.000000	0.000000	0.000000	0.997300	0.000001	0.889600
1375	0.368500	0.000000	0.000000	0.000000	0.997300	0.000001	0.889700
1376	0.365800	0.000001	0.000001	0.000000	0.997300	0.000003	0.889800
1377	0.367900	0.000000	0.000000	0.000000	0.997300	0.000001	0.889900
1378	0.368600	0.000003	0.000003	0.000000	0.997300	0.000012	0.890000
1379	0.370300	0.000000	0.000000	0.000000	0.997300	0.000001	0.890100
1380	0.368700	0.000000	0.000000	0.000000	0.997300	0.000000	0.890200
1381	0.368100	0.000000	0.000000	0.000000	0.997300	0.000000	0.890300
1382	0.364900	0.000000	0.000000	0.000000	0.997300	0.000000	0.890400
1383	0.364900	0.000000	0.000000	0.000000	0.997300	0.000000	0.890500
1384	0.366700	0.000000	0.000000	0.000000	0.997400	0.000000	0.890600
1385	0.364700	0.000000	0.000000	0.000000	0.997400	0.000000	0.890600

1386	0.364800	0.000000	0.000000	0.000000	0.997400	0.000000	0.890700
1387	0.363600	0.000000	0.000000	0.000000	0.997400	0.000000	0.890800
1388	0.364400	0.000000	0.000000	0.000000	0.997400	0.000000	0.890900
1389	0.364200	0.000001	0.000001	0.000000	0.997400	0.000004	0.891000
1390	0.360400	0.000001	0.000001	0.000000	0.997400	0.000003	0.891100
1391	0.362700	0.000001	0.000001	0.000000	0.997400	0.000002	0.891200
1392	0.362600	0.000000	0.000000	0.000000	0.997400	0.000000	0.891300
1393	0.361100	0.000000	0.000000	0.000000	0.997400	0.000001	0.891400
1394	0.359300	0.000000	0.000000	0.000000	0.997400	0.000000	0.891500
1395	0.358200	0.000000	0.000000	0.000000	0.997400	0.000000	0.891600
1396	0.359100	0.000000	0.000000	0.000000	0.997400	0.000000	0.891700
1397	0.359800	0.000000	0.000000	0.000000	0.997500	0.000000	0.891700
1398	0.359600	0.000003	0.000003	0.000000	0.997500	0.000011	0.891800
1399	0.357500	0.000002	0.000002	0.000000	0.997500	0.000008	0.891900
1400	0.350900	0.000000	0.000000	0.000000	0.997500	0.000000	0.892000
1401	0.351300	0.000000	0.000000	0.000000	0.997500	0.000000	0.892100
1402	0.354200	0.000032	0.000032	0.000000	0.997500	0.000116	0.892200
1403	0.352400	0.000028	0.000028	0.000000	0.997500	0.000102	0.892300
1404	0.351600	0.000007	0.000007	0.000000	0.997500	0.000026	0.892400
1405	0.351900	0.000000	0.000000	0.000000	0.997500	0.000000	0.892500
1406	0.352100	0.000010	0.000010	0.000000	0.997500	0.000035	0.892600
1407	0.351200	0.000002	0.000002	0.000000	0.997500	0.000008	0.892600
1408	0.351300	0.000009	0.000009	0.000000	0.997500	0.000034	0.892700
1409	0.351600	0.000001	0.000001	0.000000	0.997500	0.000005	0.892800
1410	0.351000	0.000003	0.000003	0.000000	0.997500	0.000010	0.892900
1411	0.345800	0.000027	0.000027	0.000000	0.997600	0.000100	0.893000
1412	0.341500	0.000053	0.000053	0.000000	0.997600	0.000200	0.893100
1413	0.343900	0.001236	0.001230	0.000006	0.997600	0.004574	0.893200
1414	0.345600	0.000002	0.000002	0.000000	0.997600	0.000009	0.893300
1415	0.346700	0.000001	0.000001	0.000000	0.997600	0.000003	0.893400
1416	0.345500	0.004679	0.004620	0.000060	0.997600	0.017090	0.893400
1417	0.345800	0.000813	0.000805	0.000008	0.997600	0.002977	0.893500
1418	0.345900	0.000654	0.000651	0.000003	0.997600	0.002406	0.893600
1419	0.343200	0.000091	0.000090	0.000000	0.997600	0.000337	0.893700
1420	0.342000	0.000394	0.000392	0.000002	0.997600	0.001467	0.893800
1421	0.340900	0.000492	0.000489	0.000003	0.997600	0.001831	0.893900
1422	0.336700	0.006053	0.005977	0.000076	0.997600	0.022680	0.894000
1423	0.336700	0.001086	0.001073	0.000013	0.997600	0.004072	0.894100
1424	0.336700	0.002401	0.002362	0.000039	0.997600	0.008960	0.894100
1425	0.336700	0.002848	0.002813	0.000035	0.997600	0.010670	0.894200
1426	0.332900	0.004512	0.004434	0.000079	0.997700	0.017010	0.894300
1427	0.333700	0.010720	0.010520	0.000201	0.997700	0.040250	0.894400
1428	0.335400	0.000153	0.000152	0.000001	0.997700	0.000578	0.894500
1429	0.331300	0.006285	0.006192	0.000093	0.997700	0.023870	0.894600

1430	0.331400	0.015440	0.015090	0.000341	0.997700	0.058210	0.894700
1431	0.333500	0.014450	0.014150	0.000297	0.997700	0.068540	0.894700
1432	0.337000	0.000088	0.000088	0.000000	0.997700	0.000440	0.894800
1433	0.337000	0.008612	0.008449	0.000162	0.997700	0.037860	0.894900
1434	0.334000	0.004218	0.004145	0.000074	0.997700	0.016790	0.895000
1435	0.335100	0.002271	0.002246	0.000024	0.997700	0.009347	0.895100
1436	0.334800	0.006888	0.006777	0.000112	0.997700	0.028900	0.895200
1437	0.335100	0.005386	0.005300	0.000087	0.997700	0.022320	0.895300
1438	0.334800	0.001694	0.001671	0.000023	0.997700	0.006957	0.895300
1439	0.334100	0.010010	0.009842	0.000164	0.997700	0.042790	0.895400
1440	0.322500	0.008373	0.008213	0.000161	0.997700	0.035760	0.895500
1441	0.323000	0.004660	0.004594	0.000066	0.997700	0.019400	0.895600
1442	0.324900	0.004937	0.004881	0.000056	0.997800	0.020090	0.895700
1443	0.324500	0.008908	0.008764	0.000144	0.997800	0.035460	0.895800
1444	0.325700	0.014940	0.014620	0.000316	0.997800	0.059330	0.895900
1445	0.327000	0.008623	0.008486	0.000136	0.997800	0.033790	0.895900
1446	0.328200	0.003140	0.003104	0.000036	0.997800	0.012290	0.896000
1447	0.326100	0.005834	0.005741	0.000093	0.997800	0.022720	0.896100
1448	0.328200	0.041040	0.039880	0.001165	0.997800	0.156400	0.896200
1449	0.328100	0.033040	0.032130	0.000913	0.997800	0.125500	0.896300
1450	0.325000	0.004819	0.004731	0.000088	0.997800	0.018620	0.896400
1451	0.320700	0.001566	0.001541	0.000025	0.997800	0.006140	0.896400
1452	0.321400	0.015530	0.015200	0.000330	0.997800	0.060370	0.896500
1453	0.323100	0.022230	0.021730	0.000504	0.997800	0.085770	0.896600
1454	0.320300	0.057460	0.055540	0.001916	0.997800	0.221000	0.896700
1455	0.318800	0.020010	0.019510	0.000504	0.997800	0.077970	0.896800
1456	0.318900	0.025240	0.024610	0.000629	0.997800	0.098280	0.896900
1457	0.320800	0.042730	0.041460	0.001266	0.997800	0.164600	0.896900
1458	0.323200	0.062660	0.060430	0.002237	0.997900	0.238000	0.897000
1459	0.324000	0.073760	0.071070	0.002683	0.997900	0.279200	0.897100
1460	0.321700	0.032340	0.031340	0.000999	0.997900	0.124000	0.897200
1461	0.320400	0.027540	0.026850	0.000687	0.997900	0.106700	0.897300
1462	0.318000	0.051740	0.050040	0.001696	0.997900	0.200300	0.897400
1463	0.315700	0.011830	0.011540	0.000290	0.997900	0.046510	0.897400
1464	0.316300	0.071000	0.068420	0.002582	0.997900	0.275200	0.897500
1465	0.316400	0.040520	0.039150	0.001371	0.997900	0.157400	0.897600
1466	0.315600	0.016210	0.015870	0.000340	0.997900	0.063970	0.897700
1467	0.318100	0.006527	0.006410	0.000117	0.997900	0.025630	0.897800
1468	0.315800	0.021890	0.021380	0.000516	0.997900	0.086100	0.897800
1469	0.317600	0.031720	0.030820	0.000894	0.997900	0.123400	0.897900
1470	0.315200	0.008621	0.008498	0.000123	0.997900	0.034280	0.898000
1471	0.311900	0.003097	0.003041	0.000056	0.997900	0.012420	0.898100
1472	0.312300	0.007954	0.007844	0.000110	0.997900	0.032160	0.898200
1473	0.309600	0.018170	0.017790	0.000387	0.997900	0.073430	0.898300

1474	0.306600	0.037750	0.036600	0.001148	0.997900	0.152200	0.898300
1475	0.308300	0.092570	0.089050	0.003522	0.997900	0.367400	0.898400
1476	0.308900	0.020950	0.020410	0.000532	0.998000	0.084180	0.898500
1477	0.308600	0.019000	0.018570	0.000430	0.998000	0.076740	0.898600
1478	0.307400	0.022520	0.021870	0.000654	0.998000	0.090610	0.898700
1479	0.310300	0.050800	0.049120	0.001684	0.998000	0.201800	0.898700
1480	0.311200	0.016510	0.016130	0.000373	0.998000	0.066010	0.898800
1481	0.308400	0.045600	0.044210	0.001391	0.998000	0.182400	0.898900
1482	0.308400	0.019400	0.018860	0.000535	0.998000	0.077760	0.899000
1483	0.305300	0.067330	0.064940	0.002390	0.998000	0.270300	0.899100
1484	0.307300	0.068280	0.065690	0.002590	0.998000	0.271600	0.899100
1485	0.310200	0.057140	0.055040	0.002103	0.998000	0.225400	0.899200
1486	0.307600	0.050830	0.049200	0.001630	0.998000	0.203100	0.899300
1487	0.300300	0.016320	0.015930	0.000389	0.998000	0.067380	0.899400
1488	0.283700	0.041370	0.039990	0.001380	0.998000	0.178900	0.899500
1489	0.296800	0.096150	0.092370	0.003780	0.998000	0.395100	0.899500
1490	0.306900	0.100800	0.096480	0.004366	0.998000	0.399000	0.899600
1491	0.306200	0.122500	0.117100	0.005478	0.998000	0.485200	0.899700
1492	0.305200	0.082040	0.078950	0.003095	0.998000	0.328400	0.899800
1493	0.306500	0.099520	0.095320	0.004205	0.998000	0.394800	0.899800
1494	0.307400	0.125800	0.120000	0.005866	0.998100	0.495600	0.899900
1495	0.304900	0.108600	0.103800	0.004816	0.998100	0.432200	0.900000
1496	0.299000	0.097670	0.093490	0.004175	0.998100	0.396800	0.900100
1497	0.300300	0.162600	0.154300	0.008219	0.998100	0.653200	0.900200
1498	0.302400	0.110700	0.105700	0.004982	0.998100	0.444000	0.900200
1499	0.301700	0.137100	0.130800	0.006332	0.998100	0.549900	0.900300
1500	0.303600	0.180900	0.171600	0.009300	0.998100	0.716900	0.900400
1501	0.303400	0.192600	0.182700	0.009898	0.998100	0.763400	0.900500
1502	0.294900	0.153600	0.146000	0.007645	0.998100	0.627600	0.900600
1503	0.282400	0.117000	0.111700	0.005277	0.998100	0.501400	0.900600
1504	0.282500	0.090990	0.087060	0.003930	0.998100	0.390600	0.900700
1505	0.277500	0.118300	0.112700	0.005615	0.998100	0.514900	0.900800
1506	0.286800	0.196300	0.185900	0.010380	0.998100	0.821600	0.900900
1507	0.296100	0.188000	0.178200	0.009809	0.998100	0.762900	0.900900
1508	0.294200	0.175900	0.166900	0.009019	0.998100	0.718900	0.901000
1509	0.294100	0.118500	0.113000	0.005545	0.998100	0.486900	0.901100
1510	0.298800	0.211300	0.200000	0.011310	0.998100	0.848000	0.901200
1511	0.299100	0.198400	0.188200	0.010290	0.998100	0.797000	0.901200
1512	0.295000	0.204200	0.193200	0.010940	0.998100	0.829600	0.901300
1513	0.292300	0.171700	0.163100	0.008598	0.998100	0.706500	0.901400
1514	0.292600	0.155300	0.147800	0.007559	0.998200	0.639500	0.901500
1515	0.294100	0.210400	0.199100	0.011330	0.998200	0.857200	0.901600
1516	0.293300	0.199600	0.189000	0.010610	0.998200	0.815900	0.901600
1517	0.292800	0.187200	0.177600	0.009602	0.998200	0.768100	0.901700

1518	0.294400	0.190100	0.180200	0.009916	0.998200	0.774800	0.901800
1519	0.293100	0.180400	0.171300	0.009130	0.998200	0.739600	0.901900
1520	0.292700	0.202500	0.192000	0.010550	0.998200	0.830100	0.901900
1521	0.289300	0.229000	0.216400	0.012620	0.998200	0.946400	0.902000
1522	0.287600	0.209500	0.198400	0.011150	0.998200	0.873000	0.902100
1523	0.289400	0.231700	0.218900	0.012790	0.998200	0.957100	0.902200
1524	0.289600	0.223400	0.211200	0.012230	0.998200	0.923200	0.902200
1525	0.288200	0.203900	0.193300	0.010660	0.998200	0.849300	0.902300
1526	0.290900	0.209100	0.198100	0.010940	0.998200	0.863100	0.902400
1527	0.290900	0.209100	0.198100	0.011090	0.998200	0.862600	0.902500
1528	0.291200	0.230600	0.218000	0.012580	0.998200	0.948000	0.902500
1529	0.286800	0.220600	0.208600	0.012020	0.998200	0.920800	0.902600
1530	0.280300	0.210100	0.198900	0.011130	0.998200	0.899600	0.902700
1531	0.286400	0.216400	0.204800	0.011590	0.998200	0.906500	0.902800
1532	0.289000	0.233800	0.221000	0.012830	0.998200	0.971800	0.902800
1533	0.286700	0.235300	0.222400	0.012960	0.998200	0.989500	0.902900
1534	0.283800	0.227600	0.215200	0.012390	0.998200	0.971100	0.903000
1535	0.284800	0.220500	0.208600	0.011810	0.998300	0.939500	0.903100
1536	0.287100	0.230200	0.217700	0.012510	0.998300	0.968100	0.903100
1537	0.286500	0.225100	0.213000	0.012120	0.998300	0.946000	0.903200
1538	0.283200	0.233300	0.220500	0.012800	0.998300	0.986600	0.903300
1539	0.281700	0.226800	0.214500	0.012300	0.998300	0.969200	0.903400
1540	0.278200	0.228700	0.216200	0.012510	0.998300	0.993000	0.903400
1541	0.279600	0.228600	0.216100	0.012460	0.998300	0.985700	0.903500
1542	0.281500	0.223100	0.211200	0.011990	0.998300	0.954600	0.903600
1543	0.282600	0.231100	0.218500	0.012570	0.998300	0.982600	0.903600
1544	0.284000	0.226000	0.213900	0.012150	0.998300	0.954200	0.903700
1545	0.284400	0.235800	0.222900	0.012890	0.998300	0.992000	0.903800
1546	0.283700	0.231300	0.218800	0.012530	0.998300	0.975200	0.903900
1547	0.279500	0.231200	0.218600	0.012600	0.998300	0.988200	0.903900
1548	0.276100	0.228500	0.216100	0.012440	0.998300	0.988500	0.904000
1549	0.277700	0.232300	0.219600	0.012690	0.998300	0.998500	0.904100
1550	0.276600	0.230200	0.217700	0.012540	0.998300	0.993500	0.904200
1551	0.277600	0.230100	0.217600	0.012490	0.998300	0.989500	0.904200
1552	0.279400	0.226700	0.214500	0.012180	0.998300	0.969400	0.904300
1553	0.276300	0.230100	0.217600	0.012500	0.998300	0.994300	0.904400
1554	0.272500	0.225800	0.213600	0.012220	0.998300	0.989200	0.904500
1555	0.272300	0.227000	0.214700	0.012310	0.998300	0.995000	0.904500
1556	0.272000	0.226200	0.214000	0.012240	0.998300	0.992700	0.904600
1557	0.274300	0.228700	0.216300	0.012380	0.998300	0.995000	0.904700
1558	0.274400	0.228800	0.216400	0.012370	0.998400	0.995200	0.904700
1559	0.272700	0.227100	0.214900	0.012260	0.998400	0.993900	0.904800
1560	0.273000	0.227000	0.214800	0.012230	0.998400	0.992500	0.904900
1561	0.275600	0.229500	0.217100	0.012360	0.998400	0.993700	0.905000

1562	0.274800	0.226700	0.214600	0.012150	0.998400	0.984800	0.905000
1563	0.272100	0.225400	0.213300	0.012080	0.998400	0.988400	0.905100
1564	0.271100	0.224200	0.212200	0.012000	0.998400	0.987100	0.905200
1565	0.271900	0.226800	0.214600	0.012180	0.998400	0.995400	0.905200
1566	0.269000	0.223000	0.211000	0.011920	0.998400	0.989800	0.905300
1567	0.268100	0.222800	0.210800	0.011910	0.998400	0.994100	0.905400
1568	0.266500	0.219100	0.207400	0.011640	0.998400	0.990700	0.905500
1569	0.265700	0.215900	0.204500	0.011400	0.998400	0.997900	0.905500
1570	0.267100	0.209400	0.198500	0.010840	0.998400	0.996500	0.905600
1571	0.270100	0.203000	0.192700	0.010290	0.998400	0.995700	0.905700
1572	0.269900	0.204700	0.194300	0.010410	0.998400	0.996700	0.905700
1573	0.268200	0.203000	0.192700	0.010310	0.998400	0.996500	0.905800
1574	0.263000	0.204900	0.194400	0.010540	0.998400	0.996300	0.905900
1575	0.256000	0.208200	0.197200	0.010920	0.998400	0.997700	0.905900
1576	0.255800	0.203800	0.193200	0.010570	0.998400	0.993700	0.906000
1577	0.248800	0.192600	0.182700	0.009845	0.998400	0.997900	0.906100
1578	0.255300	0.198200	0.188000	0.010130	0.998400	0.998700	0.906200
1579	0.263800	0.201900	0.191700	0.010240	0.998400	0.990400	0.906200
1580	0.266000	0.208900	0.198200	0.010720	0.998400	0.998300	0.906300
1581	0.264800	0.210000	0.199100	0.010820	0.998400	0.997700	0.906400
1582	0.258600	0.207300	0.196500	0.010720	0.998500	0.997000	0.906400
1583	0.257700	0.206300	0.195700	0.010660	0.998500	0.985100	0.906500
1584	0.259200	0.212700	0.201600	0.011110	0.998500	0.999300	0.906600
1585	0.261300	0.215700	0.204400	0.011290	0.998500	0.997400	0.906600
1586	0.260500	0.214100	0.202900	0.011180	0.998500	0.987200	0.906700
1587	0.257100	0.211100	0.200100	0.011000	0.998500	0.983600	0.906800
1588	0.250000	0.209100	0.198100	0.010980	0.998500	0.998900	0.906900
1589	0.240000	0.201000	0.190400	0.010550	0.998500	0.999400	0.906900
1590	0.241000	0.200400	0.189900	0.010480	0.998500	0.992400	0.907000
1591	0.246600	0.205700	0.195000	0.010760	0.998500	0.994800	0.907100
1592	0.254600	0.210000	0.199100	0.010910	0.998500	0.983700	0.907100
1593	0.259900	0.217000	0.205700	0.011330	0.998500	0.995800	0.907200
1594	0.261000	0.216000	0.204800	0.011220	0.998500	0.987100	0.907300
1595	0.259300	0.216100	0.204800	0.011250	0.998500	0.993900	0.907300
1596	0.252500	0.209500	0.198600	0.010870	0.998500	0.990500	0.907400
1597	0.253900	0.208200	0.197500	0.010730	0.998500	0.980700	0.907500
1598	0.259000	0.214200	0.203100	0.011070	0.998500	0.995200	0.907500
1599	0.257000	0.208500	0.197800	0.010670	0.998500	0.995300	0.907600
1600	0.255200	0.203000	0.192700	0.010280	0.998500	0.999400	0.907700
1601	0.252500	0.194800	0.185100	0.009709	0.998500	0.995000	0.907700
1602	0.252700	0.192500	0.183000	0.009523	0.998500	0.988700	0.907800
1603	0.254100	0.194600	0.184900	0.009635	0.998500	0.999000	0.907900
1604	0.253700	0.196700	0.186900	0.009790	0.998500	0.998400	0.907900
1605	0.252800	0.203900	0.193600	0.010340	0.998500	0.999500	0.908000

1606	0.251300	0.205500	0.195000	0.010480	0.998500	0.998700	0.908100
1607	0.251200	0.200900	0.190800	0.010130	0.998500	0.999300	0.908200
1608	0.253500	0.196600	0.186800	0.009747	0.998500	0.990700	0.908200
1609	0.249800	0.193500	0.183900	0.009582	0.998600	0.996600	0.908300
1610	0.242500	0.191000	0.181500	0.009530	0.998600	0.996400	0.908400
1611	0.243500	0.193000	0.183300	0.009646	0.998600	0.994400	0.908400
1612	0.246800	0.198700	0.188700	0.010000	0.998600	0.999400	0.908500
1613	0.248800	0.200800	0.190700	0.010110	0.998600	0.992200	0.908600
1614	0.249200	0.204000	0.193700	0.010330	0.998600	0.996200	0.908600
1615	0.246000	0.203000	0.192700	0.010310	0.998600	0.998300	0.908700
1616	0.240700	0.199200	0.189100	0.010120	0.998600	0.996700	0.908800
1617	0.242600	0.200200	0.190000	0.010150	0.998600	0.991300	0.908800
1618	0.247500	0.206100	0.195700	0.010490	0.998600	0.998900	0.908900
1619	0.247300	0.204100	0.193800	0.010330	0.998600	0.988600	0.909000
1620	0.241400	0.201900	0.191600	0.010270	0.998600	0.999400	0.909000
1621	0.240100	0.200700	0.190500	0.010200	0.998600	0.999400	0.909100
1622	0.244200	0.204100	0.193800	0.010360	0.998600	0.998700	0.909200
1623	0.247600	0.207200	0.196700	0.010510	0.998600	0.998800	0.909200
1624	0.248000	0.207200	0.196700	0.010500	0.998600	0.998900	0.909300
1625	0.246100	0.204800	0.194500	0.010350	0.998600	0.993000	0.909400
1626	0.246400	0.205800	0.195400	0.010400	0.998600	0.999000	0.909400
1627	0.247500	0.207000	0.196500	0.010460	0.998600	0.999400	0.909500
1628	0.248400	0.207200	0.196700	0.010450	0.998600	0.999100	0.909500
1629	0.247100	0.206500	0.196100	0.010410	0.998600	0.999400	0.909600
1630	0.245000	0.204500	0.194200	0.010300	0.998600	0.999300	0.909700
1631	0.245100	0.203700	0.193400	0.010220	0.998600	0.998500	0.909700
1632	0.244300	0.202100	0.192000	0.010110	0.998600	0.988700	0.909800
1633	0.241500	0.198400	0.188500	0.009880	0.998600	0.991000	0.909900
1634	0.240300	0.200500	0.190500	0.010050	0.998600	0.998400	0.909900
1635	0.242200	0.198600	0.188700	0.009858	0.998600	0.990600	0.910000
1636	0.240200	0.199500	0.189600	0.009964	0.998600	0.998800	0.910100
1637	0.235300	0.195600	0.185800	0.009760	0.998600	0.995400	0.910100
1638	0.230800	0.187800	0.178600	0.009266	0.998700	0.998400	0.910200
1639	0.228500	0.188500	0.179100	0.009352	0.998700	0.990600	0.910300
1640	0.229800	0.182600	0.173700	0.008890	0.998700	0.981900	0.910300
1641	0.229100	0.188200	0.178900	0.009298	0.998700	0.998400	0.910400
1642	0.229800	0.188700	0.179400	0.009312	0.998700	0.991600	0.910500
1643	0.232200	0.184400	0.175400	0.008941	0.998700	0.996900	0.910500
1644	0.231600	0.191800	0.182300	0.009490	0.998700	0.999000	0.910600
1645	0.231800	0.187000	0.177900	0.009127	0.998700	0.985300	0.910600
1646	0.234000	0.184900	0.176000	0.008920	0.998700	0.978200	0.910700
1647	0.235100	0.194900	0.185300	0.009619	0.998700	0.996200	0.910800
1648	0.234300	0.186300	0.177300	0.008998	0.998700	0.993000	0.910800
1649	0.232400	0.189500	0.180300	0.009261	0.998700	0.990600	0.910900

1650	0.232700	0.190900	0.181500	0.009342	0.998700	0.988900	0.911000
1651	0.232300	0.182600	0.173900	0.008748	0.998700	0.993800	0.911000
1652	0.232800	0.187100	0.178000	0.009074	0.998700	0.963800	0.911100
1653	0.233100	0.190500	0.181200	0.009288	0.998700	0.979500	0.911200
1654	0.232700	0.185700	0.176800	0.008938	0.998700	0.988700	0.911200
1655	0.232300	0.191200	0.181800	0.009329	0.998700	0.986700	0.911300
1656	0.233000	0.188000	0.178900	0.009077	0.998700	0.977300	0.911300
1657	0.233100	0.189800	0.180600	0.009196	0.998700	0.979200	0.911400
1658	0.232200	0.191600	0.182300	0.009342	0.998700	0.984300	0.911500
1659	0.230800	0.191300	0.182000	0.009337	0.998700	0.993800	0.911500
1660	0.231300	0.191600	0.182300	0.009337	0.998700	0.991100	0.911600
1661	0.232300	0.189900	0.180700	0.009191	0.998700	0.974400	0.911700
1662	0.231300	0.183400	0.174700	0.008740	0.998700	0.954200	0.911700
1663	0.229800	0.190400	0.181200	0.009257	0.998700	0.989000	0.911800
1664	0.229000	0.187600	0.178500	0.009068	0.998700	0.977300	0.911900
1665	0.227600	0.182500	0.173800	0.008713	0.998700	0.991700	0.911900
1666	0.226700	0.157200	0.150300	0.006985	0.998700	0.963200	0.912000
1667	0.226100	0.181700	0.173000	0.008663	0.998700	0.993300	0.912000
1668	0.223900	0.185800	0.176900	0.008996	0.998700	0.997700	0.912100
1669	0.224800	0.180000	0.171500	0.008575	0.998800	0.957600	0.912200
1670	0.227200	0.188000	0.178900	0.009076	0.998800	0.988000	0.912200
1671	0.225100	0.184500	0.175700	0.008859	0.998800	0.983200	0.912300
1672	0.220300	0.181400	0.172600	0.008716	0.998800	0.982300	0.912400
1673	0.220700	0.183300	0.174400	0.008831	0.998800	0.989400	0.912400
1674	0.222700	0.181500	0.172900	0.008663	0.998800	0.981800	0.912500
1675	0.220200	0.180100	0.171500	0.008603	0.998800	0.981800	0.912500
1676	0.218300	0.176700	0.168300	0.008402	0.998800	0.964000	0.912600
1677	0.219500	0.177900	0.169400	0.008457	0.998800	0.972500	0.912700
1678	0.219200	0.173500	0.165400	0.008155	0.998800	0.960300	0.912700
1679	0.216000	0.179100	0.170500	0.008584	0.998800	0.987600	0.912800
1680	0.210000	0.172600	0.164400	0.008231	0.998800	0.980100	0.912800
1681	0.205200	0.168100	0.160100	0.007984	0.998800	0.993100	0.912900
1682	0.207400	0.173000	0.164700	0.008285	0.998800	0.994200	0.913000
1683	0.212600	0.176400	0.168000	0.008423	0.998800	0.988500	0.913000
1684	0.216000	0.162800	0.155200	0.007544	0.998800	0.925000	0.913100
1685	0.217000	0.180800	0.172200	0.008637	0.998800	0.994000	0.913100
1686	0.216400	0.179500	0.170900	0.008541	0.998800	0.988400	0.913200
1687	0.216100	0.171400	0.163400	0.007999	0.998800	0.961600	0.913300
1688	0.216200	0.179400	0.170900	0.008526	0.998800	0.992600	0.913300
1689	0.214700	0.176600	0.168300	0.008358	0.998800	0.981600	0.913400
1690	0.214900	0.172900	0.164800	0.008108	0.998800	0.961600	0.913500
1691	0.216900	0.152400	0.145600	0.006822	0.998800	0.850500	0.913500
1692	0.217400	0.172300	0.164300	0.008010	0.998800	0.949100	0.913600
1693	0.217100	0.180900	0.172300	0.008574	0.998800	0.993500	0.913600

1694	0.216600	0.171400	0.163500	0.007934	0.998800	0.956200	0.913700
1695	0.216300	0.179400	0.170900	0.008467	0.998800	0.992300	0.913800
1696	0.215700	0.178300	0.169900	0.008404	0.998800	0.984500	0.913800
1697	0.214900	0.136400	0.130600	0.005836	0.998800	0.767600	0.913900
1698	0.214500	0.177100	0.168800	0.008315	0.998800	0.988500	0.913900
1699	0.213500	0.172600	0.164500	0.008047	0.998800	0.965000	0.914000
1700	0.211700	0.166600	0.158900	0.007671	0.998800	0.945600	0.914100
1702	0.209900	0.173900	0.165800	0.008153	0.998800	0.992700	0.914200
1705	0.209900	0.165000	0.157400	0.007555	0.998900	0.948200	0.914400
1710	0.204800	0.155600	0.148600	0.007062	0.998900	0.914300	0.914600
1715	0.207200	0.153700	0.146800	0.006880	0.998900	0.886700	0.914900
1720	0.203200	0.153900	0.147000	0.006933	0.998900	0.906500	0.915200
1725	0.199400	0.140900	0.134700	0.006179	0.998900	0.851200	0.915500
1730	0.198200	0.138500	0.132500	0.006011	0.998900	0.840000	0.915800
1735	0.186200	0.125800	0.120400	0.005404	0.998900	0.808900	0.916100
1740	0.190800	0.128300	0.122900	0.005460	0.998900	0.805100	0.916400
1745	0.191400	0.118300	0.113300	0.004959	0.999000	0.738500	0.916700
1750	0.190200	0.129800	0.124300	0.005463	0.999000	0.814300	0.917000
1755	0.190100	0.113400	0.108800	0.004625	0.999000	0.712200	0.917200
1760	0.187700	0.123100	0.118000	0.005077	0.999000	0.783000	0.917500
1765	0.186100	0.090850	0.087350	0.003503	0.999000	0.584600	0.917800
1770	0.184600	0.093960	0.090490	0.003480	0.999000	0.611800	0.918100
1775	0.182600	0.068410	0.066070	0.002337	0.999000	0.452000	0.918300
1780	0.180200	0.054840	0.053070	0.001769	0.999000	0.367000	0.918600
1785	0.178800	0.034080	0.033120	0.000955	0.999000	0.230700	0.918900
1790	0.178400	0.044870	0.043570	0.001300	0.999100	0.306100	0.919100
1795	0.175600	0.013060	0.012850	0.000214	0.999100	0.091060	0.919400
1800	0.173600	0.010880	0.010670	0.000214	0.999100	0.076310	0.919700
1805	0.172000	0.001615	0.001605	0.000011	0.999100	0.011600	0.919900
1810	0.170800	0.000680	0.000674	0.000006	0.999100	0.004904	0.920200
1815	0.164000	0.000093	0.000093	0.000000	0.999100	0.000706	0.920500
1820	0.159100	0.000010	0.000010	0.000000	0.999100	0.000077	0.920700
1825	0.164600	0.000014	0.000014	0.000000	0.999100	0.000109	0.921000
1830	0.163600	0.000000	0.000000	0.000000	0.999100	0.000000	0.921200
1835	0.162000	0.000000	0.000000	0.000000	0.999100	0.000000	0.921500
1840	0.159900	0.000000	0.000000	0.000000	0.999200	0.000000	0.921800
1845	0.157300	0.000000	0.000000	0.000000	0.999200	0.000000	0.922000
1850	0.157400	0.000000	0.000000	0.000000	0.999200	0.000000	0.922300
1855	0.155600	0.000000	0.000000	0.000000	0.999200	0.000000	0.922500
1860	0.153500	0.000000	0.000000	0.000000	0.999200	0.000000	0.922700
1865	0.151200	0.000000	0.000000	0.000000	0.999200	0.000000	0.923000
1870	0.149400	0.000000	0.000000	0.000000	0.999200	0.000000	0.923200
1875	0.136300	0.000000	0.000000	0.000000	0.999200	0.000000	0.923500
1880	0.145800	0.000000	0.000000	0.000000	0.999200	0.000001	0.923700

1885	0.146000	0.000000	0.000000	0.000000	0.999200	0.000001	0.924000
1890	0.144200	0.000000	0.000000	0.000000	0.999200	0.000003	0.924200
1895	0.140500	0.000000	0.000000	0.000000	0.999200	0.000003	0.924400
1900	0.142300	0.000000	0.000000	0.000000	0.999300	0.000000	0.924700
1905	0.141800	0.000000	0.000000	0.000000	0.999300	0.000000	0.924900
1910	0.140400	0.000000	0.000000	0.000000	0.999300	0.000000	0.925100
1915	0.139700	0.000000	0.000000	0.000000	0.999300	0.000000	0.925400
1920	0.137600	0.000002	0.000002	0.000000	0.999300	0.000015	0.925600
1925	0.137000	0.000010	0.000010	0.000000	0.999300	0.000093	0.925800
1930	0.133300	0.000008	0.000008	0.000000	0.999300	0.000073	0.926100
1935	0.133600	0.000176	0.000175	0.000001	0.999300	0.001616	0.926300
1940	0.131100	0.000253	0.000251	0.000002	0.999300	0.002394	0.926500
1945	0.122000	0.001829	0.001813	0.000015	0.999300	0.020260	0.926700
1950	0.127300	0.004839	0.004774	0.000066	0.999300	0.060240	0.927000
1955	0.129800	0.002241	0.002223	0.000017	0.999300	0.039070	0.927200
1960	0.128300	0.008615	0.008484	0.000130	0.999300	0.120000	0.927400
1965	0.125700	0.014500	0.014220	0.000274	0.999400	0.217600	0.927600
1970	0.126100	0.029920	0.029190	0.000729	0.999400	0.376400	0.927900
1975	0.123900	0.039610	0.038540	0.001070	0.999400	0.426200	0.928100
1980	0.122400	0.049130	0.047650	0.001485	0.999400	0.493300	0.928300
1985	0.121700	0.056730	0.054920	0.001806	0.999400	0.558900	0.928500
1990	0.122000	0.055650	0.053920	0.001727	0.999400	0.547600	0.928700
1995	0.119700	0.057860	0.056060	0.001805	0.999400	0.625400	0.928900
2000	0.119600	0.032510	0.031770	0.000739	0.999400	0.672900	0.929100
2005	0.118200	0.013310	0.013110	0.000201	0.999400	0.521600	0.929400
2010	0.118100	0.040020	0.039080	0.000940	0.999400	0.927300	0.929600
2015	0.117000	0.024250	0.023780	0.000475	0.999400	0.665800	0.929800
2020	0.114800	0.039410	0.038440	0.000966	0.999400	0.756000	0.930000
2025	0.114400	0.062870	0.060980	0.001896	0.999400	0.859600	0.930200
2030	0.112500	0.066880	0.064750	0.002131	0.999400	0.785200	0.930400
2035	0.111800	0.080470	0.077720	0.002752	0.999400	0.910000	0.930600
2040	0.110600	0.073650	0.071210	0.002439	0.999400	0.856200	0.930800
2045	0.110900	0.076360	0.073840	0.002525	0.999400	0.896500	0.931000
2050	0.109600	0.061610	0.059790	0.001826	0.999500	0.931900	0.931200
2055	0.108600	0.050910	0.049530	0.001378	0.999500	0.897200	0.931400
2060	0.107000	0.060250	0.058460	0.001789	0.999500	0.872200	0.931600
2065	0.106000	0.056500	0.054880	0.001615	0.999500	0.910000	0.931800
2070	0.105300	0.058800	0.057090	0.001712	0.999500	0.899500	0.932000
2075	0.105200	0.068980	0.066810	0.002172	0.999500	0.937900	0.932200
2080	0.103600	0.074960	0.072470	0.002484	0.999500	0.924800	0.932400
2085	0.102700	0.074010	0.071570	0.002436	0.999500	0.929800	0.932600
2090	0.101800	0.078040	0.075420	0.002627	0.999500	0.960100	0.932800
2095	0.100100	0.077270	0.074660	0.002613	0.999500	0.939000	0.933000
2100	0.100300	0.070990	0.068650	0.002344	0.999500	0.850000	0.933200

2105	0.099880	0.081210	0.078430	0.002780	0.999500	0.972600	0.933300
2110	0.098580	0.076840	0.074250	0.002586	0.999500	0.936200	0.933500
2115	0.097780	0.079440	0.076740	0.002702	0.999500	0.967600	0.933700
2120	0.096670	0.073710	0.071250	0.002454	0.999500	0.907400	0.933900
2125	0.095700	0.075590	0.073050	0.002541	0.999500	0.935800	0.934100
2130	0.095640	0.076950	0.074350	0.002600	0.999500	0.950500	0.934300
2135	0.094390	0.077640	0.075020	0.002625	0.999500	0.970400	0.934500
2140	0.094140	0.078770	0.076100	0.002672	0.999500	0.986600	0.934600
2145	0.092990	0.077770	0.075140	0.002628	0.999500	0.987900	0.934800
2150	0.092480	0.070400	0.068110	0.002287	0.999500	0.904800	0.935000
2155	0.091560	0.070950	0.068640	0.002309	0.999600	0.919700	0.935200
2160	0.090270	0.070730	0.068430	0.002304	0.999600	0.932800	0.935400
2165	0.084610	0.063800	0.061750	0.002055	0.999600	0.897500	0.935500
2170	0.087150	0.069100	0.066830	0.002263	0.999600	0.940800	0.935700
2175	0.087880	0.066170	0.064060	0.002111	0.999600	0.893200	0.935900
2180	0.086950	0.069510	0.067250	0.002258	0.999600	0.950400	0.936100
2185	0.086780	0.059030	0.057220	0.001814	0.999600	0.806700	0.936300
2190	0.085660	0.066020	0.063910	0.002108	0.999600	0.910500	0.936400
2195	0.085840	0.065480	0.063410	0.002074	0.999600	0.901900	0.936600
2200	0.085160	0.059740	0.057920	0.001825	0.999600	0.883000	0.936800
2205	0.083370	0.061510	0.059590	0.001916	0.999600	0.888200	0.936900
2210	0.082940	0.067450	0.065290	0.002161	0.999600	0.960900	0.937100
2215	0.082780	0.064250	0.062230	0.002023	0.999600	0.924100	0.937300
2220	0.082250	0.067070	0.064930	0.002133	0.999600	0.977000	0.937500
2225	0.081270	0.064460	0.062430	0.002026	0.999600	0.952500	0.937600
2230	0.080760	0.066310	0.064210	0.002102	0.999600	0.992500	0.937800
2235	0.080350	0.064530	0.062510	0.002022	0.999600	0.975100	0.938000
2240	0.079120	0.064400	0.062380	0.002020	0.999600	0.992300	0.938100
2245	0.078820	0.062240	0.060320	0.001919	0.999600	0.980600	0.938300
2250	0.078050	0.063490	0.061510	0.001979	0.999600	0.991900	0.938500
2255	0.077100	0.060290	0.058460	0.001836	0.999600	0.988800	0.938600
2260	0.076780	0.059590	0.057790	0.001803	0.999600	0.986600	0.938800
2265	0.075970	0.060500	0.058650	0.001848	0.999600	0.990100	0.938900
2270	0.075720	0.058020	0.056290	0.001733	0.999600	0.988100	0.939100
2275	0.075150	0.057300	0.055590	0.001701	0.999600	0.988100	0.939300
2280	0.073960	0.058690	0.056910	0.001773	0.999600	0.986500	0.939400
2285	0.073590	0.056160	0.054500	0.001658	0.999600	0.986800	0.939600
2290	0.073300	0.056080	0.054430	0.001653	0.999600	0.984700	0.939700
2295	0.071600	0.054520	0.052920	0.001598	0.999700	0.983200	0.939900
2300	0.071630	0.051620	0.050150	0.001469	0.999700	0.959200	0.940100
2305	0.071380	0.051620	0.050150	0.001468	0.999700	0.951800	0.940200
2310	0.070880	0.053480	0.051930	0.001557	0.999700	0.922700	0.940400
2315	0.070100	0.049740	0.048340	0.001401	0.999700	0.926800	0.940500
2320	0.069360	0.043740	0.042570	0.001179	0.999700	0.863400	0.940700

2325	0.067760	0.044930	0.043680	0.001241	0.999700	0.820600	0.940800
2330	0.068110	0.046380	0.045110	0.001269	0.999700	0.866000	0.941000
2335	0.067530	0.048650	0.047290	0.001363	0.999700	0.908100	0.941100
2340	0.067220	0.034140	0.033290	0.000843	0.999700	0.680000	0.941300
2345	0.067030	0.041840	0.040740	0.001100	0.999700	0.832900	0.941400
2350	0.066100	0.031130	0.030360	0.000769	0.999700	0.646200	0.941600
2355	0.064560	0.037460	0.036500	0.000954	0.999700	0.777300	0.941700
2360	0.064890	0.039860	0.038830	0.001035	0.999700	0.802600	0.941900
2365	0.064750	0.036860	0.035910	0.000954	0.999700	0.710500	0.942000
2370	0.064000	0.020730	0.020300	0.000432	0.999700	0.503700	0.942200
2375	0.063120	0.033190	0.032380	0.000817	0.999700	0.700300	0.942300
2380	0.063190	0.027890	0.027230	0.000654	0.999700	0.545700	0.942500
2385	0.061080	0.018200	0.017830	0.000374	0.999700	0.384700	0.942600
2390	0.061750	0.024420	0.023860	0.000552	0.999700	0.497000	0.942800
2395	0.061610	0.028660	0.027980	0.000673	0.999700	0.592100	0.942900
2400	0.061210	0.031040	0.030300	0.000735	0.999700	0.626600	0.943000
2405	0.060850	0.019680	0.019260	0.000422	0.999700	0.399700	0.943200
2410	0.060430	0.019300	0.018900	0.000399	0.999700	0.387200	0.943300
2415	0.058510	0.013900	0.013650	0.000248	0.999700	0.286800	0.943500
2420	0.058930	0.014020	0.013760	0.000259	0.999700	0.286600	0.943600
2425	0.058630	0.019250	0.018870	0.000381	0.999700	0.399100	0.943700
2430	0.058450	0.029130	0.028490	0.000637	0.999700	0.597300	0.943900
2435	0.057710	0.005834	0.005751	0.000083	0.999700	0.122000	0.944000
2440	0.057570	0.025910	0.025370	0.000546	0.999700	0.537000	0.944200
2445	0.056820	0.009321	0.009173	0.000148	0.999700	0.196500	0.944300
2450	0.055850	0.004786	0.004724	0.000062	0.999700	0.103000	0.944400
2455	0.055460	0.010130	0.009958	0.000172	0.999700	0.217800	0.944600
2460	0.055650	0.017750	0.017430	0.000319	0.999700	0.379400	0.944700
2465	0.055490	0.010310	0.010160	0.000152	0.999700	0.221400	0.944800
2470	0.054570	0.005140	0.005084	0.000055	0.999700	0.112700	0.945000
2475	0.054540	0.004884	0.004832	0.000053	0.999700	0.107000	0.945100
2480	0.053370	0.001181	0.001171	0.000010	0.999700	0.026620	0.945200
2485	0.052990	0.000727	0.000723	0.000003	0.999700	0.016550	0.945400
2490	0.053190	0.000258	0.000257	0.000001	0.999700	0.005854	0.945500
2495	0.052870	0.000231	0.000230	0.000001	0.999800	0.005269	0.945600
2500	0.052720	0.000661	0.000658	0.000003	0.999800	0.015100	0.945800

APPENDIX D

Spectral calculation for 26/04/2012 12:42pm using SMARTS2

Wavelength (nm)	Extraterrestrial irradiance (Wm^{-2} nm)	Global horizontal irradiance (Wm^{-2} nm)	Direct horizontal irradiance (Wm^{-2} nm)	Diffuse horizontal irradiance (Wm^{-2} nm)	RayleighScat_ trnsmittnce	WaterVapor_ transmittance	Aerosol_total_ transmittnce
280	0.047450	0.000000	0.000000	0.000000	0.193000	1.000000	0.595100
281	0.045390	0.000000	0.000000	0.000000	0.195500	1.000000	0.595600
281	0.151200	0.000000	0.000000	0.000000	0.198000	1.000000	0.596100
282	0.241700	0.000000	0.000000	0.000000	0.200500	1.000000	0.596600
282	0.348300	0.000000	0.000000	0.000000	0.203000	1.000000	0.597000
283	0.368700	0.000000	0.000000	0.000000	0.205500	1.000000	0.597500
283	0.413300	0.000000	0.000000	0.000000	0.208000	1.000000	0.598000
284	0.315100	0.000000	0.000000	0.000000	0.210500	1.000000	0.598400
284	0.322600	0.000000	0.000000	0.000000	0.213100	1.000000	0.598900
285	0.183800	0.000000	0.000000	0.000000	0.215600	1.000000	0.599400
285	0.080840	0.000000	0.000000	0.000000	0.218100	1.000000	0.599800
286	0.059830	0.000000	0.000000	0.000000	0.220700	1.000000	0.600300
286	0.202000	0.000000	0.000000	0.000000	0.223200	1.000000	0.600800
287	0.305300	0.000000	0.000000	0.000000	0.225800	1.000000	0.601200
287	0.403800	0.000000	0.000000	0.000000	0.228300	1.000000	0.601700
288	0.455100	0.000000	0.000000	0.000000	0.230900	1.000000	0.602200
288	0.334000	0.000000	0.000000	0.000000	0.233500	1.000000	0.602600
289	0.417700	0.000001	0.000000	0.000000	0.236000	1.000000	0.603100
289	0.524500	0.000002	0.000001	0.000001	0.238600	1.000000	0.603500
290	0.503500	0.000004	0.000002	0.000002	0.241200	1.000000	0.604000
290	0.678400	0.000009	0.000004	0.000005	0.243800	1.000000	0.604400
291	0.693400	0.000016	0.000007	0.000008	0.246300	1.000000	0.604900
291	0.631200	0.000025	0.000012	0.000014	0.248900	1.000000	0.605400
292	0.672300	0.000056	0.000026	0.000031	0.251500	1.000000	0.605800
292	0.765100	0.000116	0.000053	0.000063	0.254100	1.000000	0.606300
293	0.555000	0.000116	0.000054	0.000062	0.256700	1.000000	0.606700
293	0.548000	0.000174	0.000082	0.000092	0.259300	1.000000	0.607200
294	0.695400	0.000395	0.000186	0.000209	0.261900	1.000000	0.607600
294	0.512500	0.000344	0.000205	0.000139	0.264500	1.000000	0.608000
295	0.587400	0.000547	0.000317	0.000230	0.267100	1.000000	0.608500
295	0.438700	0.000611	0.000345	0.000265	0.269600	1.000000	0.608900
296	0.672700	0.001540	0.000841	0.000699	0.272200	1.000000	0.609400
296	0.680600	0.002200	0.001173	0.001027	0.274800	1.000000	0.609800
297	0.547800	0.002464	0.001281	0.001183	0.277400	1.000000	0.610300
297	0.397800	0.002326	0.001185	0.001141	0.280000	1.000000	0.610700
298	0.505300	0.004275	0.002107	0.002169	0.282600	1.000000	0.611100
298	0.622400	0.007110	0.003407	0.003703	0.285200	1.000000	0.611600
299	0.329900	0.004725	0.002215	0.002510	0.287800	1.000000	0.612000
299	0.560000	0.009917	0.004550	0.005367	0.290400	1.000000	0.612400

300	0.467200	0.011610	0.005118	0.006496	0.293000	1.000000	0.612900
300	0.443900	0.013360	0.005761	0.007598	0.295600	1.000000	0.613300
301	0.432700	0.015510	0.006557	0.008949	0.298200	1.000000	0.613700
301	0.440400	0.019450	0.008340	0.011110	0.300800	1.000000	0.614200
302	0.523500	0.027420	0.011900	0.015520	0.303400	1.000000	0.614600
302	0.297700	0.016910	0.007405	0.009506	0.305900	1.000000	0.615000
303	0.475000	0.031470	0.013810	0.017660	0.308500	1.000000	0.615500
303	0.643700	0.051670	0.022640	0.029030	0.311100	1.000000	0.615900
304	0.748400	0.067010	0.029400	0.037610	0.313700	1.000000	0.616300
304	0.510600	0.048200	0.021220	0.026980	0.316300	1.000000	0.616700
305	0.655700	0.070240	0.030930	0.039310	0.318900	1.000000	0.617200
305	0.558100	0.070560	0.031000	0.039560	0.321400	1.000000	0.617600
306	0.721300	0.100800	0.044310	0.056500	0.324000	1.000000	0.618000
306	0.451700	0.065710	0.028980	0.036730	0.326600	1.000000	0.618400
307	0.603000	0.093260	0.041220	0.052040	0.329100	1.000000	0.618900
307	0.616600	0.115400	0.047700	0.067710	0.331700	1.000000	0.619300
308	0.605600	0.125000	0.052400	0.072590	0.334300	1.000000	0.619700
308	0.675400	0.142200	0.059980	0.082200	0.336800	1.000000	0.620100
309	0.667000	0.147100	0.062620	0.084490	0.339400	1.000000	0.620500
309	0.565600	0.129500	0.055550	0.073970	0.341900	1.000000	0.620900
310	0.514900	0.130700	0.056710	0.073950	0.344500	1.000000	0.621400
310	0.385000	0.102500	0.044810	0.057650	0.347000	1.000000	0.621800
311	0.655300	0.178800	0.078670	0.100100	0.349600	1.000000	0.622200
311	0.872200	0.247200	0.109500	0.137700	0.352100	1.000000	0.622600
312	0.862900	0.249300	0.111000	0.138300	0.354600	1.000000	0.623000
312	0.585500	0.182300	0.081850	0.100500	0.357100	1.000000	0.623400
313	0.647900	0.211900	0.095730	0.116100	0.359700	1.000000	0.623800
313	0.752100	0.252600	0.114800	0.137800	0.362200	1.000000	0.624200
314	0.688200	0.227100	0.103500	0.123500	0.364700	1.000000	0.624600
314	0.835500	0.291200	0.133600	0.157600	0.367200	1.000000	0.625000
315	0.522100	0.194900	0.090020	0.104900	0.369700	1.000000	0.625400
315	0.752700	0.285400	0.132400	0.153000	0.372200	1.000000	0.625800
316	0.809500	0.298800	0.139100	0.159700	0.374700	1.000000	0.626200
316	0.426600	0.166300	0.077830	0.088490	0.377200	1.000000	0.626700
317	0.601600	0.246900	0.115400	0.131500	0.379700	1.000000	0.627100
317	0.746600	0.306800	0.144000	0.162700	0.382200	1.000000	0.627500
318	0.928800	0.377900	0.178400	0.199500	0.384700	1.000000	0.627900
318	0.690000	0.290800	0.137300	0.153400	0.387100	1.000000	0.628200
319	0.545800	0.244600	0.115200	0.129400	0.389600	1.000000	0.628600
319	0.847400	0.391700	0.184600	0.207100	0.392000	1.000000	0.629000
320	0.587000	0.260300	0.123800	0.136500	0.394500	1.000000	0.629400
320	0.835500	0.369000	0.176300	0.192600	0.396900	1.000000	0.629800
321	0.853700	0.399800	0.190600	0.209200	0.399400	1.000000	0.630200
321	0.751000	0.369300	0.175700	0.193500	0.401800	1.000000	0.630600

322	0.682700	0.343600	0.161600	0.182000	0.404300	1.000000	0.631000
322	0.792000	0.374900	0.180800	0.194200	0.406700	1.000000	0.631400
323	0.685700	0.326300	0.157900	0.168500	0.409100	1.000000	0.631800
323	0.536600	0.264600	0.128000	0.136600	0.411500	1.000000	0.632200
324	0.694900	0.367800	0.174500	0.193300	0.413900	1.000000	0.632600
324	0.730300	0.390600	0.185800	0.204800	0.416300	1.000000	0.633000
325	0.893700	0.470000	0.225100	0.244800	0.418700	1.000000	0.633300
325	0.769100	0.385300	0.189100	0.196200	0.421100	1.000000	0.633700
326	0.864600	0.451700	0.218500	0.233300	0.423500	1.000000	0.634100
326	1.001000	0.543200	0.262100	0.281000	0.425900	1.000000	0.634500
327	1.067000	0.593500	0.286300	0.307100	0.428200	1.000000	0.634900
327	0.957200	0.529700	0.256800	0.272900	0.430600	1.000000	0.635300
328	1.075000	0.590100	0.287700	0.302500	0.433000	1.000000	0.635600
328	0.939200	0.500200	0.246000	0.254200	0.435300	1.000000	0.636000
329	0.920800	0.511000	0.250600	0.260400	0.437700	1.000000	0.636400
329	1.006000	0.573600	0.281100	0.292500	0.440000	1.000000	0.636800
330	1.166000	0.671000	0.329600	0.341400	0.442300	1.000000	0.637200
330	1.245000	0.714500	0.352500	0.362000	0.444600	1.000000	0.637500
331	0.939200	0.530100	0.263300	0.266800	0.447000	1.000000	0.637900
331	0.987800	0.554900	0.276900	0.278000	0.449300	1.000000	0.638300
332	0.919500	0.525600	0.262500	0.263200	0.451600	1.000000	0.638700
332	1.094000	0.639200	0.319100	0.320100	0.453900	1.000000	0.639000
333	1.062000	0.626500	0.313400	0.313100	0.456200	1.000000	0.639400
333	0.979300	0.576400	0.289600	0.286800	0.458400	1.000000	0.639800
334	0.967100	0.562500	0.284300	0.278200	0.460700	1.000000	0.640200
334	0.990500	0.576000	0.292200	0.283900	0.463000	1.000000	0.640500
335	1.041000	0.616600	0.312800	0.303800	0.465200	1.000000	0.640900
335	0.956200	0.600900	0.290700	0.310200	0.467500	1.000000	0.641300
336	1.179000	0.733600	0.361300	0.372200	0.469700	1.000000	0.641600
336	0.649200	0.405000	0.200100	0.204900	0.472000	1.000000	0.642000
337	1.003000	0.601700	0.308900	0.292800	0.474200	1.000000	0.642400
337	0.742800	0.444000	0.228900	0.215100	0.476400	1.000000	0.642700
338	0.917600	0.548300	0.283700	0.264700	0.478600	1.000000	0.643100
338	0.962200	0.582700	0.301700	0.281000	0.480900	1.000000	0.643500
339	1.042000	0.651500	0.329200	0.322300	0.483100	1.000000	0.643800
339	1.060000	0.661500	0.337100	0.324400	0.485300	1.000000	0.644200
340	0.850800	0.534200	0.271900	0.262300	0.487400	1.000000	0.644500
340	1.286000	0.822800	0.411200	0.411600	0.489600	1.000000	0.644900
341	1.004000	0.641800	0.323000	0.318700	0.491800	1.000000	0.645300
341	0.989500	0.623500	0.321200	0.302300	0.494000	1.000000	0.645600
342	0.855900	0.536400	0.279500	0.256900	0.496100	1.000000	0.646000
342	1.151000	0.721200	0.377700	0.343500	0.498300	1.000000	0.646300
343	0.921400	0.578000	0.304100	0.273900	0.500400	1.000000	0.646700
343	1.101000	0.694500	0.364700	0.329800	0.502500	1.000000	0.647100

344	1.028000	0.651300	0.341800	0.309400	0.504700	1.000000	0.647400
344	0.831100	0.536200	0.276300	0.259900	0.506800	1.000000	0.647800
345	0.773600	0.495100	0.259300	0.235800	0.508900	1.000000	0.648100
345	1.162000	0.739400	0.392500	0.346900	0.511000	1.000000	0.648500
346	0.980900	0.623900	0.333200	0.290700	0.513100	1.000000	0.648800
346	0.990400	0.630100	0.338200	0.292000	0.515200	1.000000	0.649200
347	0.945200	0.602000	0.324300	0.277700	0.517300	1.000000	0.649500
347	1.027000	0.657400	0.353900	0.303400	0.519300	1.000000	0.649900
348	0.838000	0.537800	0.289900	0.247900	0.521400	1.000000	0.650200
348	0.963600	0.617300	0.335100	0.282200	0.523500	1.000000	0.650600
349	1.121000	0.717700	0.391500	0.326200	0.525500	1.000000	0.650900
349	1.002000	0.642300	0.351500	0.290800	0.527600	1.000000	0.651300
350	0.939500	0.604100	0.331200	0.272900	0.529600	1.000000	0.651600
350	0.984200	0.634000	0.348600	0.285400	0.531600	1.000000	0.652000
351	1.193000	0.769500	0.424200	0.345300	0.533600	1.000000	0.652300
351	1.072000	0.693400	0.382600	0.310800	0.535600	1.000000	0.652600
352	0.896100	0.583000	0.320800	0.262300	0.537700	1.000000	0.653000
352	1.199000	0.779300	0.431300	0.348000	0.539600	1.000000	0.653300
353	0.827100	0.537600	0.298900	0.238700	0.541600	1.000000	0.653700
353	1.120000	0.728600	0.406600	0.322000	0.543600	1.000000	0.654000
354	1.102000	0.716800	0.401400	0.315400	0.545600	1.000000	0.654400
354	1.151000	0.748500	0.420500	0.328000	0.547600	1.000000	0.654700
355	1.227000	0.799300	0.450100	0.349200	0.549500	1.000000	0.655000
355	1.173000	0.765600	0.431900	0.333700	0.551500	1.000000	0.655400
356	1.058000	0.692800	0.391800	0.301000	0.553400	1.000000	0.655700
356	1.135000	0.744300	0.422000	0.322300	0.555300	1.000000	0.656000
357	0.996900	0.654400	0.371900	0.282500	0.557300	1.000000	0.656400
357	0.813300	0.534300	0.304400	0.229900	0.559200	1.000000	0.656700
358	0.982800	0.646200	0.369100	0.277100	0.561100	1.000000	0.657100
358	0.852000	0.560700	0.321100	0.239700	0.563000	1.000000	0.657400
359	0.607000	0.399900	0.229500	0.170400	0.564900	1.000000	0.657700
359	0.832600	0.549200	0.315900	0.233300	0.566800	1.000000	0.658100
360	1.189000	0.785400	0.452300	0.333000	0.568700	1.000000	0.658400
360	1.349000	0.892100	0.515100	0.377000	0.570500	1.000000	0.658700
361	0.923800	0.611500	0.354000	0.257500	0.572400	1.000000	0.659000
361	0.871500	0.577800	0.335300	0.242500	0.574300	1.000000	0.659400
362	1.165000	0.774500	0.450300	0.324200	0.576100	1.000000	0.659700
362	0.812800	0.542000	0.315700	0.226300	0.577900	1.000000	0.660000
363	1.245000	0.832600	0.485900	0.346700	0.579800	1.000000	0.660400
363	1.113000	0.746300	0.436300	0.310000	0.581600	1.000000	0.660700
364	0.977700	0.656800	0.384700	0.272100	0.583400	1.000000	0.661000
364	1.240000	0.834400	0.489700	0.344700	0.585200	1.000000	0.661300
365	0.949200	0.639800	0.376200	0.263600	0.587000	1.000000	0.661700
365	0.968400	0.653600	0.385100	0.268500	0.588800	1.000000	0.662000

366	1.360000	0.919100	0.542600	0.376500	0.590600	1.000000	0.662300
366	1.493000	1.011000	0.597900	0.412900	0.592400	1.000000	0.662600
367	1.275000	0.864700	0.512400	0.352300	0.594200	1.000000	0.663000
367	1.136000	0.771700	0.458300	0.313500	0.596000	1.000000	0.663300
368	1.369000	0.930700	0.553800	0.376900	0.597700	1.000000	0.663600
368	1.126000	0.766100	0.456800	0.309400	0.599500	1.000000	0.663900
369	1.148000	0.782600	0.467400	0.315200	0.601200	1.000000	0.664200
369	1.086000	0.741400	0.443600	0.297800	0.602900	1.000000	0.664600
370	1.337000	0.914700	0.548300	0.366400	0.604700	1.000000	0.664900
370	1.338000	0.917000	0.550700	0.366400	0.606400	1.000000	0.665200
371	1.056000	0.725200	0.436200	0.289000	0.608100	1.000000	0.665500
371	0.974200	0.670000	0.403700	0.266200	0.609800	1.000000	0.665800
372	1.547000	1.065000	0.643100	0.422000	0.611500	1.000000	0.666100
372	0.980100	0.675400	0.408500	0.266900	0.613200	1.000000	0.666500
373	1.076000	0.742200	0.449700	0.292400	0.614900	1.000000	0.666800
373	1.138000	0.786500	0.477400	0.309100	0.616600	1.000000	0.667100
374	0.686300	0.475200	0.288900	0.186300	0.618200	1.000000	0.667400
374	0.977700	0.677900	0.412900	0.265000	0.619900	1.000000	0.667700
375	0.876600	0.608800	0.371400	0.237400	0.621600	1.000000	0.668000
375	0.625000	0.434500	0.265600	0.169000	0.623200	1.000000	0.668300
376	1.416000	0.985300	0.603300	0.382000	0.624800	1.000000	0.668600
376	0.956000	0.665800	0.408400	0.257400	0.626500	1.000000	0.669000
377	1.103000	0.768800	0.472400	0.296400	0.628100	1.000000	0.669300
377	1.009000	0.704200	0.433400	0.270800	0.629700	1.000000	0.669600
378	1.416000	0.990000	0.610300	0.379600	0.631300	1.000000	0.669900
378	1.585000	1.109000	0.684800	0.423900	0.632900	1.000000	0.670200
379	1.505000	1.053000	0.651700	0.401600	0.634500	1.000000	0.670500
379	1.024000	0.716900	0.444400	0.272600	0.636100	1.000000	0.670800
380	1.062000	0.744300	0.462200	0.282100	0.637700	1.000000	0.671100
380	0.970200	0.680400	0.423200	0.257200	0.639300	1.000000	0.671400
381	1.375000	0.966100	0.601800	0.364300	0.640900	1.000000	0.671700
381	1.252000	0.880900	0.549500	0.331400	0.642400	1.000000	0.672000
382	0.911700	0.642900	0.401600	0.241300	0.644000	1.000000	0.672300
382	0.915500	0.646800	0.404600	0.242200	0.645500	1.000000	0.672600
383	0.760600	0.538400	0.337300	0.201200	0.647100	1.000000	0.672900
383	0.759900	0.538800	0.338000	0.200800	0.648600	1.000000	0.673200
384	0.577100	0.409800	0.257400	0.152300	0.650100	1.000000	0.673500
384	0.589300	0.418900	0.263600	0.155300	0.651600	1.000000	0.673800
385	1.036000	0.737100	0.464500	0.272600	0.653200	1.000000	0.674100
385	1.002000	0.713800	0.450500	0.263400	0.654700	1.000000	0.674400
386	0.999800	0.713700	0.451000	0.262700	0.656200	1.000000	0.674700
386	0.633900	0.453200	0.286800	0.166400	0.657700	1.000000	0.675000
387	1.135000	0.812700	0.515000	0.297700	0.659200	1.000000	0.675300
387	0.915300	0.656100	0.416400	0.239700	0.660600	1.000000	0.675600

388	0.964700	0.692300	0.440000	0.252300	0.662100	1.000000	0.675900
388	0.860200	0.618000	0.393300	0.224700	0.663600	1.000000	0.676200
389	0.869200	0.625400	0.398600	0.226800	0.665000	1.000000	0.676500
389	0.907200	0.653400	0.417000	0.236400	0.666500	1.000000	0.676800
390	1.299000	0.937000	0.598900	0.338100	0.667900	1.000000	0.677100
390	1.383000	0.998700	0.639200	0.359500	0.669400	1.000000	0.677400
391	1.134000	0.819900	0.525500	0.294400	0.670800	1.000000	0.677700
391	1.433000	1.037000	0.665600	0.371500	0.672200	1.000000	0.678000
392	1.563000	1.132000	0.727800	0.404700	0.673600	1.000000	0.678300
392	1.216000	0.881700	0.567500	0.314200	0.675100	1.000000	0.678600
393	1.153000	0.837300	0.539600	0.297700	0.676500	1.000000	0.678900
393	0.636200	0.462600	0.298500	0.164100	0.677900	1.000000	0.679100
394	0.248900	0.181200	0.117100	0.064130	0.679300	1.000000	0.679400
394	0.805500	0.587000	0.379800	0.207200	0.680700	1.000000	0.679700
395	1.092000	0.796800	0.516200	0.280600	0.682000	1.000000	0.680000
395	1.336000	0.975500	0.632900	0.342700	0.683400	1.000000	0.680300
396	1.397000	1.021000	0.663100	0.357600	0.684800	1.000000	0.680600
396	1.337000	0.978200	0.636300	0.341900	0.686100	1.000000	0.680900
397	0.747800	0.547900	0.356800	0.191100	0.687500	1.000000	0.681200
397	0.305200	0.223900	0.146000	0.077880	0.688800	1.000000	0.681400
398	0.958500	0.703800	0.459600	0.244200	0.690200	1.000000	0.681700
398	1.551000	1.139000	0.745100	0.394300	0.691500	1.000000	0.682000
399	1.517000	1.115000	0.730000	0.384900	0.692900	1.000000	0.682300
399	1.689000	1.244000	0.815500	0.428600	0.694200	1.000000	0.682600
400	1.750000	1.290000	0.846700	0.443400	0.695500	1.000000	0.682900
400	1.634000	1.205000	0.791900	0.412900	0.696800	1.000000	0.683100
401	1.672000	1.237000	0.814300	0.423100	0.699400	1.000000	0.683700
402	1.753000	1.300000	0.857500	0.442500	0.702000	1.000000	0.684300
403	1.654000	1.230000	0.813100	0.416800	0.704600	1.000000	0.684800
404	1.763000	1.313000	0.870400	0.442900	0.707100	1.000000	0.685400
405	1.620000	1.208000	0.802500	0.405400	0.709600	1.000000	0.685900
406	1.612000	1.205000	0.802600	0.402800	0.712100	1.000000	0.686500
407	1.548000	1.160000	0.774200	0.385900	0.714500	1.000000	0.687000
408	1.673000	1.255000	0.839600	0.415400	0.717000	1.000000	0.687600
409	1.835000	1.379000	0.924300	0.454200	0.719400	1.000000	0.688100
410	1.540000	1.159000	0.778800	0.380200	0.721800	1.000000	0.688700
411	1.801000	1.358000	0.914700	0.443500	0.724200	1.000000	0.689200
412	1.875000	1.418000	0.956800	0.460900	0.726500	1.000000	0.689800
413	1.728000	1.307000	0.884300	0.422900	0.728900	1.000000	0.690300
414	1.724000	1.307000	0.886200	0.421100	0.731200	1.000000	0.690800
415	1.807000	1.372000	0.932300	0.440100	0.733400	1.000000	0.691400
416	1.824000	1.389000	0.945500	0.443600	0.735700	1.000000	0.691900
417	1.735000	1.323000	0.902300	0.420500	0.737900	1.000000	0.692400
418	1.709000	1.305000	0.891700	0.412800	0.740200	1.000000	0.692900

419	1.730000	1.323000	0.906200	0.416800	0.742400	1.000000	0.693500
420	1.467000	1.123000	0.770800	0.352200	0.744500	1.000000	0.694000
421	1.833000	1.406000	0.967100	0.439100	0.746700	1.000000	0.694500
422	1.752000	1.345000	0.927000	0.418200	0.748800	1.000000	0.695000
423	1.489000	1.146000	0.791100	0.354600	0.751000	1.000000	0.695600
424	1.605000	1.236000	0.854900	0.380800	0.753000	1.000000	0.696100
425	1.656000	1.278000	0.885700	0.392100	0.755100	1.000000	0.696600
426	1.600000	1.238000	0.859200	0.378300	0.757200	1.000000	0.697100
427	1.539000	1.191000	0.828800	0.362500	0.759200	1.000000	0.697600
428	1.541000	1.194000	0.832100	0.361600	0.761200	1.000000	0.698100
429	1.406000	1.092000	0.762300	0.329500	0.763200	1.000000	0.698600
430	1.130000	0.878600	0.614600	0.264000	0.765200	1.000000	0.699100
431	0.999700	0.777900	0.545200	0.232700	0.767200	1.000000	0.699600
432	1.803000	1.406000	0.987300	0.419100	0.769100	1.000000	0.700100
433	1.596000	1.247000	0.876800	0.370000	0.771000	1.000000	0.700600
434	1.524000	1.191000	0.839200	0.351900	0.772900	1.000000	0.701100
435	1.640000	1.283000	0.905400	0.377300	0.774800	1.000000	0.701600
436	1.823000	1.428000	1.010000	0.418600	0.776700	1.000000	0.702100
437	1.822000	1.431000	1.013000	0.417700	0.778600	1.000000	0.702600
438	1.652000	1.300000	0.921700	0.378000	0.780400	1.000000	0.703100
439	1.570000	1.234000	0.876700	0.357000	0.782200	1.000000	0.703600
440	1.759000	1.385000	0.985700	0.399200	0.784000	1.000000	0.704100
441	1.763000	1.391000	0.991400	0.399500	0.785800	0.999900	0.704600
442	1.841000	1.454000	1.038000	0.415700	0.787600	0.999300	0.705100
443	1.863000	1.467000	1.050000	0.417200	0.789300	0.996700	0.705500
444	1.833000	1.448000	1.038000	0.410500	0.791000	0.998800	0.706000
445	1.937000	1.530000	1.098000	0.431700	0.792800	0.998300	0.706500
446	1.716000	1.358000	0.976300	0.381900	0.794500	0.998300	0.707000
447	1.946000	1.545000	1.112000	0.432900	0.796100	0.999500	0.707400
448	1.974000	1.566000	1.129000	0.437000	0.797800	0.999800	0.707900
449	1.993000	1.587000	1.146000	0.441300	0.799500	1.000000	0.708400
450	2.024000	1.614000	1.167000	0.447300	0.801100	1.000000	0.708900
451	2.182000	1.742000	1.261000	0.480700	0.802700	1.000000	0.709300
452	2.031000	1.623000	1.177000	0.446200	0.804300	1.000000	0.709800
453	1.866000	1.493000	1.084000	0.408800	0.805900	1.000000	0.710300
454	1.997000	1.600000	1.163000	0.436600	0.807500	1.000000	0.710700
455	2.002000	1.605000	1.169000	0.436100	0.809100	1.000000	0.711200
456	2.055000	1.649000	1.202000	0.446400	0.810600	1.000000	0.711600
457	2.065000	1.659000	1.211000	0.447400	0.812100	1.000000	0.712100
458	2.009000	1.613000	1.180000	0.433300	0.813600	1.000000	0.712600
459	2.026000	1.629000	1.193000	0.436000	0.815100	1.000000	0.713000
460	1.996000	1.606000	1.178000	0.428100	0.816600	1.000000	0.713500
461	2.066000	1.663000	1.222000	0.441700	0.818100	1.000000	0.713900
462	2.022000	1.631000	1.199000	0.431500	0.819600	1.000000	0.714400

463	2.019000	1.628000	1.199000	0.429000	0.821000	1.000000	0.714800
464	2.032000	1.641000	1.210000	0.431100	0.822500	1.000000	0.715300
465	1.991000	1.611000	1.190000	0.421800	0.823900	1.000000	0.715700
466	2.049000	1.660000	1.227000	0.433200	0.825300	1.000000	0.716200
467	1.982000	1.605000	1.188000	0.417000	0.826700	0.999900	0.716600
468	2.084000	1.689000	1.252000	0.437200	0.828100	0.999800	0.717100
469	2.056000	1.667000	1.237000	0.430000	0.829400	0.999600	0.717500
470	2.037000	1.651000	1.227000	0.424000	0.830800	0.998700	0.717900
471	2.018000	1.638000	1.219000	0.419200	0.832100	0.999300	0.718400
472	2.059000	1.671000	1.245000	0.426000	0.833400	0.999400	0.718800
473	2.033000	1.651000	1.231000	0.419200	0.834800	0.999300	0.719200
474	2.036000	1.652000	1.234000	0.417900	0.836100	0.999800	0.719700
475	2.111000	1.711000	1.280000	0.431000	0.837400	1.000000	0.720100
476	2.064000	1.671000	1.252000	0.419100	0.838600	1.000000	0.720500
477	2.047000	1.657000	1.243000	0.413900	0.839900	1.000000	0.721000
478	2.142000	1.736000	1.304000	0.432400	0.841200	1.000000	0.721400
479	2.021000	1.641000	1.234000	0.407700	0.842400	1.000000	0.721800
480	2.071000	1.686000	1.268000	0.417600	0.843700	1.000000	0.722200
481	2.043000	1.667000	1.255000	0.411900	0.844900	1.000000	0.722700
482	2.092000	1.710000	1.289000	0.421500	0.846100	1.000000	0.723100
483	2.072000	1.698000	1.280000	0.417200	0.847300	1.000000	0.723500
484	2.000000	1.640000	1.239000	0.401800	0.848500	1.000000	0.723900
485	1.997000	1.639000	1.239000	0.400000	0.849700	0.999300	0.724300
486	1.625000	1.335000	1.010000	0.324900	0.850800	0.999400	0.724800
487	1.825000	1.501000	1.137000	0.364100	0.852000	0.999600	0.725200
488	1.969000	1.620000	1.229000	0.391600	0.853100	0.999600	0.725600
489	1.844000	1.517000	1.152000	0.365400	0.854300	0.999500	0.726000
490	2.084000	1.717000	1.305000	0.412400	0.855400	0.999700	0.726400
491	1.935000	1.596000	1.214000	0.382200	0.856500	0.999900	0.726800
492	1.857000	1.534000	1.168000	0.366000	0.857600	0.999900	0.727200
493	2.017000	1.666000	1.270000	0.396400	0.858700	1.000000	0.727600
494	1.939000	1.603000	1.223000	0.379900	0.859800	1.000000	0.728000
495	2.074000	1.715000	1.309000	0.405200	0.860900	1.000000	0.728500
496	2.008000	1.661000	1.270000	0.391100	0.861900	1.000000	0.728900
497	1.955000	1.618000	1.238000	0.379900	0.863000	1.000000	0.729300
498	1.897000	1.571000	1.204000	0.367800	0.864000	1.000000	0.729700
499	1.894000	1.569000	1.203000	0.366100	0.865100	1.000000	0.730100
500	1.889000	1.565000	1.201000	0.363900	0.866100	0.999700	0.730500
501	1.842000	1.526000	1.172000	0.353600	0.867100	0.999400	0.731000
502	1.845000	1.523000	1.172000	0.351400	0.868100	0.997300	0.731600
503	1.938000	1.595000	1.229000	0.366000	0.869100	0.994600	0.732200
504	1.793000	1.447000	1.119000	0.327800	0.870100	0.978000	0.732700
505	1.948000	1.603000	1.238000	0.365100	0.871100	0.994500	0.733300
506	2.078000	1.706000	1.319000	0.386700	0.872000	0.991300	0.733900

507	1.934000	1.586000	1.228000	0.358100	0.873000	0.989700	0.734400
508	1.855000	1.528000	1.183000	0.344200	0.874000	0.992000	0.735000
509	1.982000	1.637000	1.269000	0.368100	0.874900	0.994200	0.735500
510	1.925000	1.595000	1.237000	0.357600	0.875800	0.995900	0.736100
511	1.934000	1.607000	1.248000	0.359800	0.876800	0.998300	0.736600
512	2.004000	1.669000	1.296000	0.372600	0.877700	0.999300	0.737200
513	1.842000	1.536000	1.194000	0.341900	0.878600	0.999600	0.737700
514	1.822000	1.522000	1.184000	0.337800	0.879500	1.000000	0.738300
515	1.837000	1.535000	1.195000	0.339600	0.880400	1.000000	0.738800
516	1.923000	1.608000	1.253000	0.354600	0.881300	1.000000	0.739300
517	1.436000	1.202000	0.937400	0.264200	0.882200	1.000000	0.739900
518	1.740000	1.456000	1.137000	0.319200	0.883000	1.000000	0.740400
519	1.674000	1.402000	1.095000	0.306200	0.883900	1.000000	0.741000
520	1.822000	1.525000	1.193000	0.332100	0.884800	1.000000	0.741500
521	1.834000	1.536000	1.203000	0.333300	0.885600	1.000000	0.742000
522	1.902000	1.593000	1.248000	0.344500	0.886500	1.000000	0.742500
523	1.783000	1.493000	1.171000	0.322100	0.887300	1.000000	0.743100
524	1.910000	1.599000	1.256000	0.343600	0.888100	0.999200	0.743600
525	1.914000	1.601000	1.258000	0.342700	0.888900	0.999000	0.744100
526	1.810000	1.515000	1.192000	0.323600	0.889700	0.999900	0.744600
527	1.599000	1.337000	1.052000	0.284300	0.890500	0.999100	0.745200
528	1.874000	1.567000	1.235000	0.332300	0.891300	0.999800	0.745700
529	1.968000	1.644000	1.297000	0.347500	0.892100	0.999500	0.746200
530	1.849000	1.545000	1.219000	0.325500	0.892900	0.999600	0.746700
531	2.007000	1.677000	1.325000	0.352300	0.893700	0.999700	0.747200
532	1.912000	1.599000	1.265000	0.334900	0.894500	1.000000	0.747700
533	1.709000	1.430000	1.132000	0.298600	0.895200	1.000000	0.748200
534	1.813000	1.518000	1.202000	0.316000	0.896000	1.000000	0.748700
535	1.873000	1.570000	1.244000	0.325700	0.896700	1.000000	0.749200
536	1.969000	1.651000	1.310000	0.341600	0.897500	1.000000	0.749700
537	1.821000	1.529000	1.213000	0.315400	0.898200	1.000000	0.750200
538	1.936000	1.626000	1.292000	0.334400	0.899000	0.999700	0.750700
539	1.901000	1.597000	1.270000	0.327500	0.899700	0.999300	0.751200
540	1.842000	1.545000	1.230000	0.315600	0.900400	0.997600	0.751700
541	1.728000	1.442000	1.149000	0.292800	0.901100	0.992800	0.752200
542	1.891000	1.577000	1.258000	0.319100	0.901800	0.992300	0.752700
543	1.831000	1.537000	1.226000	0.311000	0.902500	0.997300	0.753200
544	1.919000	1.604000	1.281000	0.322800	0.903200	0.993600	0.753700
545	1.893000	1.585000	1.267000	0.318300	0.903900	0.995400	0.754200
546	1.860000	1.550000	1.240000	0.309400	0.904600	0.991500	0.754700
547	1.908000	1.597000	1.278000	0.318500	0.905200	0.995600	0.755200
548	1.793000	1.504000	1.205000	0.299400	0.905900	0.997500	0.755600
549	1.866000	1.569000	1.257000	0.311500	0.906600	0.998400	0.756100
550	1.845000	1.553000	1.245000	0.307500	0.907200	0.998500	0.756600

551	1.833000	1.545000	1.239000	0.305100	0.907900	0.999200	0.757100
552	1.897000	1.599000	1.284000	0.315000	0.908500	0.999700	0.757600
553	1.832000	1.545000	1.241000	0.303200	0.909200	0.999700	0.758000
554	1.887000	1.591000	1.280000	0.311400	0.909800	1.000000	0.758500
555	1.887000	1.590000	1.280000	0.310200	0.910500	1.000000	0.759000
556	1.842000	1.553000	1.251000	0.301800	0.911100	1.000000	0.759400
557	1.809000	1.525000	1.229000	0.295400	0.911700	1.000000	0.759900
558	1.844000	1.553000	1.253000	0.299800	0.912300	1.000000	0.760400
559	1.755000	1.477000	1.193000	0.284300	0.912900	1.000000	0.760800
560	1.783000	1.501000	1.213000	0.288000	0.913500	1.000000	0.761300
561	1.928000	1.623000	1.312000	0.310500	0.914100	1.000000	0.761800
562	1.779000	1.496000	1.211000	0.285300	0.914700	1.000000	0.762200
563	1.870000	1.572000	1.273000	0.298600	0.915300	0.999900	0.762700
564	1.839000	1.545000	1.252000	0.292600	0.915900	0.999900	0.763100
565	1.867000	1.567000	1.272000	0.295800	0.916500	0.999800	0.763600
566	1.724000	1.446000	1.174000	0.271900	0.917000	0.999600	0.764100
567	1.843000	1.543000	1.254000	0.289100	0.917600	0.998900	0.764500
568	1.852000	1.540000	1.253000	0.286500	0.918200	0.993800	0.765000
569	1.826000	1.491000	1.217000	0.274000	0.918700	0.978900	0.765400
570	1.830000	1.505000	1.228000	0.276800	0.919300	0.986100	0.765900
571	1.764000	1.465000	1.195000	0.269900	0.919900	0.996000	0.766300
572	1.870000	1.538000	1.257000	0.281000	0.920400	0.988500	0.766700
573	1.891000	1.556000	1.273000	0.283500	0.920900	0.990200	0.767200
574	1.877000	1.545000	1.265000	0.280600	0.921500	0.991600	0.767600
575	1.833000	1.506000	1.234000	0.272300	0.922000	0.991100	0.768100
576	1.812000	1.490000	1.221000	0.268700	0.922500	0.992900	0.768500
577	1.862000	1.534000	1.258000	0.275800	0.923100	0.994000	0.768900
578	1.816000	1.502000	1.232000	0.269800	0.923600	0.997000	0.769400
579	1.798000	1.493000	1.225000	0.268000	0.924100	0.998500	0.769800
580	1.851000	1.546000	1.268000	0.277200	0.924600	0.998700	0.770200
581	1.820000	1.525000	1.252000	0.273200	0.925100	0.999200	0.770700
582	1.841000	1.548000	1.271000	0.276700	0.925600	0.998800	0.771100
583	1.853000	1.562000	1.283000	0.278800	0.926100	0.998700	0.771500
584	1.847000	1.559000	1.281000	0.277500	0.926600	0.997800	0.772000
585	1.827000	1.543000	1.269000	0.273800	0.927100	0.997200	0.772400
586	1.759000	1.482000	1.220000	0.261900	0.927600	0.994600	0.772800
587	1.821000	1.522000	1.255000	0.267100	0.928100	0.988000	0.773200
588	1.817000	1.473000	1.220000	0.253700	0.928600	0.962200	0.773700
589	1.650000	1.264000	1.052000	0.212000	0.929000	0.914200	0.774100
590	1.706000	1.311000	1.092000	0.219400	0.929500	0.916600	0.774500
591	1.795000	1.421000	1.181000	0.239600	0.930000	0.940800	0.774900
592	1.781000	1.388000	1.156000	0.232400	0.930400	0.926600	0.775300
593	1.773000	1.415000	1.176000	0.239000	0.930900	0.945800	0.775700
594	1.798000	1.425000	1.185000	0.239300	0.931300	0.939400	0.776200

595	1.782000	1.391000	1.161000	0.230700	0.931800	0.927500	0.776600
596	1.793000	1.456000	1.211000	0.245300	0.932200	0.962400	0.777000
597	1.810000	1.464000	1.219000	0.245300	0.932700	0.958500	0.777400
598	1.765000	1.444000	1.201000	0.242300	0.933100	0.967600	0.777800
599	1.766000	1.456000	1.211000	0.244500	0.933600	0.974200	0.778200
600	1.765000	1.474000	1.226000	0.248500	0.934000	0.985200	0.778600
601	1.735000	1.463000	1.216000	0.247000	0.934400	0.993400	0.779000
602	1.724000	1.456000	1.210000	0.245300	0.934900	0.995400	0.779400
603	1.738000	1.471000	1.224000	0.247500	0.935300	0.998000	0.779800
604	1.786000	1.514000	1.260000	0.254000	0.935700	0.999200	0.780200
605	1.780000	1.511000	1.258000	0.253000	0.936100	1.000000	0.780600
606	1.761000	1.498000	1.248000	0.250300	0.936500	1.000000	0.781000
607	1.747000	1.489000	1.241000	0.248400	0.936900	1.000000	0.781400
608	1.741000	1.487000	1.239000	0.247400	0.937400	1.000000	0.781800
609	1.721000	1.472000	1.228000	0.244300	0.937800	1.000000	0.782200
610	1.707000	1.461000	1.219000	0.241800	0.938200	1.000000	0.782600
611	1.708000	1.463000	1.222000	0.241400	0.938600	1.000000	0.783000
612	1.698000	1.455000	1.216000	0.239400	0.939000	1.000000	0.783400
613	1.667000	1.428000	1.194000	0.234200	0.939300	1.000000	0.783800
614	1.613000	1.384000	1.157000	0.226200	0.939700	1.000000	0.784100
615	1.681000	1.444000	1.209000	0.235500	0.940100	1.000000	0.784500
616	1.599000	1.375000	1.151000	0.223500	0.940500	1.000000	0.784900
617	1.610000	1.385000	1.160000	0.224500	0.940900	1.000000	0.785300
618	1.689000	1.453000	1.218000	0.234800	0.941300	1.000000	0.785700
619	1.669000	1.436000	1.204000	0.231300	0.941600	1.000000	0.786100
620	1.694000	1.456000	1.222000	0.233700	0.942000	1.000000	0.786400
621	1.712000	1.468000	1.233000	0.234500	0.942400	1.000000	0.786800
622	1.642000	1.397000	1.176000	0.221700	0.942700	1.000000	0.787200
623	1.650000	1.394000	1.174000	0.219600	0.943100	1.000000	0.787600
624	1.636000	1.387000	1.169000	0.218400	0.943500	1.000000	0.788000
625	1.604000	1.367000	1.152000	0.215100	0.943800	0.999700	0.788300
626	1.609000	1.371000	1.156000	0.214900	0.944200	0.998000	0.788700
627	1.647000	1.392000	1.175000	0.216700	0.944500	0.991600	0.789100
628	1.669000	1.347000	1.143000	0.204000	0.944900	0.984500	0.789400
629	1.680000	1.398000	1.184000	0.214600	0.945200	0.987800	0.789800
630	1.626000	1.358000	1.150000	0.208200	0.945600	0.993900	0.790200
631	1.664000	1.414000	1.196000	0.218000	0.945900	0.997100	0.790600
632	1.564000	1.324000	1.121000	0.203200	0.946200	0.987500	0.790900
633	1.657000	1.416000	1.198000	0.217800	0.946600	0.991500	0.791300
634	1.604000	1.380000	1.168000	0.212500	0.946900	0.994600	0.791600
635	1.632000	1.406000	1.190000	0.215900	0.947200	0.993400	0.792000
636	1.582000	1.366000	1.157000	0.209500	0.947600	0.994600	0.792400
637	1.620000	1.401000	1.186000	0.214200	0.947900	0.994200	0.792700
638	1.643000	1.427000	1.209000	0.218200	0.948200	0.997200	0.793100

639	1.623000	1.412000	1.196000	0.215400	0.948500	0.996700	0.793500
640	1.582000	1.380000	1.170000	0.210200	0.948800	0.997000	0.793800
641	1.597000	1.395000	1.183000	0.212000	0.949200	0.996500	0.794200
642	1.574000	1.377000	1.168000	0.208900	0.949500	0.997300	0.794500
643	1.605000	1.402000	1.190000	0.211800	0.949800	0.994500	0.794900
644	1.582000	1.385000	1.176000	0.208900	0.950100	0.995500	0.795200
645	1.599000	1.393000	1.184000	0.209100	0.950400	0.990700	0.795600
646	1.564000	1.339000	1.141000	0.198500	0.950700	0.974200	0.795900
647	1.567000	1.303000	1.113000	0.189900	0.951000	0.948100	0.796300
648	1.590000	1.304000	1.116000	0.188800	0.951300	0.935200	0.796600
649	1.593000	1.309000	1.120000	0.189300	0.951600	0.936000	0.797000
650	1.482000	1.268000	1.082000	0.186100	0.951900	0.970500	0.797300
651	1.591000	1.371000	1.170000	0.201300	0.952200	0.977100	0.797700
652	1.571000	1.283000	1.100000	0.183200	0.952500	0.928700	0.798000
653	1.583000	1.361000	1.163000	0.198600	0.952800	0.973800	0.798400
654	1.568000	1.355000	1.157000	0.197300	0.953000	0.977600	0.798700
655	1.529000	1.288000	1.103000	0.185500	0.953300	0.954700	0.799000
656	1.316000	1.126000	0.963900	0.162400	0.953600	0.969100	0.799400
657	1.363000	1.164000	0.997000	0.167400	0.953900	0.967300	0.799700
658	1.531000	1.323000	1.132000	0.190900	0.954200	0.978000	0.800100
659	1.538000	1.336000	1.144000	0.192500	0.954400	0.984200	0.800400
660	1.537000	1.333000	1.142000	0.191300	0.954700	0.986700	0.800700
661	1.544000	1.337000	1.146000	0.191200	0.955000	0.994000	0.801100
662	1.566000	1.349000	1.158000	0.191800	0.955200	0.997700	0.801400
663	1.541000	1.333000	1.144000	0.189400	0.955500	0.996600	0.801700
664	1.521000	1.330000	1.141000	0.189700	0.955800	0.997600	0.802100
665	1.532000	1.349000	1.156000	0.192500	0.956000	0.998300	0.802400
666	1.532000	1.356000	1.163000	0.193600	0.956300	0.998800	0.802700
667	1.523000	1.353000	1.160000	0.193100	0.956600	0.998900	0.803100
668	1.519000	1.354000	1.161000	0.193000	0.956800	1.000000	0.803400
669	1.541000	1.375000	1.180000	0.195600	0.957100	0.999700	0.803700
670	1.518000	1.356000	1.163000	0.192500	0.957300	1.000000	0.804000
671	1.512000	1.352000	1.161000	0.191600	0.957600	1.000000	0.804400
672	1.494000	1.336000	1.147000	0.188900	0.957800	1.000000	0.804700
673	1.508000	1.350000	1.160000	0.190500	0.958100	1.000000	0.805000
674	1.511000	1.353000	1.163000	0.190500	0.958300	1.000000	0.805300
675	1.490000	1.335000	1.148000	0.187500	0.958600	1.000000	0.805700
676	1.513000	1.357000	1.167000	0.190000	0.958800	1.000000	0.806000
677	1.486000	1.333000	1.147000	0.186300	0.959100	1.000000	0.806300
678	1.502000	1.348000	1.160000	0.187900	0.959300	1.000000	0.806600
679	1.486000	1.334000	1.148000	0.185500	0.959500	1.000000	0.806900
680	1.479000	1.328000	1.144000	0.184300	0.959800	0.999900	0.807300
681	1.476000	1.325000	1.142000	0.183400	0.960000	0.999400	0.807600
682	1.477000	1.327000	1.144000	0.183200	0.960200	0.998900	0.807900

683	1.480000	1.329000	1.146000	0.183100	0.960500	0.998500	0.808200
684	1.459000	1.309000	1.130000	0.179800	0.960700	0.997500	0.808500
685	1.472000	1.323000	1.141000	0.181300	0.960900	0.998400	0.808800
686	1.418000	1.273000	1.099000	0.173900	0.961100	0.997400	0.809100
687	1.475000	1.026000	0.905000	0.120600	0.961400	0.995600	0.809500
688	1.462000	1.128000	0.987600	0.140600	0.961600	0.998200	0.809800
689	1.463000	1.132000	0.991100	0.141000	0.961800	0.997400	0.810100
690	1.465000	1.171000	1.023000	0.148200	0.962000	0.996200	0.810400
691	1.454000	1.199000	1.045000	0.154200	0.962300	0.990600	0.810700
692	1.433000	1.196000	1.042000	0.154600	0.962500	0.970600	0.811000
693	1.438000	1.141000	0.996900	0.144100	0.962700	0.907200	0.811300
694	1.449000	1.111000	0.971000	0.139600	0.962900	0.864400	0.811600
695	1.422000	1.147000	1.000000	0.147200	0.963100	0.899400	0.811900
696	1.433000	1.147000	1.000000	0.147100	0.963300	0.891000	0.812200
697	1.433000	1.252000	1.088000	0.164300	0.963500	0.967800	0.812500
698	1.405000	1.224000	1.064000	0.160100	0.963700	0.964600	0.812800
699	1.435000	1.182000	1.031000	0.151100	0.963900	0.914100	0.813100
700	1.416000	1.164000	1.016000	0.148300	0.964100	0.912900	0.813400
701	1.396000	1.129000	0.986900	0.141700	0.964400	0.899000	0.813700
702	1.378000	1.137000	0.993300	0.143800	0.964600	0.915700	0.814000
703	1.392000	1.148000	1.002000	0.145500	0.964800	0.914100	0.814300
704	1.400000	1.193000	1.040000	0.152900	0.965000	0.942600	0.814600
705	1.415000	1.197000	1.045000	0.152000	0.965100	0.937100	0.814900
706	1.395000	1.200000	1.047000	0.153000	0.965300	0.951100	0.815200
707	1.375000	1.186000	1.035000	0.151100	0.965500	0.952900	0.815500
708	1.408000	1.215000	1.061000	0.154400	0.965700	0.953300	0.815800
709	1.367000	1.204000	1.050000	0.154300	0.965900	0.970700	0.816100
710	1.394000	1.214000	1.060000	0.154300	0.966100	0.961300	0.816400
711	1.379000	1.210000	1.056000	0.154300	0.966300	0.967300	0.816700
712	1.364000	1.208000	1.053000	0.154700	0.966500	0.974500	0.816900
713	1.354000	1.189000	1.038000	0.151500	0.966700	0.967600	0.817200
714	1.376000	1.211000	1.056000	0.154300	0.966900	0.967900	0.817500
715	1.329000	1.142000	0.998200	0.143600	0.967000	0.946400	0.817800
716	1.362000	1.158000	1.013000	0.145000	0.967200	0.937400	0.818100
717	1.338000	0.900800	0.798300	0.102500	0.967400	0.751200	0.818400
718	1.332000	0.822900	0.732000	0.090910	0.967600	0.691700	0.818700
719	1.305000	0.753100	0.669800	0.083290	0.967800	0.645600	0.818900
720	1.333000	0.784200	0.699200	0.085080	0.968000	0.659200	0.819200
721	1.316000	0.910300	0.804400	0.105900	0.968100	0.767700	0.819500
722	1.332000	1.101000	0.965200	0.135500	0.968300	0.909400	0.819800
723	1.334000	0.992900	0.874600	0.118300	0.968500	0.822400	0.820100
724	1.342000	0.878900	0.778400	0.100500	0.968700	0.727000	0.820400
725	1.330000	0.847200	0.752700	0.094450	0.968800	0.708900	0.820600
726	1.327000	0.889100	0.787900	0.101200	0.969000	0.743200	0.820900

727	1.342000	0.925600	0.818600	0.107000	0.969200	0.763500	0.821200
728	1.323000	0.848100	0.752300	0.095810	0.969300	0.711300	0.821500
729	1.265000	0.886900	0.782900	0.104000	0.969500	0.773500	0.821700
730	1.317000	0.946800	0.837400	0.109400	0.969700	0.794100	0.822000
731	1.294000	0.891800	0.789100	0.102600	0.969800	0.761300	0.822300
732	1.315000	0.997300	0.878100	0.119200	0.970000	0.833300	0.822600
733	1.293000	1.069000	0.937300	0.131200	0.970200	0.904100	0.822800
734	1.321000	1.115000	0.976800	0.138400	0.970300	0.921700	0.823100
735	1.310000	1.094000	0.959100	0.134900	0.970500	0.912100	0.823400
736	1.288000	1.078000	0.945400	0.132500	0.970600	0.914100	0.823700
737	1.302000	1.086000	0.952300	0.133600	0.970800	0.910600	0.823900
738	1.301000	1.136000	0.993500	0.142500	0.971000	0.950100	0.824200
739	1.249000	1.088000	0.951400	0.136600	0.971100	0.947100	0.824500
740	1.274000	1.131000	0.987800	0.143300	0.971300	0.963800	0.824700
741	1.254000	1.126000	0.982400	0.143300	0.971400	0.973600	0.825000
742	1.235000	1.122000	0.977900	0.143600	0.971600	0.983300	0.825300
743	1.273000	1.161000	1.012000	0.149000	0.971700	0.986400	0.825500
744	1.279000	1.174000	1.023000	0.151300	0.971900	0.992400	0.825800
745	1.251000	1.155000	1.006000	0.149400	0.972000	0.997200	0.826100
746	1.274000	1.176000	1.024000	0.152100	0.972200	0.997100	0.826300
747	1.278000	1.183000	1.030000	0.153100	0.972300	0.998400	0.826600
748	1.264000	1.171000	1.019000	0.151600	0.972500	0.999000	0.826900
749	1.263000	1.170000	1.019000	0.151600	0.972600	0.999300	0.827100
750	1.245000	1.155000	1.005000	0.149600	0.972800	0.999400	0.827400
751	1.243000	1.153000	1.004000	0.149300	0.972900	0.999400	0.827600
752	1.260000	1.170000	1.019000	0.151300	0.973100	0.999600	0.827900
753	1.243000	1.155000	1.006000	0.149300	0.973200	0.999900	0.828200
754	1.266000	1.176000	1.024000	0.151800	0.973300	0.999600	0.828400
755	1.260000	1.170000	1.019000	0.150800	0.973500	0.999300	0.828700
756	1.233000	1.146000	0.998600	0.147700	0.973600	1.000000	0.828900
757	1.242000	1.154000	1.006000	0.148600	0.973800	1.000000	0.829200
758	1.241000	1.154000	1.005000	0.148300	0.973900	1.000000	0.829400
759	1.226000	1.128000	0.984000	0.144000	0.974000	1.000000	0.829700
760	1.238000	0.391500	0.366000	0.025460	0.974200	1.000000	0.829900
761	1.232000	0.268100	0.254600	0.013570	0.974300	1.000000	0.830200
762	1.201000	0.747100	0.672300	0.074820	0.974400	1.000000	0.830400
763	1.238000	0.503700	0.465200	0.038450	0.974600	1.000000	0.830700
764	1.240000	0.645300	0.587700	0.057600	0.974700	1.000000	0.831000
765	1.237000	0.768900	0.692200	0.076670	0.974800	1.000000	0.831200
766	1.167000	0.841900	0.749900	0.091950	0.975000	1.000000	0.831500
767	1.183000	0.962400	0.849300	0.113000	0.975100	1.000000	0.831700
768	1.218000	1.079000	0.945600	0.133300	0.975200	1.000000	0.832000
769	1.211000	1.093000	0.956600	0.136400	0.975400	1.000000	0.832200
770	1.197000	1.103000	0.964000	0.139300	0.975500	1.000000	0.832400

771	1.198000	1.115000	0.973400	0.141300	0.975600	1.000000	0.832700
772	1.191000	1.111000	0.970200	0.140900	0.975700	1.000000	0.832900
773	1.188000	1.109000	0.968700	0.140500	0.975900	1.000000	0.833200
774	1.204000	1.126000	0.983100	0.142400	0.976000	0.999900	0.833400
775	1.152000	1.077000	0.940900	0.136100	0.976100	0.999900	0.833700
776	1.201000	1.124000	0.982000	0.141900	0.976200	1.000000	0.833900
777	1.195000	1.118000	0.977000	0.140900	0.976400	1.000000	0.834200
778	1.186000	1.110000	0.970200	0.139700	0.976500	0.999700	0.834400
779	1.191000	1.114000	0.974000	0.140100	0.976600	0.999600	0.834600
780	1.178000	1.102000	0.964000	0.138400	0.976700	0.999800	0.834900
781	1.175000	1.100000	0.962300	0.137900	0.976800	0.999800	0.835100
782	1.187000	1.112000	0.972700	0.139200	0.976900	0.999600	0.835400
783	1.167000	1.094000	0.956900	0.136600	0.977100	0.999600	0.835600
784	1.161000	1.088000	0.952200	0.135800	0.977200	0.999700	0.835800
785	1.171000	1.094000	0.958000	0.136000	0.977300	0.996300	0.836100
786	1.152000	1.073000	0.939900	0.132900	0.977400	0.993700	0.836300
787	1.172000	1.067000	0.936400	0.130200	0.977500	0.972600	0.836600
788	1.157000	1.040000	0.914300	0.126000	0.977600	0.961200	0.836800
789	1.165000	1.036000	0.911100	0.124600	0.977800	0.951300	0.837000
790	1.156000	0.992600	0.874900	0.117800	0.977900	0.919900	0.837300
791	1.148000	1.019000	0.896600	0.122200	0.978000	0.949200	0.837500
792	1.129000	1.007000	0.886300	0.121000	0.978100	0.953400	0.837700
793	1.131000	1.005000	0.884700	0.120200	0.978200	0.949200	0.838000
794	1.106000	1.028000	0.902500	0.125400	0.978300	0.990000	0.838200
795	1.111000	1.021000	0.897200	0.123600	0.978400	0.979800	0.838400
796	1.133000	0.985500	0.869300	0.116100	0.978500	0.930600	0.838700
797	1.138000	0.990600	0.874400	0.116100	0.978600	0.931100	0.838900
798	1.135000	1.036000	0.911900	0.124200	0.978700	0.973300	0.839100
799	1.136000	1.026000	0.903400	0.122100	0.978800	0.963300	0.839300
800	1.109000	0.987200	0.870700	0.116500	0.979000	0.950200	0.839600
801	1.128000	0.995600	0.878700	0.116900	0.979100	0.942900	0.839800
802	1.127000	0.996000	0.879400	0.116600	0.979200	0.944100	0.840000
803	1.108000	0.973800	0.860500	0.113300	0.979300	0.938800	0.840300
804	1.119000	0.988700	0.873500	0.115200	0.979400	0.943600	0.840500
805	1.086000	0.974500	0.860300	0.114200	0.979500	0.957300	0.840700
806	1.117000	1.024000	0.903100	0.121200	0.979600	0.977000	0.840900
807	1.108000	1.011000	0.892100	0.119100	0.979700	0.971900	0.841200
808	1.101000	1.008000	0.889500	0.118700	0.979800	0.975700	0.841400
809	1.084000	0.976600	0.862900	0.113700	0.979900	0.960300	0.841600
810	1.079000	0.949700	0.840700	0.109100	0.980000	0.939900	0.841800
811	1.100000	0.957000	0.847400	0.109500	0.980100	0.929400	0.842100
812	1.096000	0.911400	0.810100	0.101300	0.980200	0.891100	0.842300
813	1.095000	0.884900	0.787100	0.097810	0.980300	0.866300	0.842500
814	1.096000	0.746900	0.669000	0.077890	0.980400	0.735900	0.842700

815	1.088000	0.743500	0.665600	0.077910	0.980500	0.737400	0.842900
816	1.084000	0.684600	0.615100	0.069510	0.980600	0.683400	0.843200
817	1.084000	0.703600	0.631600	0.072010	0.980600	0.701800	0.843400
818	1.071000	0.677200	0.609400	0.067870	0.980700	0.684800	0.843600
819	1.057000	0.784500	0.701100	0.083440	0.980800	0.798200	0.843800
820	1.032000	0.716000	0.641800	0.074160	0.980900	0.747900	0.844000
821	1.051000	0.893500	0.794100	0.099420	0.981000	0.908400	0.844300
822	1.040000	0.849200	0.756400	0.092740	0.981100	0.874100	0.844500
823	1.054000	0.510600	0.463100	0.047540	0.981200	0.528000	0.844700
824	1.056000	0.806600	0.721900	0.084660	0.981300	0.821100	0.844900
825	1.055000	0.874700	0.778700	0.096040	0.981400	0.885900	0.845100
826	1.061000	0.824200	0.735700	0.088450	0.981500	0.831800	0.845300
827	1.062000	0.888800	0.791800	0.097000	0.981600	0.893700	0.845500
828	1.061000	0.714000	0.642200	0.071850	0.981700	0.725800	0.845800
829	1.057000	0.830300	0.741700	0.088650	0.981700	0.841100	0.846000
830	1.043000	0.805100	0.720200	0.084880	0.981800	0.827000	0.846200
831	1.025000	0.797300	0.713400	0.083980	0.981900	0.833500	0.846400
832	1.043000	0.775300	0.694900	0.080450	0.982000	0.797500	0.846600
833	1.012000	0.850800	0.759200	0.091540	0.982100	0.897700	0.846800
834	1.022000	0.811300	0.725600	0.085620	0.982200	0.848900	0.847000
835	1.025000	0.912400	0.811600	0.100800	0.982300	0.947100	0.847200
836	1.037000	0.856500	0.765600	0.090900	0.982300	0.882700	0.847500
837	1.029000	0.919400	0.818400	0.101000	0.982400	0.950200	0.847700
838	1.031000	0.895000	0.798500	0.096500	0.982500	0.924700	0.847900
839	0.996900	0.894700	0.797100	0.097630	0.982600	0.954800	0.848100
840	1.025000	0.927400	0.826000	0.101400	0.982700	0.962300	0.848300
841	1.028000	0.917900	0.818500	0.099470	0.982800	0.949900	0.848500
842	1.014000	0.922900	0.822000	0.100900	0.982800	0.966900	0.848700
843	1.013000	0.939500	0.835800	0.103600	0.982900	0.984500	0.848900
844	0.994000	0.910500	0.811000	0.099540	0.983000	0.972800	0.849100
845	1.008000	0.939100	0.835700	0.103400	0.983100	0.988400	0.849300
846	1.013000	0.946800	0.842500	0.104300	0.983200	0.991100	0.849500
847	0.983900	0.925600	0.823400	0.102100	0.983200	0.997100	0.849700
848	1.010000	0.942000	0.838800	0.103200	0.983300	0.988900	0.849900
849	1.008000	0.939800	0.837000	0.102800	0.983400	0.988700	0.850100
850	0.880200	0.822000	0.732200	0.089810	0.983500	0.990300	0.850300
851	0.993000	0.918300	0.818600	0.099670	0.983600	0.981400	0.850500
852	0.971500	0.902100	0.804100	0.097940	0.983600	0.985100	0.850700
853	0.974600	0.913400	0.813900	0.099490	0.983700	0.993600	0.850900
854	0.802200	0.745200	0.664500	0.080610	0.983800	0.985300	0.851100
855	0.846300	0.795100	0.708700	0.086450	0.983900	0.995700	0.851300
856	0.976500	0.912800	0.814000	0.098770	0.983900	0.990900	0.851500
857	0.991900	0.933600	0.832400	0.101300	0.984000	0.997100	0.851700
858	0.979500	0.919300	0.819900	0.099380	0.984100	0.994400	0.851900

859	0.967800	0.911200	0.812600	0.098520	0.984200	0.997000	0.852100
860	0.967800	0.914100	0.815200	0.098840	0.984200	0.999800	0.852300
861	0.968700	0.913700	0.815200	0.098560	0.984300	0.998600	0.852500
862	0.961400	0.908400	0.810400	0.097920	0.984400	1.000000	0.852700
863	0.978100	0.924000	0.824500	0.099420	0.984500	0.999800	0.852900
864	0.977200	0.923200	0.824000	0.099180	0.984500	0.999600	0.853100
865	0.960300	0.907800	0.810400	0.097400	0.984600	1.000000	0.853300
866	0.822400	0.777500	0.694200	0.083280	0.984700	1.000000	0.853500
867	0.838600	0.792900	0.708100	0.084810	0.984700	1.000000	0.853700
868	0.931000	0.880400	0.786400	0.094010	0.984800	1.000000	0.853900
869	0.917100	0.867500	0.775000	0.092490	0.984900	1.000000	0.854100
870	0.952700	0.901200	0.805300	0.095940	0.985000	1.000000	0.854300
871	0.951000	0.899400	0.803800	0.095570	0.985000	0.999700	0.854500
872	0.951500	0.900300	0.804800	0.095530	0.985100	1.000000	0.854700
873	0.952900	0.901700	0.806200	0.095520	0.985200	1.000000	0.854900
874	0.937400	0.887100	0.793300	0.093820	0.985200	1.000000	0.855000
875	0.924300	0.874300	0.782000	0.092280	0.985300	0.999400	0.855200
876	0.926500	0.875700	0.783400	0.092230	0.985400	0.998600	0.855400
877	0.944900	0.894000	0.799900	0.094060	0.985400	0.999500	0.855600
878	0.940200	0.887600	0.794500	0.093120	0.985500	0.997500	0.855800
879	0.934000	0.882200	0.789700	0.092420	0.985600	0.997800	0.856000
880	0.933600	0.882400	0.790100	0.092330	0.985600	0.998400	0.856200
881	0.885300	0.832000	0.745400	0.086600	0.985700	0.993000	0.856400
882	0.928900	0.872500	0.781800	0.090610	0.985800	0.992500	0.856600
883	0.917500	0.863700	0.774000	0.089720	0.985800	0.994500	0.856700
884	0.919600	0.865800	0.776000	0.089710	0.985900	0.994600	0.856900
885	0.930000	0.875800	0.785200	0.090620	0.985900	0.994900	0.857100
886	0.903600	0.836300	0.750700	0.085610	0.986000	0.978600	0.857300
887	0.888000	0.832000	0.746500	0.085540	0.986100	0.990000	0.857500
888	0.917800	0.849600	0.762900	0.086730	0.986100	0.978600	0.857700
889	0.921800	0.870100	0.780600	0.089510	0.986200	0.996800	0.857900
890	0.923200	0.853800	0.767200	0.086670	0.986300	0.977900	0.858000
891	0.921400	0.859000	0.771600	0.087410	0.986300	0.985200	0.858200
892	0.911600	0.832900	0.749100	0.083770	0.986400	0.966500	0.858400
893	0.892900	0.787100	0.708900	0.078140	0.986400	0.933600	0.858600
894	0.914100	0.757200	0.684300	0.072830	0.986500	0.880200	0.858800
895	0.889500	0.677300	0.614800	0.062530	0.986600	0.812300	0.859000
896	0.917900	0.635800	0.578800	0.056990	0.986600	0.741000	0.859100
897	0.897900	0.516800	0.473400	0.043380	0.986700	0.619400	0.859300
898	0.900200	0.579300	0.529000	0.050230	0.986700	0.690300	0.859500
899	0.902400	0.418800	0.385100	0.033750	0.986800	0.501100	0.859700
900	0.879200	0.614600	0.559200	0.055380	0.986900	0.746700	0.859900
901	0.860600	0.440900	0.406300	0.034570	0.986900	0.554100	0.860000
902	0.844100	0.540600	0.493800	0.046830	0.987000	0.686300	0.860200

903	0.885200	0.545700	0.499500	0.046220	0.987000	0.661800	0.860400
904	0.896900	0.737500	0.668700	0.068860	0.987100	0.874200	0.860600
905	0.896500	0.708100	0.643100	0.065010	0.987200	0.840900	0.860800
906	0.878200	0.657700	0.598100	0.059630	0.987200	0.798200	0.860900
907	0.881800	0.495300	0.454600	0.040730	0.987300	0.604100	0.861100
908	0.868400	0.513300	0.470700	0.042560	0.987300	0.635000	0.861300
909	0.849700	0.565600	0.517000	0.048620	0.987400	0.712600	0.861500
910	0.861100	0.469400	0.431600	0.037800	0.987400	0.586800	0.861600
911	0.865500	0.528300	0.483100	0.045200	0.987500	0.653300	0.861800
912	0.853800	0.545300	0.499600	0.045640	0.987500	0.684800	0.862000
913	0.881600	0.477400	0.439400	0.038080	0.987600	0.583000	0.862200
914	0.875600	0.479100	0.441500	0.037620	0.987600	0.589700	0.862300
915	0.859200	0.514300	0.473100	0.041200	0.987700	0.643900	0.862500
916	0.868700	0.431800	0.398500	0.033300	0.987800	0.536300	0.862700
917	0.855500	0.579800	0.531100	0.048720	0.987800	0.725500	0.862900
918	0.853300	0.434400	0.401400	0.032940	0.987900	0.549700	0.863000
919	0.860300	0.599200	0.548100	0.051150	0.987900	0.744100	0.863200
920	0.851800	0.620700	0.566100	0.054610	0.988000	0.776200	0.863400
921	0.832000	0.654300	0.596200	0.058070	0.988000	0.836700	0.863500
922	0.827300	0.561700	0.514000	0.047730	0.988100	0.725200	0.863700
923	0.796800	0.627300	0.571600	0.055770	0.988100	0.837100	0.863900
924	0.824300	0.565700	0.518700	0.047010	0.988200	0.734200	0.864100
925	0.832200	0.560400	0.513800	0.046630	0.988200	0.720200	0.864200
926	0.808600	0.553800	0.508300	0.045510	0.988300	0.733100	0.864400
927	0.839500	0.645200	0.590400	0.054820	0.988300	0.820000	0.864600
928	0.845200	0.414000	0.384200	0.029760	0.988400	0.530000	0.864700
929	0.833700	0.361900	0.337300	0.024670	0.988400	0.471500	0.864900
930	0.833600	0.258900	0.243600	0.015340	0.988500	0.340500	0.865100
931	0.836600	0.246800	0.232600	0.014220	0.988500	0.323900	0.865200
932	0.830100	0.154100	0.146900	0.007207	0.988600	0.206100	0.865400
933	0.834300	0.115800	0.111000	0.004841	0.988600	0.155000	0.865600
934	0.833300	0.045220	0.044120	0.001107	0.988700	0.061680	0.865700
935	0.823400	0.126600	0.121000	0.005639	0.988700	0.171000	0.865900
936	0.816800	0.066120	0.063830	0.002295	0.988800	0.090980	0.866100
937	0.824700	0.066830	0.064480	0.002344	0.988800	0.091020	0.866200
938	0.823300	0.086490	0.083250	0.003246	0.988900	0.117700	0.866400
939	0.817800	0.239000	0.225500	0.013490	0.988900	0.320700	0.866600
940	0.813900	0.307400	0.288400	0.019000	0.989000	0.412100	0.866700
941	0.786200	0.210000	0.198700	0.011240	0.989000	0.294000	0.866900
942	0.778700	0.247200	0.233300	0.013900	0.989100	0.348300	0.867100
943	0.809200	0.150700	0.143500	0.007251	0.989100	0.206100	0.867200
944	0.791000	0.174100	0.164500	0.009650	0.989100	0.241600	0.867400
945	0.799000	0.218700	0.206700	0.012000	0.989200	0.300500	0.867600
946	0.804100	0.090190	0.086610	0.003582	0.989200	0.125100	0.867700

947	0.804300	0.213700	0.202400	0.011280	0.989300	0.292200	0.867900
948	0.806600	0.155600	0.147600	0.008027	0.989300	0.212500	0.868000
949	0.806500	0.309100	0.290900	0.018260	0.989400	0.418600	0.868200
950	0.803600	0.053390	0.051610	0.001780	0.989400	0.074550	0.868400
951	0.795800	0.306900	0.288900	0.017920	0.989500	0.421200	0.868500
952	0.798800	0.130600	0.124600	0.005995	0.989500	0.180900	0.868700
953	0.793800	0.197100	0.186700	0.010340	0.989600	0.272800	0.868800
954	0.781400	0.266300	0.250900	0.015380	0.989600	0.372200	0.869000
955	0.740000	0.186900	0.177100	0.009742	0.989600	0.277400	0.869200
956	0.783900	0.215600	0.201800	0.013700	0.989700	0.298300	0.869300
957	0.780700	0.136100	0.130100	0.006021	0.989700	0.193000	0.869500
958	0.785400	0.328500	0.306800	0.021790	0.989800	0.452300	0.869600
959	0.789600	0.235400	0.221800	0.013660	0.989800	0.325300	0.869800
960	0.781100	0.264600	0.249200	0.015470	0.989900	0.369300	0.870000
961	0.777000	0.315500	0.295400	0.020080	0.989900	0.440000	0.870100
962	0.779800	0.301100	0.282000	0.019160	0.989900	0.418400	0.870300
963	0.771100	0.363800	0.339100	0.024740	0.990000	0.508600	0.870400
964	0.768500	0.326900	0.305100	0.021770	0.990000	0.459200	0.870600
965	0.772400	0.364000	0.339700	0.024300	0.990100	0.508500	0.870700
966	0.757300	0.351100	0.328300	0.022760	0.990100	0.501200	0.870900
967	0.772400	0.348200	0.325800	0.022330	0.990100	0.487600	0.871000
968	0.765500	0.549000	0.505600	0.043460	0.990200	0.763100	0.871200
969	0.767700	0.566100	0.522400	0.043690	0.990200	0.786100	0.871400
970	0.770600	0.506100	0.468400	0.037680	0.990300	0.702100	0.871500
971	0.762900	0.616700	0.567000	0.049680	0.990300	0.858200	0.871700
972	0.768400	0.587000	0.540100	0.046940	0.990300	0.811400	0.871800
973	0.762500	0.471600	0.437900	0.033700	0.990400	0.662900	0.872000
974	0.750100	0.450600	0.417600	0.033020	0.990400	0.642500	0.872100
975	0.756300	0.476800	0.441300	0.035590	0.990500	0.673200	0.872300
976	0.760300	0.432600	0.402600	0.030050	0.990500	0.610900	0.872400
977	0.749300	0.528500	0.488000	0.040560	0.990500	0.751100	0.872600
978	0.758500	0.493000	0.456900	0.036100	0.990600	0.694700	0.872700
979	0.742300	0.515300	0.476700	0.038580	0.990600	0.740400	0.872900
980	0.750500	0.483600	0.447800	0.035840	0.990700	0.687800	0.873000
981	0.754200	0.620500	0.570700	0.049880	0.990700	0.871900	0.873200
982	0.753600	0.582000	0.536300	0.045650	0.990700	0.820000	0.873300
983	0.748400	0.552000	0.509400	0.042640	0.990800	0.784000	0.873500
984	0.744900	0.655300	0.601200	0.054080	0.990800	0.929500	0.873600
985	0.746700	0.578200	0.533300	0.044960	0.990800	0.822400	0.873800
986	0.742400	0.675100	0.618800	0.056320	0.990900	0.959500	0.873900
987	0.740100	0.654000	0.599900	0.054080	0.990900	0.933100	0.874100
988	0.741500	0.654300	0.600200	0.054140	0.991000	0.931500	0.874200
989	0.730200	0.681200	0.623800	0.057470	0.991000	0.982900	0.874400
990	0.731900	0.649000	0.595500	0.053460	0.991000	0.936100	0.874500

991	0.735800	0.685000	0.627500	0.057570	0.991100	0.981000	0.874700
992	0.735400	0.687800	0.630000	0.057860	0.991100	0.985300	0.874800
993	0.735500	0.664300	0.609300	0.055020	0.991100	0.952500	0.875000
994	0.735500	0.691300	0.633200	0.058140	0.991200	0.989800	0.875100
995	0.732200	0.692300	0.634000	0.058350	0.991200	0.995200	0.875300
996	0.730800	0.685800	0.628400	0.057440	0.991200	0.988100	0.875400
997	0.731200	0.688700	0.631000	0.057720	0.991300	0.991400	0.875500
998	0.729300	0.686200	0.628800	0.057390	0.991300	0.990300	0.875700
999	0.726100	0.683700	0.626600	0.057110	0.991400	0.991100	0.875800
1000	0.723400	0.674300	0.618400	0.055880	0.991400	0.981500	0.876000
1001	0.726100	0.684600	0.627500	0.057040	0.991400	0.992200	0.876100
1002	0.725100	0.656500	0.603100	0.053370	0.991500	0.954700	0.876300
1003	0.717200	0.674300	0.618400	0.055900	0.991500	0.989400	0.876400
1004	0.709200	0.660100	0.605800	0.054340	0.991500	0.980000	0.876600
1005	0.669600	0.632700	0.580300	0.052440	0.991600	0.994200	0.876700
1006	0.693300	0.649900	0.596400	0.053540	0.991600	0.986600	0.876800
1007	0.711500	0.670300	0.615000	0.055270	0.991600	0.991200	0.877000
1008	0.713800	0.666600	0.612000	0.054610	0.991700	0.983100	0.877100
1009	0.711400	0.659400	0.605700	0.053690	0.991700	0.976100	0.877300
1010	0.712400	0.657100	0.603900	0.053270	0.991700	0.971600	0.877400
1011	0.708900	0.668500	0.613700	0.054780	0.991800	0.992200	0.877600
1012	0.708000	0.662200	0.608300	0.053930	0.991800	0.984500	0.877700
1013	0.705300	0.666900	0.612400	0.054560	0.991800	0.994700	0.877800
1014	0.705500	0.667200	0.612700	0.054500	0.991900	0.994900	0.878000
1015	0.696100	0.657300	0.603700	0.053550	0.991900	0.993400	0.878100
1016	0.697600	0.658200	0.604700	0.053530	0.991900	0.992700	0.878300
1017	0.694200	0.654000	0.601000	0.053030	0.991900	0.991400	0.878400
1018	0.698400	0.661500	0.607800	0.053730	0.992000	0.996500	0.878500
1019	0.683900	0.637500	0.586200	0.051210	0.992000	0.981300	0.878700
1020	0.688300	0.650600	0.598000	0.052590	0.992000	0.994400	0.878800
1021	0.691800	0.655600	0.602600	0.052990	0.992100	0.997000	0.879000
1022	0.681200	0.642100	0.590400	0.051630	0.992100	0.991900	0.879100
1023	0.693600	0.652800	0.600400	0.052370	0.992100	0.990500	0.879200
1024	0.691200	0.639300	0.588600	0.050670	0.992200	0.974400	0.879400
1025	0.689800	0.653300	0.600900	0.052420	0.992200	0.996500	0.879500
1026	0.690000	0.650900	0.598900	0.052010	0.992200	0.993000	0.879600
1027	0.686800	0.648200	0.596500	0.051740	0.992300	0.993500	0.879800
1028	0.688100	0.648700	0.597100	0.051650	0.992300	0.992500	0.879900
1029	0.678600	0.639000	0.588200	0.050740	0.992300	0.991400	0.880100
1030	0.682100	0.646700	0.595200	0.051480	0.992300	0.998000	0.880200
1031	0.680400	0.643200	0.592200	0.051030	0.992400	0.995400	0.880300
1032	0.680200	0.644900	0.593700	0.051170	0.992400	0.998300	0.880500
1033	0.666900	0.632100	0.582000	0.050060	0.992400	0.998000	0.880600
1034	0.671200	0.636900	0.586500	0.050380	0.992500	0.999200	0.880700

1035	0.666600	0.632800	0.582800	0.050000	0.992500	0.999900	0.880900
1036	0.674900	0.639600	0.589200	0.050390	0.992500	0.998500	0.881000
1037	0.666000	0.631900	0.582100	0.049730	0.992600	1.000000	0.881100
1038	0.662800	0.628800	0.579400	0.049400	0.992600	0.999800	0.881300
1039	0.669200	0.634400	0.584700	0.049740	0.992600	0.999500	0.881400
1040	0.661800	0.627600	0.578400	0.049130	0.992600	1.000000	0.881500
1041	0.666200	0.631300	0.582000	0.049300	0.992700	0.999500	0.881700
1042	0.665600	0.630900	0.581700	0.049210	0.992700	1.000000	0.881800
1043	0.658300	0.623800	0.575300	0.048560	0.992700	1.000000	0.881900
1044	0.663200	0.628300	0.579500	0.048820	0.992800	1.000000	0.882100
1045	0.658900	0.624100	0.575700	0.048390	0.992800	1.000000	0.882200
1046	0.644500	0.610200	0.563000	0.047230	0.992800	1.000000	0.882300
1047	0.652600	0.617600	0.569900	0.047700	0.992800	1.000000	0.882500
1048	0.657600	0.622000	0.574100	0.047950	0.992900	0.999900	0.882600
1049	0.656100	0.620000	0.572300	0.047680	0.992900	0.999900	0.882700
1050	0.652900	0.616600	0.569300	0.047320	0.992900	0.999900	0.882900
1051	0.652700	0.616400	0.569200	0.047220	0.992900	0.999900	0.883000
1052	0.649900	0.613200	0.566400	0.046870	0.993000	0.999900	0.883100
1053	0.647900	0.610900	0.564300	0.046600	0.993000	0.999900	0.883200
1054	0.646000	0.608800	0.562500	0.046340	0.993000	0.999900	0.883400
1055	0.648800	0.610900	0.564600	0.046390	0.993100	0.999700	0.883500
1056	0.647700	0.609300	0.563100	0.046150	0.993100	0.999500	0.883600
1057	0.646500	0.607700	0.561800	0.045930	0.993100	0.999600	0.883800
1058	0.638500	0.599700	0.554500	0.045220	0.993100	0.999600	0.883900
1059	0.624700	0.585900	0.541800	0.044060	0.993200	0.998900	0.884000
1060	0.638000	0.598300	0.553400	0.044920	0.993200	0.999600	0.884100
1061	0.626900	0.587500	0.543500	0.044000	0.993200	0.999200	0.884300
1062	0.637700	0.596200	0.551700	0.044510	0.993200	0.997500	0.884400
1063	0.629100	0.587400	0.543700	0.043730	0.993300	0.996700	0.884500
1064	0.637100	0.596300	0.551900	0.044390	0.993300	0.999700	0.884700
1065	0.637000	0.592300	0.548500	0.043830	0.993300	0.993600	0.884800
1066	0.623800	0.583400	0.540200	0.043240	0.993300	0.998900	0.884900
1067	0.626000	0.583700	0.540600	0.043110	0.993400	0.995400	0.885000
1068	0.625600	0.580600	0.537900	0.042670	0.993400	0.991900	0.885200
1069	0.595100	0.551700	0.511200	0.040470	0.993400	0.988900	0.885300
1070	0.612500	0.562400	0.521400	0.040950	0.993400	0.978700	0.885400
1071	0.620500	0.580200	0.537600	0.042620	0.993500	0.995200	0.885500
1072	0.622200	0.572200	0.530700	0.041540	0.993500	0.978700	0.885700
1073	0.605400	0.559500	0.518800	0.040680	0.993500	0.982400	0.885800
1074	0.619800	0.581700	0.539100	0.042600	0.993500	0.996100	0.885900
1075	0.604000	0.538400	0.499900	0.038530	0.993600	0.947000	0.886000
1076	0.614900	0.573100	0.531400	0.041640	0.993600	0.988100	0.886200
1077	0.616600	0.558600	0.518500	0.040110	0.993600	0.960600	0.886300
1078	0.615200	0.551200	0.512000	0.039200	0.993600	0.950100	0.886400

1079	0.597900	0.560000	0.519400	0.040610	0.993600	0.990900	0.886500
1080	0.613800	0.544200	0.505600	0.038550	0.993700	0.939000	0.886700
1081	0.600000	0.528200	0.491200	0.037050	0.993700	0.932600	0.886800
1082	0.593200	0.543100	0.504500	0.038660	0.993700	0.968300	0.886900
1083	0.582600	0.538300	0.499700	0.038550	0.993700	0.976200	0.887000
1084	0.603700	0.519600	0.483600	0.036000	0.993800	0.911100	0.887100
1085	0.604400	0.542600	0.504500	0.038020	0.993800	0.949000	0.887300
1086	0.606700	0.489600	0.456700	0.032930	0.993800	0.855500	0.887400
1087	0.577200	0.508100	0.472900	0.035220	0.993800	0.930600	0.887500
1088	0.594200	0.540400	0.502400	0.038010	0.993900	0.960100	0.887600
1089	0.587600	0.510400	0.475400	0.035000	0.993900	0.918200	0.887800
1090	0.596700	0.494700	0.461200	0.033540	0.993900	0.876900	0.887900
1091	0.598900	0.534800	0.497700	0.037070	0.993900	0.942400	0.888000
1092	0.590200	0.536000	0.498500	0.037460	0.993900	0.957500	0.888100
1093	0.583000	0.435400	0.407200	0.028220	0.994000	0.791500	0.888200
1094	0.541800	0.477100	0.444500	0.032650	0.994000	0.929500	0.888400
1095	0.571300	0.443800	0.415200	0.028580	0.994000	0.823200	0.888500
1096	0.574200	0.419700	0.393200	0.026460	0.994000	0.775400	0.888600
1097	0.571500	0.518300	0.482600	0.035680	0.994100	0.955900	0.888700
1098	0.569000	0.409900	0.384600	0.025350	0.994100	0.764900	0.888800
1099	0.573600	0.425300	0.398800	0.026490	0.994100	0.786600	0.889000
1100	0.582900	0.388800	0.365400	0.023480	0.994100	0.709000	0.889100
1101	0.579600	0.400600	0.376100	0.024520	0.994100	0.733700	0.889200
1102	0.563300	0.369000	0.347100	0.021950	0.994200	0.696500	0.889300
1103	0.577500	0.362100	0.341000	0.021070	0.994200	0.667500	0.889400
1104	0.577100	0.364300	0.343000	0.021270	0.994200	0.671800	0.889500
1105	0.575300	0.411800	0.387100	0.024660	0.994200	0.760200	0.889700
1106	0.574700	0.276300	0.262100	0.014230	0.994200	0.515100	0.889800
1107	0.572100	0.387600	0.364400	0.023110	0.994300	0.719300	0.889900
1108	0.572400	0.303200	0.286800	0.016440	0.994300	0.565700	0.890000
1109	0.571600	0.298200	0.282600	0.015640	0.994300	0.558100	0.890100
1110	0.572300	0.361000	0.341100	0.019910	0.994300	0.672600	0.890200
1111	0.569400	0.224500	0.213800	0.010720	0.994400	0.423700	0.890400
1112	0.564100	0.290500	0.275400	0.015160	0.994400	0.550700	0.890500
1113	0.562800	0.164700	0.157500	0.007122	0.994400	0.315800	0.890600
1114	0.567200	0.185100	0.177100	0.007968	0.994400	0.352300	0.890700
1115	0.564600	0.151700	0.145500	0.006245	0.994400	0.290600	0.890800
1116	0.561500	0.104600	0.101100	0.003577	0.994500	0.203000	0.890900
1117	0.567100	0.025780	0.025250	0.000523	0.994500	0.050230	0.891100
1118	0.564000	0.119100	0.114900	0.004138	0.994500	0.229700	0.891200
1119	0.552800	0.046390	0.045240	0.001153	0.994500	0.092270	0.891300
1120	0.553500	0.056780	0.055460	0.001318	0.994500	0.113000	0.891400
1121	0.556500	0.081470	0.079390	0.002084	0.994600	0.160800	0.891500
1122	0.560400	0.025500	0.025110	0.000392	0.994600	0.050500	0.891600

1123	0.559500	0.052010	0.050810	0.001204	0.994600	0.102300	0.891700
1124	0.558800	0.043950	0.042950	0.001006	0.994600	0.086600	0.891800
1125	0.546700	0.060810	0.059270	0.001533	0.994600	0.122100	0.892000
1126	0.540400	0.012590	0.012460	0.000135	0.994600	0.025980	0.892100
1127	0.553500	0.068990	0.067230	0.001754	0.994700	0.136800	0.892200
1128	0.548200	0.031210	0.030690	0.000518	0.994700	0.063070	0.892300
1129	0.546900	0.034270	0.033690	0.000582	0.994700	0.069380	0.892400
1130	0.541800	0.020700	0.020340	0.000363	0.994700	0.042260	0.892500
1131	0.547800	0.159000	0.153600	0.005438	0.994700	0.315400	0.892600
1132	0.548400	0.118900	0.115200	0.003744	0.994800	0.236300	0.892700
1133	0.541400	0.060390	0.059030	0.001356	0.994800	0.122700	0.892900
1134	0.541000	0.009494	0.009395	0.000100	0.994800	0.019550	0.893000
1135	0.546300	0.004058	0.004006	0.000052	0.994800	0.008251	0.893100
1136	0.543100	0.045250	0.044400	0.000853	0.994800	0.091970	0.893200
1137	0.543500	0.151100	0.146200	0.004908	0.994900	0.302500	0.893300
1138	0.532100	0.102900	0.099790	0.003105	0.994900	0.210800	0.893400
1139	0.533900	0.189200	0.181500	0.007690	0.994900	0.382000	0.893500
1140	0.532700	0.144900	0.139700	0.005197	0.994900	0.294700	0.893600
1141	0.527700	0.098130	0.095150	0.002984	0.994900	0.202600	0.893700
1142	0.534400	0.119900	0.116000	0.003906	0.994900	0.243800	0.893900
1143	0.533000	0.184600	0.177600	0.006972	0.995000	0.374300	0.894000
1144	0.529700	0.049930	0.048630	0.001295	0.995000	0.103100	0.894100
1145	0.532100	0.058000	0.056750	0.001246	0.995000	0.119800	0.894200
1146	0.536500	0.062390	0.061050	0.001337	0.995000	0.127800	0.894300
1147	0.537400	0.014110	0.013970	0.000143	0.995000	0.029200	0.894400
1148	0.533900	0.158700	0.153100	0.005685	0.995000	0.321800	0.894500
1149	0.531800	0.116700	0.113000	0.003747	0.995100	0.238500	0.894600
1150	0.530700	0.056870	0.055200	0.001674	0.995100	0.116700	0.894700
1151	0.530400	0.102300	0.099250	0.003037	0.995100	0.210000	0.894800
1152	0.526400	0.138000	0.133400	0.004647	0.995100	0.284200	0.894900
1153	0.527400	0.143300	0.138100	0.005275	0.995100	0.293600	0.895000
1154	0.530100	0.056550	0.055260	0.001293	0.995100	0.117000	0.895200
1155	0.528900	0.197500	0.189700	0.007826	0.995200	0.402200	0.895300
1156	0.524400	0.169600	0.163300	0.006336	0.995200	0.349200	0.895400
1157	0.525900	0.206000	0.197200	0.008812	0.995200	0.420400	0.895500
1158	0.524700	0.203300	0.194600	0.008653	0.995200	0.415800	0.895600
1159	0.515900	0.228600	0.218700	0.009944	0.995200	0.475100	0.895700
1160	0.512100	0.185000	0.177300	0.007659	0.995200	0.388100	0.895800
1161	0.504100	0.241300	0.230200	0.011130	0.995300	0.511600	0.895900
1162	0.512700	0.236200	0.225400	0.010770	0.995300	0.492600	0.896000
1163	0.518200	0.379100	0.358600	0.020500	0.995300	0.775100	0.896100
1164	0.509700	0.292200	0.277800	0.014390	0.995300	0.610500	0.896200
1165	0.513400	0.278900	0.265400	0.013550	0.995300	0.578900	0.896300
1166	0.507600	0.279300	0.265500	0.013790	0.995300	0.585700	0.896400

1167	0.511000	0.305600	0.290300	0.015330	0.995400	0.636000	0.896500
1168	0.514500	0.322200	0.305500	0.016740	0.995400	0.664600	0.896600
1169	0.503200	0.333400	0.316000	0.017430	0.995400	0.702900	0.896700
1170	0.508200	0.371600	0.351400	0.020170	0.995400	0.773800	0.896800
1171	0.512900	0.364300	0.344500	0.019760	0.995400	0.751500	0.896900
1172	0.512200	0.374000	0.353500	0.020500	0.995400	0.772300	0.897000
1173	0.510000	0.372800	0.352600	0.020170	0.995500	0.773500	0.897200
1174	0.509800	0.239900	0.228400	0.011500	0.995500	0.501200	0.897300
1175	0.498100	0.375200	0.354300	0.020860	0.995500	0.795500	0.897400
1176	0.495500	0.416900	0.392700	0.024160	0.995500	0.886200	0.897500
1177	0.504000	0.398600	0.376200	0.022410	0.995500	0.834600	0.897600
1178	0.496500	0.277600	0.263200	0.014380	0.995500	0.592600	0.897700
1179	0.498500	0.425000	0.400300	0.024660	0.995500	0.897700	0.897800
1180	0.504200	0.363500	0.343900	0.019600	0.995600	0.762400	0.897900
1181	0.500700	0.377300	0.356700	0.020580	0.995600	0.796100	0.898000
1182	0.498200	0.238600	0.227100	0.011500	0.995600	0.509500	0.898100
1183	0.477300	0.372800	0.352300	0.020510	0.995600	0.824700	0.898200
1184	0.490300	0.341700	0.323600	0.018120	0.995600	0.737300	0.898300
1185	0.496600	0.323500	0.307000	0.016520	0.995600	0.690600	0.898400
1186	0.496900	0.408400	0.385600	0.022840	0.995700	0.866600	0.898500
1187	0.496600	0.380700	0.360000	0.020700	0.995700	0.809700	0.898600
1188	0.486900	0.243300	0.232100	0.011240	0.995700	0.532300	0.898700
1189	0.472300	0.348600	0.330000	0.018680	0.995700	0.780100	0.898800
1190	0.488100	0.398400	0.376200	0.022190	0.995700	0.860400	0.898900
1191	0.495100	0.364700	0.345400	0.019280	0.995700	0.778900	0.899000
1192	0.493400	0.408900	0.385900	0.023000	0.995700	0.873000	0.899100
1193	0.491700	0.385100	0.364000	0.021110	0.995800	0.826200	0.899200
1194	0.491900	0.401900	0.379500	0.022400	0.995800	0.860900	0.899300
1195	0.487100	0.370000	0.350200	0.019810	0.995800	0.802300	0.899400
1196	0.484900	0.348400	0.330200	0.018240	0.995800	0.759700	0.899500
1197	0.479400	0.410900	0.387800	0.023040	0.995800	0.902500	0.899600
1198	0.470200	0.368100	0.347900	0.020180	0.995800	0.825400	0.899700
1199	0.461100	0.288100	0.273600	0.014470	0.995800	0.661800	0.899800
1200	0.477300	0.376500	0.355900	0.020610	0.995900	0.831500	0.899900
1201	0.485100	0.359200	0.340200	0.018990	0.995900	0.782000	0.900000
1202	0.484600	0.365800	0.345900	0.019980	0.995900	0.795800	0.900100
1203	0.468500	0.360500	0.341400	0.019120	0.995900	0.814900	0.900200
1204	0.466700	0.292700	0.278100	0.014640	0.995900	0.679400	0.900300
1205	0.479500	0.374600	0.354200	0.020400	0.995900	0.833200	0.900400
1206	0.478700	0.424800	0.400800	0.023970	0.995900	0.937600	0.900500
1207	0.480500	0.357900	0.338900	0.019030	0.995900	0.793200	0.900600
1208	0.464400	0.365300	0.345400	0.019860	0.996000	0.837100	0.900700
1209	0.454100	0.358600	0.339200	0.019370	0.996000	0.837600	0.900800
1210	0.470200	0.391300	0.369800	0.021540	0.996000	0.879600	0.900900

1211	0.464800	0.360800	0.341300	0.019540	0.996000	0.820000	0.901000
1212	0.472800	0.346300	0.328500	0.017730	0.996000	0.775100	0.901000
1213	0.473800	0.410100	0.387500	0.022610	0.996000	0.911400	0.901100
1214	0.473000	0.360200	0.341500	0.018730	0.996000	0.804300	0.901200
1215	0.473900	0.353000	0.334700	0.018320	0.996100	0.786600	0.901300
1216	0.473100	0.410600	0.387900	0.022740	0.996100	0.913000	0.901400
1217	0.472000	0.395800	0.374200	0.021610	0.996100	0.882700	0.901500
1218	0.470300	0.404700	0.382400	0.022220	0.996100	0.910800	0.901600
1219	0.467900	0.393100	0.371900	0.021200	0.996100	0.898100	0.901700
1220	0.468600	0.404500	0.382300	0.022180	0.996100	0.914100	0.901800
1221	0.468000	0.413800	0.390800	0.023000	0.996100	0.932400	0.901900
1222	0.466100	0.399800	0.377800	0.021990	0.996100	0.908100	0.902000
1223	0.463800	0.393300	0.371800	0.021460	0.996200	0.898300	0.902100
1224	0.465700	0.387900	0.367200	0.020770	0.996200	0.881200	0.902200
1225	0.464300	0.410700	0.388100	0.022590	0.996200	0.932400	0.902300
1226	0.463700	0.418600	0.395300	0.023310	0.996200	0.950200	0.902400
1227	0.455100	0.375000	0.355000	0.019950	0.996200	0.869200	0.902500
1228	0.457400	0.418000	0.394800	0.023270	0.996200	0.961200	0.902600
1229	0.462000	0.418700	0.395400	0.023270	0.996200	0.952600	0.902700
1230	0.460000	0.409900	0.387300	0.022580	0.996200	0.937200	0.902800
1231	0.458700	0.429600	0.405400	0.024150	0.996300	0.983700	0.902900
1232	0.455800	0.426200	0.402300	0.023910	0.996300	0.982100	0.902900
1233	0.456700	0.401300	0.379500	0.021810	0.996300	0.924600	0.903000
1234	0.455700	0.432000	0.407700	0.024380	0.996300	0.995600	0.903100
1235	0.454000	0.426300	0.402400	0.023870	0.996300	0.986500	0.903200
1236	0.455500	0.431300	0.407100	0.024250	0.996300	0.994200	0.903300
1237	0.455400	0.422000	0.398500	0.023490	0.996300	0.973600	0.903400
1238	0.455000	0.431200	0.407000	0.024190	0.996300	0.995200	0.903500
1239	0.450500	0.426700	0.402800	0.023910	0.996400	0.994900	0.903600
1240	0.447700	0.425600	0.401800	0.023870	0.996400	0.998400	0.903700
1241	0.451500	0.423200	0.399700	0.023500	0.996400	0.984900	0.903800
1242	0.448300	0.425800	0.402000	0.023800	0.996400	0.997700	0.903900
1243	0.443300	0.421800	0.398200	0.023570	0.996400	0.999500	0.904000
1244	0.444300	0.421100	0.397600	0.023440	0.996400	0.995900	0.904100
1245	0.448400	0.426400	0.402600	0.023750	0.996400	0.999400	0.904100
1246	0.445900	0.424100	0.400500	0.023600	0.996400	0.999600	0.904200
1247	0.444500	0.421600	0.398200	0.023390	0.996400	0.997900	0.904300
1248	0.445800	0.420000	0.396800	0.023160	0.996500	0.992300	0.904400
1249	0.445900	0.423200	0.399800	0.023430	0.996500	0.999200	0.904500
1250	0.444700	0.421300	0.398000	0.023260	0.996500	0.998500	0.904600
1251	0.442300	0.417600	0.394700	0.022980	0.996500	0.998800	0.904700
1252	0.438100	0.415000	0.392200	0.022850	0.996500	0.997300	0.904800
1253	0.439100	0.413300	0.390600	0.022630	0.996500	0.998800	0.904900
1254	0.439800	0.408900	0.386700	0.022190	0.996500	0.990800	0.905000

1255	0.439000	0.414200	0.391600	0.022670	0.996500	0.994900	0.905000
1256	0.437300	0.407500	0.385400	0.022080	0.996500	0.997300	0.905100
1257	0.435600	0.405000	0.383100	0.021890	0.996600	0.998300	0.905200
1258	0.435900	0.408500	0.386300	0.022160	0.996600	0.993400	0.905300
1259	0.434900	0.399600	0.378200	0.021370	0.996600	0.998100	0.905400
1260	0.435800	0.400400	0.379000	0.021380	0.996600	0.993700	0.905500
1261	0.434300	0.386700	0.366500	0.020200	0.996600	0.993500	0.905600
1262	0.430900	0.378700	0.359100	0.019580	0.996600	0.997700	0.905700
1263	0.433800	0.379100	0.359600	0.019510	0.996600	0.991500	0.905800
1264	0.429900	0.360500	0.342400	0.018020	0.996600	0.991800	0.905800
1265	0.429000	0.376500	0.357200	0.019380	0.996600	0.996500	0.905900
1266	0.431200	0.370200	0.351400	0.018740	0.996700	0.998500	0.906000
1267	0.427200	0.370200	0.351300	0.018840	0.996700	0.989400	0.906100
1268	0.423700	0.358600	0.340600	0.017940	0.996700	0.993900	0.906200
1269	0.425800	0.270600	0.259500	0.011150	0.996700	0.994800	0.906300
1270	0.428700	0.371100	0.352300	0.018800	0.996700	0.996400	0.906400
1271	0.428600	0.381400	0.361700	0.019710	0.996700	0.985200	0.906500
1272	0.427100	0.382000	0.362200	0.019730	0.996700	0.988700	0.906600
1273	0.425700	0.380000	0.360500	0.019570	0.996700	0.990800	0.906600
1274	0.423000	0.376900	0.357500	0.019380	0.996700	0.983300	0.906700
1275	0.424000	0.383600	0.363800	0.019890	0.996700	0.995300	0.906800
1276	0.424700	0.384700	0.364800	0.019940	0.996800	0.988500	0.906900
1277	0.423800	0.380600	0.360900	0.019660	0.996800	0.968500	0.907000
1278	0.422100	0.391900	0.371300	0.020590	0.996800	0.996200	0.907100
1279	0.418900	0.383300	0.363400	0.019990	0.996800	0.975400	0.907200
1280	0.415300	0.377800	0.358300	0.019550	0.996800	0.970000	0.907200
1281	0.401000	0.368200	0.349100	0.019160	0.996800	0.971600	0.907300
1282	0.368500	0.346300	0.328100	0.018250	0.996800	0.991900	0.907400
1283	0.388700	0.363600	0.344500	0.019080	0.996800	0.988200	0.907500
1284	0.408000	0.375200	0.355700	0.019460	0.996800	0.968400	0.907600
1285	0.411100	0.381200	0.361300	0.019860	0.996800	0.977100	0.907700
1286	0.412300	0.385300	0.365100	0.020120	0.996900	0.980800	0.907800
1287	0.414300	0.375700	0.356400	0.019260	0.996900	0.955500	0.907800
1288	0.412500	0.375800	0.356500	0.019320	0.996900	0.956200	0.907900
1289	0.412500	0.359900	0.341900	0.018030	0.996900	0.918800	0.908000
1290	0.407800	0.372100	0.353000	0.019050	0.996900	0.958000	0.908100
1291	0.408500	0.377200	0.357800	0.019440	0.996900	0.970300	0.908200
1292	0.411100	0.343200	0.326400	0.016770	0.996900	0.878200	0.908300
1293	0.410700	0.365800	0.347400	0.018460	0.996900	0.935600	0.908300
1294	0.407500	0.357400	0.339500	0.017880	0.996900	0.921200	0.908400
1295	0.409600	0.360200	0.342300	0.017920	0.996900	0.924000	0.908500
1296	0.410000	0.335200	0.319100	0.016110	0.997000	0.860200	0.908600
1297	0.407800	0.312000	0.297400	0.014610	0.997000	0.805800	0.908700
1298	0.404700	0.347400	0.330300	0.017120	0.997000	0.901700	0.908800

1299	0.407600	0.368600	0.349900	0.018680	0.997000	0.948000	0.908900
1300	0.406800	0.292900	0.279300	0.013590	0.997000	0.758100	0.908900
1301	0.404900	0.297900	0.284300	0.013550	0.997000	0.775200	0.909000
1302	0.402000	0.347600	0.330500	0.017120	0.997000	0.907400	0.909100
1303	0.399600	0.284000	0.271100	0.012880	0.997000	0.748900	0.909200
1304	0.398500	0.227300	0.217800	0.009498	0.997000	0.603200	0.909300
1305	0.401400	0.334400	0.318300	0.016110	0.997000	0.875100	0.909300
1306	0.402200	0.332800	0.317000	0.015810	0.997000	0.869500	0.909400
1307	0.401200	0.231600	0.222000	0.009613	0.997100	0.610400	0.909500
1308	0.400300	0.295500	0.281600	0.013810	0.997100	0.776100	0.909600
1309	0.400800	0.332500	0.316800	0.015660	0.997100	0.871900	0.909700
1310	0.398800	0.231300	0.221700	0.009611	0.997100	0.613100	0.909800
1311	0.397700	0.274200	0.261900	0.012360	0.997100	0.726000	0.909800
1312	0.392000	0.272000	0.259600	0.012330	0.997100	0.730300	0.909900
1313	0.386600	0.249300	0.238700	0.010620	0.997100	0.681300	0.910000
1314	0.394600	0.224300	0.215000	0.009281	0.997100	0.602100	0.910100
1315	0.385700	0.212100	0.203800	0.008266	0.997100	0.584400	0.910200
1316	0.386400	0.260900	0.249600	0.011290	0.997100	0.713300	0.910200
1317	0.393900	0.249900	0.239100	0.010850	0.997100	0.669300	0.910300
1318	0.390700	0.279300	0.266700	0.012600	0.997200	0.753300	0.910400
1319	0.393800	0.190700	0.183500	0.007156	0.997200	0.514600	0.910500
1320	0.392900	0.197300	0.189500	0.007851	0.997200	0.532300	0.910600
1321	0.390400	0.235000	0.225200	0.009752	0.997200	0.636300	0.910700
1322	0.390100	0.229600	0.220500	0.009087	0.997200	0.623000	0.910700
1323	0.390100	0.158900	0.153400	0.005538	0.997200	0.433200	0.910800
1324	0.390300	0.187800	0.180700	0.007054	0.997200	0.510100	0.910900
1325	0.389400	0.259100	0.248000	0.011020	0.997200	0.701500	0.911000
1326	0.387300	0.210500	0.202200	0.008251	0.997200	0.575000	0.911100
1327	0.385400	0.195800	0.188300	0.007510	0.997200	0.537800	0.911100
1328	0.385100	0.168800	0.162600	0.006199	0.997200	0.464900	0.911200
1329	0.377600	0.110400	0.107100	0.003312	0.997200	0.312200	0.911300
1330	0.381400	0.150800	0.146100	0.004785	0.997300	0.421500	0.911400
1331	0.383700	0.075870	0.073970	0.001897	0.997300	0.212200	0.911400
1332	0.378000	0.082630	0.080450	0.002183	0.997300	0.234300	0.911500
1333	0.381900	0.117300	0.114000	0.003248	0.997300	0.328700	0.911600
1334	0.384200	0.110700	0.107100	0.003644	0.997300	0.306700	0.911700
1335	0.382600	0.157200	0.151900	0.005222	0.997300	0.437000	0.911800
1336	0.381200	0.114300	0.111000	0.003355	0.997300	0.320400	0.911800
1337	0.381500	0.098750	0.095860	0.002897	0.997300	0.276700	0.911900
1338	0.379500	0.105900	0.102800	0.003032	0.997300	0.298400	0.912000
1339	0.374800	0.108000	0.104800	0.003131	0.997300	0.308000	0.912100
1340	0.374400	0.108600	0.105300	0.003350	0.997300	0.309400	0.912200
1341	0.378200	0.095420	0.092970	0.002451	0.997300	0.270500	0.912200
1342	0.377300	0.088250	0.086060	0.002189	0.997400	0.251100	0.912300

1343	0.377000	0.051420	0.050500	0.000922	0.997400	0.147500	0.912400
1344	0.377300	0.032630	0.032000	0.000626	0.997400	0.093360	0.912500
1345	0.376700	0.045860	0.045080	0.000782	0.997400	0.131700	0.912500
1346	0.374200	0.014780	0.014650	0.000131	0.997400	0.043100	0.912600
1347	0.374700	0.013750	0.013640	0.000102	0.997400	0.040070	0.912700
1348	0.374600	0.000376	0.000375	0.000001	0.997400	0.001103	0.912800
1349	0.372900	0.001656	0.001652	0.000005	0.997400	0.004876	0.912900
1350	0.369200	0.002002	0.001996	0.000006	0.997400	0.005953	0.912900
1351	0.370000	0.000212	0.000212	0.000000	0.997400	0.000630	0.913000
1352	0.372200	0.000019	0.000019	0.000000	0.997400	0.000056	0.913100
1353	0.371500	0.000000	0.000000	0.000000	0.997400	0.000001	0.913200
1354	0.369900	0.000003	0.000003	0.000000	0.997400	0.000009	0.913200
1355	0.366100	0.000000	0.000000	0.000000	0.997500	0.000000	0.913300
1356	0.364600	0.000000	0.000000	0.000000	0.997500	0.000001	0.913400
1357	0.363000	0.000000	0.000000	0.000000	0.997500	0.000001	0.913500
1358	0.366300	0.000000	0.000000	0.000000	0.997500	0.000000	0.913500
1359	0.365000	0.000000	0.000000	0.000000	0.997500	0.000000	0.913600
1360	0.362500	0.000000	0.000000	0.000000	0.997500	0.000000	0.913700
1361	0.365800	0.000000	0.000000	0.000000	0.997500	0.000000	0.913800
1362	0.364500	0.000000	0.000000	0.000000	0.997500	0.000000	0.913800
1363	0.360300	0.000000	0.000000	0.000000	0.997500	0.000000	0.913900
1364	0.362000	0.000000	0.000000	0.000000	0.997500	0.000000	0.914000
1365	0.362600	0.000000	0.000000	0.000000	0.997500	0.000000	0.914100
1366	0.361900	0.000000	0.000000	0.000000	0.997500	0.000000	0.914100
1367	0.359500	0.000000	0.000000	0.000000	0.997500	0.000000	0.914200
1368	0.359400	0.000000	0.000000	0.000000	0.997500	0.000000	0.914300
1369	0.356200	0.000000	0.000000	0.000000	0.997600	0.000000	0.914400
1370	0.355900	0.000000	0.000000	0.000000	0.997600	0.000000	0.914400
1371	0.355700	0.000000	0.000000	0.000000	0.997600	0.000000	0.914500
1372	0.358400	0.000000	0.000000	0.000000	0.997600	0.000000	0.914600
1373	0.359300	0.000000	0.000000	0.000000	0.997600	0.000000	0.914700
1374	0.357500	0.000001	0.000001	0.000000	0.997600	0.000003	0.914700
1375	0.353900	0.000001	0.000001	0.000000	0.997600	0.000004	0.914800
1376	0.351200	0.000003	0.000003	0.000000	0.997600	0.000009	0.914900
1377	0.353300	0.000001	0.000001	0.000000	0.997600	0.000004	0.915000
1378	0.354000	0.000012	0.000012	0.000000	0.997600	0.000037	0.915000
1379	0.355600	0.000001	0.000001	0.000000	0.997600	0.000002	0.915100
1380	0.354000	0.000000	0.000000	0.000000	0.997600	0.000001	0.915200
1381	0.353500	0.000000	0.000000	0.000000	0.997600	0.000000	0.915300
1382	0.350400	0.000000	0.000000	0.000000	0.997600	0.000000	0.915300
1383	0.350400	0.000000	0.000000	0.000000	0.997700	0.000000	0.915400
1384	0.352100	0.000000	0.000000	0.000000	0.997700	0.000000	0.915500
1385	0.350200	0.000000	0.000000	0.000000	0.997700	0.000000	0.915500
1386	0.350300	0.000000	0.000000	0.000000	0.997700	0.000000	0.915600

1387	0.349200	0.000000	0.000000	0.000000	0.997700	0.000001	0.915700
1388	0.349900	0.000000	0.000000	0.000000	0.997700	0.000000	0.915800
1389	0.349700	0.000004	0.000004	0.000000	0.997700	0.000013	0.915800
1390	0.346100	0.000003	0.000003	0.000000	0.997700	0.000010	0.915900
1391	0.348300	0.000002	0.000002	0.000000	0.997700	0.000007	0.916000
1392	0.348200	0.000000	0.000000	0.000000	0.997700	0.000000	0.916100
1393	0.346700	0.000001	0.000001	0.000000	0.997700	0.000003	0.916100
1394	0.345100	0.000000	0.000000	0.000000	0.997700	0.000000	0.916200
1395	0.344000	0.000000	0.000000	0.000000	0.997700	0.000000	0.916300
1396	0.344800	0.000000	0.000000	0.000000	0.997700	0.000000	0.916300
1397	0.345600	0.000000	0.000000	0.000000	0.997700	0.000001	0.916400
1398	0.345300	0.000011	0.000011	0.000000	0.997800	0.000037	0.916500
1399	0.343300	0.000008	0.000008	0.000000	0.997800	0.000026	0.916600
1400	0.337000	0.000000	0.000000	0.000000	0.997800	0.000000	0.916600
1401	0.337400	0.000000	0.000000	0.000000	0.997800	0.000000	0.916700
1402	0.340100	0.000076	0.000076	0.000000	0.997800	0.000246	0.916800
1403	0.338400	0.000074	0.000074	0.000000	0.997800	0.000239	0.916800
1404	0.337700	0.000020	0.000020	0.000000	0.997800	0.000064	0.916900
1405	0.337900	0.000000	0.000000	0.000000	0.997800	0.000000	0.917000
1406	0.338200	0.000032	0.000032	0.000000	0.997800	0.000103	0.917000
1407	0.337300	0.000005	0.000005	0.000000	0.997800	0.000017	0.917100
1408	0.337400	0.000029	0.000029	0.000000	0.997800	0.000096	0.917200
1409	0.337700	0.000005	0.000005	0.000000	0.997800	0.000017	0.917300
1410	0.337100	0.000008	0.000008	0.000000	0.997800	0.000026	0.917300
1411	0.332100	0.000069	0.000069	0.000000	0.997800	0.000228	0.917400
1412	0.328000	0.000124	0.000124	0.000000	0.997800	0.000414	0.917500
1413	0.330200	0.002443	0.002438	0.000005	0.997800	0.008086	0.917500
1414	0.331800	0.000007	0.000007	0.000000	0.997900	0.000023	0.917600
1415	0.333000	0.000003	0.000003	0.000000	0.997900	0.000009	0.917700
1416	0.331800	0.007555	0.007507	0.000047	0.997900	0.024760	0.917700
1417	0.332100	0.001445	0.001439	0.000006	0.997900	0.004743	0.917800
1418	0.332100	0.001317	0.001315	0.000002	0.997900	0.004335	0.917900
1419	0.329500	0.000187	0.000187	0.000000	0.997900	0.000620	0.918000
1420	0.328400	0.000795	0.000794	0.000001	0.997900	0.002647	0.918000
1421	0.327400	0.000962	0.000959	0.000003	0.997900	0.003209	0.918100
1422	0.323300	0.009829	0.009768	0.000060	0.997900	0.033050	0.918200
1423	0.323300	0.001771	0.001761	0.000011	0.997900	0.005957	0.918200
1424	0.323300	0.003730	0.003699	0.000031	0.997900	0.012510	0.918300
1425	0.323400	0.004702	0.004674	0.000027	0.997900	0.015810	0.918400
1426	0.319700	0.006864	0.006802	0.000062	0.997900	0.023260	0.918400
1427	0.320500	0.015690	0.015530	0.000159	0.997900	0.052970	0.918500
1428	0.322100	0.000318	0.000318	0.000001	0.997900	0.001079	0.918600
1429	0.318100	0.009717	0.009643	0.000074	0.997900	0.033140	0.918600
1430	0.318200	0.021850	0.021580	0.000270	0.997900	0.074170	0.918700

1431	0.320300	0.020740	0.020510	0.000235	0.998000	0.086140	0.918800
1432	0.323600	0.000190	0.000190	0.000000	0.998000	0.000823	0.918800
1433	0.323600	0.012600	0.012470	0.000128	0.998000	0.048870	0.918900
1434	0.320700	0.006281	0.006222	0.000058	0.998000	0.022320	0.919000
1435	0.321800	0.003846	0.003827	0.000019	0.998000	0.014060	0.919000
1436	0.321500	0.010560	0.010470	0.000088	0.998000	0.039290	0.919100
1437	0.321800	0.008208	0.008139	0.000069	0.998000	0.030210	0.919200
1438	0.321500	0.002731	0.002713	0.000018	0.998000	0.009971	0.919200
1439	0.320800	0.015200	0.015060	0.000130	0.998000	0.057540	0.919300
1440	0.309700	0.012340	0.012210	0.000127	0.998000	0.046880	0.919400
1441	0.310200	0.007368	0.007316	0.000052	0.998000	0.027340	0.919400
1442	0.312000	0.008081	0.008037	0.000044	0.998000	0.029350	0.919500
1443	0.311600	0.013420	0.013300	0.000114	0.998000	0.047840	0.919600
1444	0.312700	0.021330	0.021080	0.000250	0.998000	0.075960	0.919600
1445	0.314100	0.013210	0.013100	0.000108	0.998000	0.046420	0.919700
1446	0.315200	0.005116	0.005087	0.000028	0.998000	0.017940	0.919800
1447	0.313100	0.008961	0.008887	0.000074	0.998000	0.031340	0.919800
1448	0.315100	0.054300	0.053380	0.000924	0.998000	0.186400	0.919900
1449	0.315100	0.044200	0.043480	0.000724	0.998100	0.151300	0.920000
1450	0.312100	0.007207	0.007138	0.000069	0.998100	0.025050	0.920000
1451	0.308000	0.002434	0.002414	0.000020	0.998100	0.008578	0.920100
1452	0.308600	0.022030	0.021760	0.000262	0.998100	0.077070	0.920200
1453	0.310300	0.031040	0.030640	0.000400	0.998100	0.107800	0.920200
1454	0.307600	0.073180	0.071660	0.001519	0.998100	0.254200	0.920300
1455	0.306200	0.027240	0.026840	0.000399	0.998100	0.095660	0.920400
1456	0.306300	0.034620	0.034120	0.000499	0.998100	0.121500	0.920400
1457	0.308000	0.055950	0.054950	0.001004	0.998100	0.194500	0.920500
1458	0.310400	0.078350	0.076570	0.001772	0.998100	0.268900	0.920600
1459	0.311200	0.092140	0.090010	0.002126	0.998100	0.315300	0.920600
1460	0.308900	0.041930	0.041140	0.000791	0.998100	0.145200	0.920700
1461	0.307700	0.037490	0.036940	0.000545	0.998100	0.130900	0.920800
1462	0.305400	0.066300	0.064960	0.001344	0.998100	0.231800	0.920800
1463	0.303200	0.016270	0.016040	0.000230	0.998100	0.057670	0.920900
1464	0.303800	0.088320	0.086270	0.002045	0.998100	0.309400	0.921000
1465	0.303800	0.051150	0.050070	0.001085	0.998100	0.179500	0.921000
1466	0.303000	0.023000	0.022730	0.000270	0.998100	0.081740	0.921100
1467	0.305500	0.009725	0.009633	0.000092	0.998100	0.034370	0.921200
1468	0.303300	0.030180	0.029770	0.000409	0.998200	0.107000	0.921200
1469	0.305000	0.041990	0.041280	0.000708	0.998200	0.147400	0.921300
1470	0.302700	0.013270	0.013170	0.000097	0.998200	0.047440	0.921300
1471	0.299500	0.004620	0.004575	0.000044	0.998200	0.016680	0.921400
1472	0.299900	0.012320	0.012230	0.000087	0.998200	0.044730	0.921500
1473	0.297300	0.025570	0.025260	0.000306	0.998200	0.093020	0.921500
1474	0.294400	0.048890	0.047990	0.000909	0.998200	0.177900	0.921600

1475	0.296000	0.113600	0.110800	0.002790	0.998200	0.407600	0.921700
1476	0.296600	0.028350	0.027930	0.000421	0.998200	0.102700	0.921700
1477	0.296300	0.026400	0.026060	0.000341	0.998200	0.096030	0.921800
1478	0.295200	0.029480	0.028970	0.000517	0.998200	0.107100	0.921900
1479	0.297900	0.064370	0.063040	0.001333	0.998200	0.230900	0.921900
1480	0.298800	0.022910	0.022620	0.000295	0.998200	0.082560	0.922000
1481	0.296200	0.058800	0.057700	0.001102	0.998200	0.212300	0.922000
1482	0.296200	0.025690	0.025270	0.000423	0.998200	0.092940	0.922100
1483	0.293200	0.084050	0.082160	0.001892	0.998200	0.305100	0.922200
1484	0.295100	0.083650	0.081600	0.002048	0.998200	0.301000	0.922200
1485	0.297900	0.070730	0.069070	0.001663	0.998200	0.252300	0.922300
1486	0.295400	0.064790	0.063500	0.001290	0.998200	0.233900	0.922400
1487	0.288400	0.022450	0.022140	0.000307	0.998200	0.083580	0.922400
1488	0.272500	0.052320	0.051230	0.001092	0.998200	0.204600	0.922500
1489	0.285000	0.116800	0.113800	0.002992	0.998300	0.434300	0.922500
1490	0.294800	0.119700	0.116300	0.003451	0.998300	0.428900	0.922600
1491	0.294100	0.143800	0.139500	0.004330	0.998300	0.515900	0.922700
1492	0.293100	0.100600	0.098120	0.002449	0.998300	0.364100	0.922700
1493	0.294400	0.119100	0.115700	0.003325	0.998300	0.427600	0.922800
1494	0.295200	0.146800	0.142200	0.004636	0.998300	0.524000	0.922900
1495	0.292800	0.128000	0.124200	0.003806	0.998300	0.461100	0.922900
1496	0.287100	0.116000	0.112700	0.003299	0.998300	0.426800	0.923000
1497	0.288300	0.185000	0.178500	0.006491	0.998300	0.674000	0.923000
1498	0.290400	0.130300	0.126300	0.003937	0.998300	0.473200	0.923100
1499	0.289700	0.159900	0.154900	0.005004	0.998300	0.581100	0.923200
1500	0.291600	0.205400	0.198000	0.007344	0.998300	0.737900	0.923200
1501	0.291400	0.218500	0.210700	0.007817	0.998300	0.785600	0.923300
1502	0.283200	0.175700	0.169700	0.006037	0.998300	0.651000	0.923300
1503	0.271200	0.137200	0.133000	0.004170	0.998300	0.532900	0.923400
1504	0.271300	0.107700	0.104600	0.003104	0.998300	0.418700	0.923500
1505	0.266400	0.137000	0.132600	0.004435	0.998300	0.540600	0.923500
1506	0.275400	0.220600	0.212400	0.008190	0.998300	0.837700	0.923600
1507	0.284300	0.212200	0.204400	0.007742	0.998300	0.780900	0.923600
1508	0.282500	0.199300	0.192200	0.007119	0.998300	0.738700	0.923700
1509	0.282400	0.137600	0.133200	0.004379	0.998300	0.512300	0.923800
1510	0.286900	0.236500	0.227600	0.008925	0.998300	0.861200	0.923800
1511	0.287200	0.223900	0.215800	0.008123	0.998400	0.815700	0.923900
1512	0.283300	0.228400	0.219800	0.008632	0.998400	0.842300	0.923900
1513	0.280700	0.195600	0.188800	0.006787	0.998400	0.730100	0.924000
1514	0.281000	0.178200	0.172200	0.005968	0.998400	0.665300	0.924100
1515	0.282400	0.235000	0.226000	0.008935	0.998400	0.868500	0.924100
1516	0.281600	0.223500	0.215200	0.008371	0.998400	0.829200	0.924200
1517	0.281100	0.211500	0.203900	0.007577	0.998400	0.787100	0.924300
1518	0.282700	0.213900	0.206100	0.007822	0.998400	0.791000	0.924300

1519	0.281500	0.204400	0.197200	0.007204	0.998400	0.760300	0.924400
1520	0.281100	0.227700	0.219300	0.008324	0.998400	0.846600	0.924400
1521	0.277900	0.253600	0.243700	0.009946	0.998400	0.951500	0.924500
1522	0.276200	0.234200	0.225400	0.008797	0.998400	0.885400	0.924500
1523	0.278000	0.256300	0.246300	0.010080	0.998400	0.961200	0.924600
1524	0.278100	0.248000	0.238400	0.009639	0.998400	0.930300	0.924700
1525	0.276800	0.228800	0.220300	0.008405	0.998400	0.864400	0.924700
1526	0.279300	0.234200	0.225500	0.008629	0.998400	0.877000	0.924800
1527	0.279400	0.233600	0.224900	0.008743	0.998400	0.874300	0.924800
1528	0.279700	0.255500	0.245600	0.009915	0.998400	0.953300	0.924900
1529	0.275400	0.244900	0.235400	0.009477	0.998400	0.927700	0.925000
1530	0.269200	0.234300	0.225500	0.008776	0.998400	0.910400	0.925000
1531	0.275100	0.240900	0.231800	0.009132	0.998400	0.915500	0.925100
1532	0.277500	0.258500	0.248400	0.010110	0.998400	0.974600	0.925100
1533	0.275300	0.259800	0.249600	0.010210	0.998400	0.990700	0.925200
1534	0.272600	0.251900	0.242100	0.009767	0.998500	0.974200	0.925300
1535	0.273500	0.244900	0.235600	0.009311	0.998500	0.945700	0.925300
1536	0.275700	0.254800	0.244900	0.009859	0.998500	0.971400	0.925400
1537	0.275100	0.249700	0.240100	0.009548	0.998500	0.951600	0.925400
1538	0.272000	0.257500	0.247400	0.010090	0.998500	0.988100	0.925500
1539	0.270500	0.251000	0.241300	0.009695	0.998500	0.972600	0.925500
1540	0.267200	0.252400	0.242600	0.009854	0.998500	0.993800	0.925600
1541	0.268500	0.252500	0.242600	0.009812	0.998500	0.987300	0.925700
1542	0.270400	0.247300	0.237900	0.009444	0.998500	0.959500	0.925700
1543	0.271400	0.255200	0.245300	0.009904	0.998500	0.984600	0.925800
1544	0.272800	0.250300	0.240800	0.009571	0.998500	0.959000	0.925800
1545	0.273100	0.260000	0.249900	0.010150	0.998500	0.992900	0.925900
1546	0.272400	0.255600	0.245700	0.009868	0.998500	0.978000	0.925900
1547	0.268400	0.255100	0.245100	0.009921	0.998500	0.989600	0.926000
1548	0.265100	0.252100	0.242300	0.009797	0.998500	0.989800	0.926100
1549	0.266700	0.255900	0.245900	0.009996	0.998500	0.998700	0.926100
1550	0.265700	0.253800	0.243900	0.009873	0.998500	0.994300	0.926200
1551	0.266600	0.253800	0.243900	0.009838	0.998500	0.990700	0.926200
1552	0.268300	0.250600	0.241000	0.009595	0.998500	0.972800	0.926300
1553	0.265300	0.253600	0.243800	0.009843	0.998500	0.995000	0.926300
1554	0.261600	0.249000	0.239400	0.009622	0.998500	0.990500	0.926400
1555	0.261500	0.250200	0.240500	0.009692	0.998500	0.995600	0.926500
1556	0.261200	0.249300	0.239700	0.009636	0.998500	0.993500	0.926500
1557	0.263400	0.252000	0.242300	0.009744	0.998500	0.995600	0.926600
1558	0.263500	0.252100	0.242400	0.009738	0.998500	0.995800	0.926600
1559	0.261900	0.250300	0.240700	0.009652	0.998500	0.994600	0.926700
1560	0.262200	0.250300	0.240600	0.009629	0.998600	0.993400	0.926700
1561	0.264600	0.252900	0.243200	0.009727	0.998600	0.994500	0.926800
1562	0.263900	0.250200	0.240600	0.009562	0.998600	0.986500	0.926900

1563	0.261300	0.248500	0.239000	0.009509	0.998600	0.989700	0.926900
1564	0.260400	0.247300	0.237900	0.009446	0.998600	0.988600	0.927000
1565	0.261100	0.249900	0.240300	0.009582	0.998600	0.996000	0.927000
1566	0.258300	0.245900	0.236500	0.009383	0.998600	0.990900	0.927100
1567	0.257400	0.245600	0.236200	0.009375	0.998600	0.994800	0.927100
1568	0.256000	0.241800	0.232600	0.009161	0.998600	0.991700	0.927200
1569	0.255100	0.238600	0.229700	0.008972	0.998600	0.998100	0.927200
1570	0.256500	0.232400	0.223800	0.008536	0.998600	0.996900	0.927300
1571	0.259400	0.226400	0.218300	0.008099	0.998600	0.996200	0.927400
1572	0.259200	0.228000	0.219800	0.008195	0.998600	0.997100	0.927400
1573	0.257600	0.226200	0.218100	0.008113	0.998600	0.996900	0.927500
1574	0.252500	0.227500	0.219200	0.008295	0.998600	0.996700	0.927500
1575	0.245900	0.230000	0.221400	0.008596	0.998600	0.998000	0.927600
1576	0.245600	0.225700	0.217400	0.008321	0.998600	0.994500	0.927600
1577	0.238900	0.214000	0.206300	0.007748	0.998600	0.998100	0.927700
1578	0.245200	0.220200	0.212200	0.007975	0.998600	0.998800	0.927700
1579	0.253300	0.224700	0.216600	0.008062	0.998600	0.991500	0.927800
1580	0.255500	0.231800	0.223300	0.008435	0.998600	0.998500	0.927900
1581	0.254300	0.232700	0.224200	0.008510	0.998600	0.998000	0.927900
1582	0.248300	0.229400	0.221000	0.008436	0.998600	0.997300	0.928000
1583	0.247400	0.228400	0.220000	0.008386	0.998600	0.986900	0.928000
1584	0.248900	0.234800	0.226000	0.008738	0.998600	0.999400	0.928100
1585	0.250900	0.237900	0.229000	0.008879	0.998600	0.997700	0.928100
1586	0.250200	0.236300	0.227500	0.008789	0.998600	0.988600	0.928200
1587	0.246900	0.233000	0.224300	0.008650	0.998600	0.985500	0.928200
1588	0.240100	0.230300	0.221700	0.008633	0.998700	0.999100	0.928300
1589	0.230500	0.221300	0.213000	0.008295	0.998700	0.999500	0.928300
1590	0.231400	0.220800	0.212600	0.008237	0.998700	0.993200	0.928400
1591	0.236900	0.226600	0.218200	0.008458	0.998700	0.995400	0.928500
1592	0.244500	0.231600	0.223000	0.008579	0.998700	0.985600	0.928500
1593	0.249600	0.239100	0.230200	0.008909	0.998700	0.996200	0.928600
1594	0.250600	0.238100	0.229300	0.008821	0.998700	0.988600	0.928600
1595	0.249000	0.238100	0.229200	0.008843	0.998700	0.994600	0.928700
1596	0.242400	0.230900	0.222400	0.008550	0.998700	0.991500	0.928700
1597	0.243800	0.229800	0.221400	0.008439	0.998700	0.982800	0.928800
1598	0.248700	0.236200	0.227500	0.008705	0.998700	0.995800	0.928800
1599	0.246800	0.230400	0.222000	0.008388	0.998700	0.995900	0.928900
1600	0.245100	0.224900	0.216800	0.008081	0.998700	0.999500	0.928900
1601	0.242400	0.216600	0.209000	0.007634	0.998700	0.995600	0.929000
1602	0.242600	0.214300	0.206800	0.007489	0.998700	0.990000	0.929000
1603	0.244100	0.216500	0.208900	0.007577	0.998700	0.999100	0.929100
1604	0.243700	0.218500	0.210800	0.007697	0.998700	0.998500	0.929200
1605	0.242700	0.225500	0.217400	0.008130	0.998700	0.999600	0.929200
1606	0.241300	0.226900	0.218700	0.008239	0.998700	0.998900	0.929300

1607	0.241200	0.222400	0.214500	0.007963	0.998700	0.999300	0.929300
1608	0.243400	0.218400	0.210700	0.007663	0.998700	0.991800	0.929400
1609	0.239900	0.215000	0.207500	0.007533	0.998700	0.997000	0.929400
1610	0.232900	0.211800	0.204300	0.007491	0.998700	0.996800	0.929500
1611	0.233800	0.213800	0.206300	0.007582	0.998700	0.995000	0.929500
1612	0.237000	0.219800	0.211900	0.007859	0.998700	0.999400	0.929600
1613	0.238900	0.222100	0.214200	0.007945	0.998700	0.993100	0.929600
1614	0.239300	0.225300	0.217100	0.008121	0.998700	0.996600	0.929700
1615	0.236300	0.223900	0.215800	0.008100	0.998700	0.998500	0.929700
1616	0.231200	0.219600	0.211700	0.007952	0.998700	0.997100	0.929800
1617	0.232900	0.220800	0.212800	0.007973	0.998700	0.992300	0.929800
1618	0.237700	0.227100	0.218900	0.008238	0.998700	0.999100	0.929900
1619	0.237400	0.225100	0.217000	0.008115	0.998800	0.989900	0.929900
1620	0.231900	0.222300	0.214200	0.008066	0.998800	0.999500	0.930000
1621	0.230500	0.221100	0.213100	0.008014	0.998800	0.999500	0.930000
1622	0.234500	0.224800	0.216700	0.008140	0.998800	0.998800	0.930100
1623	0.237800	0.228100	0.219900	0.008258	0.998800	0.998900	0.930100
1624	0.238200	0.228200	0.220000	0.008243	0.998800	0.999000	0.930200
1625	0.236300	0.225700	0.217600	0.008127	0.998800	0.993800	0.930200
1626	0.236600	0.226600	0.218500	0.008169	0.998800	0.999100	0.930300
1627	0.237700	0.227900	0.219700	0.008213	0.998800	0.999500	0.930400
1628	0.238500	0.228200	0.220000	0.008204	0.998800	0.999200	0.930400
1629	0.237300	0.227400	0.219200	0.008175	0.998800	0.999500	0.930500
1630	0.235300	0.225300	0.217200	0.008085	0.998800	0.999300	0.930500
1631	0.235400	0.224400	0.216400	0.008025	0.998800	0.998700	0.930600
1632	0.234600	0.222900	0.214900	0.007941	0.998800	0.989900	0.930600
1633	0.232000	0.218900	0.211200	0.007759	0.998800	0.992000	0.930700
1634	0.230700	0.220900	0.213000	0.007894	0.998800	0.998600	0.930700
1635	0.232600	0.219200	0.211400	0.007741	0.998800	0.991700	0.930800
1636	0.230600	0.219900	0.212100	0.007823	0.998800	0.998900	0.930800
1637	0.225900	0.215500	0.207900	0.007663	0.998800	0.996000	0.930900
1638	0.221600	0.207500	0.200200	0.007275	0.998800	0.998600	0.930900
1639	0.219400	0.207900	0.200500	0.007342	0.998800	0.991700	0.931000
1640	0.220700	0.202300	0.195300	0.006980	0.998800	0.983900	0.931000
1641	0.220000	0.207600	0.200300	0.007300	0.998800	0.998600	0.931100
1642	0.220700	0.208200	0.200900	0.007310	0.998800	0.992600	0.931100
1643	0.223000	0.204200	0.197200	0.007020	0.998800	0.997300	0.931200
1644	0.222400	0.211500	0.204000	0.007449	0.998800	0.999100	0.931200
1645	0.222600	0.206800	0.199600	0.007165	0.998800	0.987000	0.931300
1646	0.224700	0.204900	0.197900	0.007003	0.998800	0.980600	0.931300
1647	0.225800	0.214800	0.207300	0.007550	0.998800	0.996600	0.931400
1648	0.225000	0.206300	0.199300	0.007063	0.998800	0.993800	0.931400
1649	0.223200	0.209300	0.202000	0.007269	0.998800	0.991600	0.931500
1650	0.223500	0.210600	0.203300	0.007332	0.998800	0.990200	0.931500

1651	0.223000	0.202500	0.195700	0.006867	0.998800	0.994500	0.931600
1652	0.223600	0.206900	0.199800	0.007122	0.998800	0.967700	0.931600
1653	0.223900	0.210300	0.203000	0.007289	0.998900	0.981800	0.931700
1654	0.223500	0.205600	0.198600	0.007015	0.998900	0.989900	0.931700
1655	0.223100	0.210900	0.203500	0.007321	0.998900	0.988200	0.931800
1656	0.223700	0.207800	0.200700	0.007123	0.998900	0.979800	0.931800
1657	0.223800	0.209600	0.202400	0.007216	0.998900	0.981500	0.931900
1658	0.222900	0.211300	0.204000	0.007330	0.998900	0.986100	0.931900
1659	0.221700	0.210900	0.203600	0.007325	0.998900	0.994500	0.932000
1660	0.222200	0.211200	0.203900	0.007326	0.998900	0.992200	0.932000
1661	0.223100	0.209600	0.202400	0.007211	0.998900	0.977200	0.932100
1662	0.222100	0.203200	0.196300	0.006858	0.998900	0.959300	0.932100
1663	0.220700	0.209900	0.202600	0.007262	0.998900	0.990200	0.932200
1664	0.219900	0.207000	0.199900	0.007113	0.998900	0.979800	0.932200
1665	0.218600	0.202000	0.195100	0.006836	0.998900	0.992700	0.932300
1666	0.217700	0.176900	0.171400	0.005484	0.998900	0.967300	0.932300
1667	0.217100	0.200900	0.194100	0.006796	0.998900	0.994000	0.932400
1668	0.215100	0.204800	0.197700	0.007056	0.998900	0.998000	0.932400
1669	0.215900	0.199200	0.192400	0.006726	0.998900	0.962100	0.932500
1670	0.218100	0.207200	0.200100	0.007118	0.998900	0.989300	0.932500
1671	0.216200	0.203600	0.196700	0.006948	0.998900	0.985000	0.932600
1672	0.211600	0.200000	0.193200	0.006836	0.998900	0.984300	0.932600
1673	0.211900	0.201900	0.195000	0.006925	0.998900	0.990700	0.932600
1674	0.213800	0.200400	0.193600	0.006794	0.998900	0.983800	0.932700
1675	0.211500	0.198700	0.192000	0.006747	0.998900	0.983800	0.932700
1676	0.209700	0.195200	0.188600	0.006589	0.998900	0.967700	0.932800
1677	0.210800	0.196400	0.189800	0.006632	0.998900	0.975200	0.932800
1678	0.210500	0.192200	0.185800	0.006395	0.998900	0.964300	0.932900
1679	0.207400	0.197300	0.190600	0.006730	0.998900	0.988900	0.932900
1680	0.201700	0.190400	0.184000	0.006454	0.998900	0.982300	0.933000
1681	0.197100	0.185500	0.179200	0.006260	0.998900	0.993900	0.933000
1682	0.199200	0.190500	0.184000	0.006495	0.998900	0.994900	0.933100
1683	0.204100	0.194400	0.187800	0.006604	0.998900	0.989800	0.933100
1684	0.207500	0.180900	0.175000	0.005916	0.998900	0.931200	0.933200
1685	0.208300	0.199100	0.192400	0.006771	0.998900	0.994600	0.933200
1686	0.207800	0.197700	0.191100	0.006696	0.998900	0.989700	0.933300
1687	0.207600	0.189800	0.183500	0.006272	0.998900	0.965400	0.933300
1688	0.207600	0.197700	0.191000	0.006683	0.998900	0.993400	0.933400
1689	0.206200	0.194800	0.188200	0.006551	0.998900	0.983500	0.933400
1690	0.206400	0.191000	0.184700	0.006356	0.998900	0.965300	0.933500
1691	0.208300	0.170600	0.165200	0.005350	0.999000	0.863400	0.933500
1692	0.208800	0.190700	0.184400	0.006279	0.999000	0.954000	0.933600
1693	0.208400	0.199200	0.192500	0.006719	0.999000	0.994300	0.933600
1694	0.208000	0.189800	0.183600	0.006219	0.999000	0.960700	0.933700

1695	0.207800	0.197700	0.191100	0.006636	0.999000	0.993100	0.933700
1696	0.207100	0.196500	0.189900	0.006586	0.999000	0.986100	0.933700
1697	0.206300	0.154200	0.149600	0.004577	0.999000	0.787100	0.933800
1698	0.206000	0.195200	0.188700	0.006516	0.999000	0.989800	0.933800
1699	0.205000	0.190600	0.184300	0.006306	0.999000	0.968300	0.933900
1700	0.203300	0.184500	0.178500	0.006012	0.999000	0.950700	0.933900
1702	0.201600	0.191700	0.185300	0.006388	0.999000	0.993600	0.934000
1705	0.201500	0.182800	0.176800	0.005920	0.999000	0.953100	0.934200
1710	0.196600	0.172700	0.167100	0.005533	0.999000	0.920900	0.934400
1715	0.199000	0.170800	0.165400	0.005390	0.999000	0.895600	0.934600
1720	0.195100	0.170700	0.165300	0.005430	0.999000	0.913300	0.934900
1725	0.191500	0.157100	0.152200	0.004840	0.999000	0.861700	0.935100
1730	0.190300	0.154700	0.150000	0.004708	0.999000	0.851900	0.935300
1735	0.178800	0.140800	0.136500	0.004232	0.999100	0.822200	0.935500
1740	0.183200	0.143700	0.139400	0.004276	0.999100	0.819000	0.935800
1745	0.183800	0.132900	0.129000	0.003882	0.999100	0.753900	0.936000
1750	0.182700	0.145300	0.141000	0.004277	0.999100	0.828500	0.936200
1755	0.182600	0.127900	0.124300	0.003621	0.999100	0.730100	0.936400
1760	0.180200	0.138200	0.134200	0.003974	0.999100	0.799100	0.936600
1765	0.178800	0.103700	0.101000	0.002742	0.999100	0.606500	0.936900
1770	0.177300	0.108200	0.105500	0.002725	0.999100	0.639800	0.937100
1775	0.175400	0.080400	0.078570	0.001830	0.999100	0.482200	0.937300
1780	0.173000	0.065310	0.063920	0.001385	0.999100	0.396700	0.937500
1785	0.171700	0.042030	0.041290	0.000748	0.999200	0.258200	0.937700
1790	0.171300	0.054790	0.053770	0.001018	0.999200	0.338900	0.937900
1795	0.168700	0.018110	0.017940	0.000168	0.999200	0.114200	0.938100
1800	0.166700	0.014410	0.014240	0.000168	0.999200	0.091520	0.938300
1805	0.165200	0.002735	0.002727	0.000008	0.999200	0.017720	0.938500
1810	0.164000	0.001120	0.001116	0.000005	0.999200	0.007299	0.938700
1815	0.157500	0.000212	0.000212	0.000000	0.999200	0.001443	0.938900
1820	0.152800	0.000028	0.000028	0.000000	0.999200	0.000194	0.939200
1825	0.158000	0.000039	0.000039	0.000000	0.999200	0.000267	0.939400
1830	0.157100	0.000000	0.000000	0.000000	0.999200	0.000000	0.939600
1835	0.155600	0.000000	0.000000	0.000000	0.999200	0.000000	0.939800
1840	0.153500	0.000000	0.000000	0.000000	0.999300	0.000000	0.939900
1845	0.151000	0.000000	0.000000	0.000000	0.999300	0.000000	0.940100
1850	0.151200	0.000000	0.000000	0.000000	0.999300	0.000000	0.940300
1855	0.149400	0.000000	0.000000	0.000000	0.999300	0.000000	0.940500
1860	0.147400	0.000000	0.000000	0.000000	0.999300	0.000000	0.940700
1865	0.145200	0.000000	0.000000	0.000000	0.999300	0.000000	0.940900
1870	0.143500	0.000000	0.000000	0.000000	0.999300	0.000000	0.941100
1875	0.130900	0.000000	0.000000	0.000000	0.999300	0.000000	0.941300
1880	0.140000	0.000001	0.000001	0.000000	0.999300	0.000005	0.941500
1885	0.140200	0.000000	0.000000	0.000000	0.999300	0.000002	0.941700

1890	0.138400	0.000001	0.000001	0.000000	0.999300	0.000012	0.941900
1895	0.134900	0.000001	0.000001	0.000000	0.999300	0.000010	0.942000
1900	0.136700	0.000000	0.000000	0.000000	0.999300	0.000000	0.942200
1905	0.136200	0.000000	0.000000	0.000000	0.999300	0.000000	0.942400
1910	0.134800	0.000000	0.000000	0.000000	0.999400	0.000001	0.942600
1915	0.134200	0.000000	0.000000	0.000000	0.999400	0.000001	0.942800
1920	0.132100	0.000006	0.000006	0.000000	0.999400	0.000046	0.943000
1925	0.131500	0.000028	0.000028	0.000000	0.999400	0.000229	0.943100
1930	0.128000	0.000019	0.000019	0.000000	0.999400	0.000162	0.943300
1935	0.128300	0.000341	0.000340	0.000001	0.999400	0.002831	0.943500
1940	0.125900	0.000436	0.000435	0.000001	0.999400	0.003730	0.943700
1945	0.117200	0.002860	0.002848	0.000012	0.999400	0.028330	0.943800
1950	0.122200	0.006845	0.006794	0.000051	0.999400	0.074880	0.944000
1955	0.124700	0.003589	0.003575	0.000014	0.999400	0.052730	0.944200
1960	0.123200	0.011800	0.011700	0.000102	0.999400	0.142500	0.944400
1965	0.120700	0.018990	0.018780	0.000214	0.999400	0.245800	0.944500
1970	0.121000	0.036760	0.036200	0.000568	0.999400	0.407000	0.944700
1975	0.119000	0.047420	0.046590	0.000834	0.999400	0.458200	0.944900
1980	0.117600	0.057100	0.055950	0.001156	0.999400	0.519700	0.945000
1985	0.116900	0.065060	0.063650	0.001405	0.999400	0.582800	0.945200
1990	0.117200	0.064290	0.062940	0.001344	0.999500	0.575100	0.945400
1995	0.115000	0.066620	0.065220	0.001404	0.999500	0.649000	0.945500
2000	0.114900	0.040190	0.039610	0.000576	0.999500	0.695200	0.945700
2005	0.113500	0.018070	0.017910	0.000157	0.999500	0.550000	0.945900
2010	0.113500	0.048850	0.048120	0.000733	0.999500	0.935200	0.946000
2015	0.112300	0.030930	0.030560	0.000371	0.999500	0.688500	0.946200
2020	0.110300	0.047680	0.046930	0.000752	0.999500	0.775000	0.946400
2025	0.109900	0.072370	0.070900	0.001474	0.999500	0.872400	0.946500
2030	0.108000	0.076040	0.074380	0.001656	0.999500	0.802800	0.946700
2035	0.107300	0.089810	0.087670	0.002138	0.999500	0.918000	0.946800
2040	0.106200	0.082850	0.080950	0.001895	0.999500	0.868800	0.947000
2045	0.106500	0.085790	0.083830	0.001961	0.999500	0.907200	0.947200
2050	0.105300	0.070860	0.069440	0.001420	0.999500	0.938700	0.947300
2055	0.104200	0.059760	0.058690	0.001072	0.999500	0.907200	0.947500
2060	0.102800	0.069190	0.067800	0.001390	0.999500	0.884300	0.947600
2065	0.101700	0.065370	0.064110	0.001255	0.999500	0.919100	0.947800
2070	0.101100	0.067680	0.066350	0.001331	0.999500	0.910000	0.947900
2075	0.101000	0.077920	0.076240	0.001687	0.999500	0.944100	0.948100
2080	0.099500	0.083640	0.081710	0.001928	0.999500	0.931600	0.948200
2085	0.098660	0.082630	0.080740	0.001890	0.999500	0.936200	0.948400
2090	0.097800	0.086600	0.084560	0.002037	0.999600	0.964100	0.948500
2095	0.096170	0.085600	0.083580	0.002027	0.999600	0.944500	0.948700
2100	0.096360	0.079100	0.077280	0.001818	0.999600	0.861300	0.948800
2105	0.095920	0.089530	0.087370	0.002155	0.999600	0.975700	0.949000

2110	0.094670	0.085020	0.083020	0.002005	0.999600	0.942100	0.949100
2115	0.093900	0.087590	0.085500	0.002094	0.999600	0.971200	0.949300
2120	0.092830	0.081650	0.079750	0.001902	0.999600	0.915200	0.949400
2125	0.091900	0.083470	0.081500	0.001969	0.999600	0.941400	0.949600
2130	0.091840	0.084800	0.082780	0.002015	0.999600	0.954400	0.949700
2135	0.090640	0.085450	0.083420	0.002033	0.999600	0.973400	0.949800
2140	0.090400	0.086550	0.084480	0.002069	0.999600	0.988100	0.950000
2145	0.089300	0.085450	0.083420	0.002036	0.999600	0.989200	0.950100
2150	0.088810	0.078050	0.076280	0.001772	0.999600	0.913600	0.950300
2155	0.087930	0.078570	0.076780	0.001788	0.999600	0.927700	0.950400
2160	0.086680	0.078230	0.076440	0.001785	0.999600	0.939400	0.950600
2165	0.081250	0.070740	0.069150	0.001592	0.999600	0.906000	0.950700
2170	0.083690	0.076210	0.074460	0.001752	0.999600	0.945200	0.950800
2175	0.084400	0.073410	0.071780	0.001634	0.999600	0.902700	0.951000
2180	0.083500	0.076690	0.074940	0.001748	0.999600	0.955000	0.951100
2185	0.083340	0.066020	0.064610	0.001405	0.999600	0.821900	0.951200
2190	0.082260	0.073050	0.071420	0.001632	0.999600	0.918300	0.951400
2195	0.082430	0.072540	0.070940	0.001605	0.999600	0.910600	0.951500
2200	0.081780	0.066700	0.065280	0.001412	0.999600	0.891900	0.951600
2205	0.080060	0.068320	0.066830	0.001482	0.999600	0.897300	0.951800
2210	0.079650	0.074300	0.072630	0.001672	0.999600	0.964900	0.951900
2215	0.079490	0.071050	0.069490	0.001565	0.999600	0.930700	0.952000
2220	0.078990	0.073890	0.072240	0.001650	0.999600	0.979600	0.952200
2225	0.078040	0.071180	0.069610	0.001567	0.999700	0.957000	0.952300
2230	0.077560	0.073000	0.071380	0.001626	0.999700	0.993300	0.952400
2235	0.077160	0.071190	0.069620	0.001564	0.999700	0.977500	0.952600
2240	0.075980	0.070970	0.069410	0.001562	0.999700	0.993200	0.952700
2245	0.075690	0.068810	0.067330	0.001483	0.999700	0.982600	0.952800
2250	0.074950	0.069970	0.068440	0.001529	0.999700	0.992800	0.952900
2255	0.074040	0.066750	0.065330	0.001420	0.999700	0.990100	0.953100
2260	0.073730	0.066020	0.064630	0.001394	0.999700	0.988100	0.953200
2265	0.072950	0.066830	0.065400	0.001428	0.999700	0.991200	0.953300
2270	0.072710	0.064380	0.063040	0.001339	0.999700	0.989400	0.953400
2275	0.072170	0.063610	0.062300	0.001315	0.999700	0.989500	0.953600
2280	0.071030	0.064860	0.063490	0.001370	0.999700	0.988100	0.953700
2285	0.070670	0.062340	0.061060	0.001281	0.999700	0.988300	0.953800
2290	0.070400	0.062240	0.060960	0.001277	0.999700	0.986500	0.953900
2295	0.068760	0.060530	0.059300	0.001235	0.999700	0.985100	0.954100
2300	0.068790	0.057680	0.056540	0.001135	0.999700	0.963700	0.954200
2305	0.068550	0.057650	0.056520	0.001134	0.999700	0.957100	0.954300
2310	0.068070	0.059380	0.058180	0.001202	0.999700	0.930300	0.954400
2315	0.067320	0.055600	0.054520	0.001082	0.999700	0.933700	0.954500
2320	0.066610	0.049390	0.048480	0.000911	0.999700	0.873800	0.954700
2325	0.065070	0.050430	0.049480	0.000959	0.999700	0.835500	0.954800

2330	0.065400	0.052080	0.051100	0.000980	0.999700	0.879300	0.954900
2335	0.064850	0.054300	0.053250	0.001053	0.999700	0.917200	0.955000
2340	0.064550	0.039290	0.038640	0.000652	0.999700	0.703300	0.955100
2345	0.064370	0.047350	0.046500	0.000849	0.999700	0.847500	0.955300
2350	0.063480	0.035800	0.035210	0.000594	0.999700	0.666000	0.955400
2355	0.062000	0.042650	0.041910	0.000737	0.999700	0.795400	0.955500
2360	0.062310	0.045160	0.044360	0.000799	0.999700	0.819600	0.955600
2365	0.062180	0.041820	0.041080	0.000737	0.999700	0.730400	0.955700
2370	0.061460	0.024770	0.024440	0.000334	0.999700	0.531500	0.955800
2375	0.060620	0.038030	0.037400	0.000631	0.999700	0.721600	0.955900
2380	0.060690	0.032320	0.031810	0.000505	0.999700	0.573700	0.956100
2385	0.058650	0.021810	0.021530	0.000289	0.999700	0.416100	0.956200
2390	0.059300	0.028480	0.028050	0.000426	0.999700	0.524800	0.956300
2395	0.059170	0.033090	0.032570	0.000520	0.999700	0.618100	0.956400
2400	0.058780	0.035730	0.035160	0.000568	0.999700	0.654300	0.956500
2405	0.058440	0.023280	0.022950	0.000326	0.999700	0.428900	0.956600
2410	0.058030	0.023000	0.022700	0.000308	0.999700	0.419700	0.956700
2415	0.056190	0.017050	0.016860	0.000192	0.999700	0.319900	0.956800
2420	0.056590	0.017040	0.016840	0.000200	0.999800	0.316900	0.956900
2425	0.056310	0.023000	0.022710	0.000294	0.999800	0.433500	0.957000
2430	0.056130	0.033980	0.033490	0.000492	0.999800	0.634400	0.957200
2435	0.055420	0.007528	0.007464	0.000064	0.999800	0.143200	0.957300
2440	0.055290	0.030440	0.030020	0.000422	0.999800	0.574600	0.957400
2445	0.054570	0.011700	0.011580	0.000114	0.999800	0.224400	0.957500
2450	0.053630	0.006303	0.006255	0.000048	0.999800	0.123400	0.957600
2455	0.053260	0.012570	0.012430	0.000133	0.999800	0.246100	0.957700
2460	0.053440	0.021570	0.021330	0.000246	0.999800	0.420100	0.957800
2465	0.053290	0.013110	0.012990	0.000118	0.999800	0.256400	0.957900
2470	0.052410	0.007009	0.006967	0.000043	0.999800	0.139900	0.958000
2475	0.052380	0.006685	0.006644	0.000041	0.999800	0.133300	0.958100
2480	0.051250	0.001757	0.001750	0.000007	0.999800	0.036020	0.958200
2485	0.050890	0.001188	0.001185	0.000003	0.999800	0.024580	0.958300
2490	0.051080	0.000475	0.000474	0.000001	0.999800	0.009787	0.958400
2495	0.050770	0.000423	0.000422	0.000001	0.999800	0.008754	0.958500
2500	0.050620	0.001106	0.001104	0.000002	0.999800	0.022960	0.958600