



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل



**STUDIES ON SOLAR AND TERRESTRIAL RADIATION
TRANSFER THROUGH THE EARTH-ATMOSPHERE
SYSTEM, INCLUDING ATMOSPHERIC
GREENHOUSE EFFECT**

A THESIS

**Submitted to Faculty of Science (Qena)
South Valley University**

For The Degree Of Ph.D. Of Science (Physics)

By

Badry Nobi Mohamed Abdalla

M. Sc. in Physics

Department of physics(Qena)

South Valley University

1998

BN 145

Acknowledgment

Acknowledgment

First of all, it is my duty to bow my head in true gratitude to the **Almighty God**, Whose guidance and help enabled me to take the first steps on the path of improving my knowledge through this humble effort

I would like to thank my supervisor **Prof. Abdelazeem M. Abdelmegeed, Professor of atmospheric physics at Phys. Dept.- Faculty of Science in Qena**, for his keen interest in the work, suggesting the problem and his true efforts to facilitate all scientific problems, continuous discussion, encouragement, and fruitful advice.

I have great pleasure in expressing my deepest appreciation to **Prof. Sayed M. El Shazly, Professor of atmospheric physics and the head of Phys. Dept.- Faculty of Science in Qena**, for his effort in suggesting the problem, supervision. Also for his true efforts to facilitate all scientific problems and the beneficial discussion throughout the course of this work.

I would like to thank my advisor **Dr. Melanie A. Wetzel, Associate Research Professor of atmospheric science at Desert Research Institute-University and Community College System of Nevada U.S.A**, who gave me the opportunity to perform this work, and followed each step of my thesis work with patience, beneficial discussion, encouragement, and providing the excellent research facilities.

I'm also grateful to thank all DRI staff specially **Prof. Peter Parber**, Chairman of Atmospheric Sciences Center at DRI, **Dr. Randolph Borys, Prof. Douglas Lowenthal, Dr. Darko Koracin and Dr. Kelly Redmond**, for their helpful, motivation, and encouragements. I'm also thankful for everybody who gave me hand during this work.

I would like to introduce my thankful to the Dean of Faculty of Science, and the head of Phys. Dept. in Qena-South Valley University, for their kindness, and encouragements.

Thanks also to all staff members and colleagues in the department of Physics at Qena-South Valley University for their care and kind help.

Abstract

Abstract

This work deals with very interesting problem concerning studies on solar and terrestrial radiation transfer through the Earth-atmosphere system, including atmospheric greenhouse effect. Greenhouse gases (H_2O , CO_2 , O_3 , CH_4 , N_2O and CFCs), aerosols, and clouds play an important role in climate change. Most of these parameters are effective absorbers and/or scatterers, and this may perturb the energy balance on the Earth. Consequent warming or cooling in the Earth-atmosphere system may occur, such as increase in the Earth's surface temperature due to greenhouse warming effect, cooling due to aerosol scattering, or change in meteorological conditions. The evidence that human activities are altering the concentration of these greenhouse gases and the other parameters in the atmosphere and intensifying the greenhouse effect is incontrovertible, but there is a considerable uncertainty about the consequences for climate change processes.

The modeling objective of this study is to give an improved understanding of how changing greenhouse gases concentration, aerosols and clouds affect on the variability of solar and terrestrial radiation of the Earth-atmosphere system, radiative forcing, rate of temperature change and the equilibrium warming. A research program of data analysis and radiative transfer modeling using standard and local atmospheric conditions for specific location has been carried out by applying the developed Streamer radiative transfer model given by (J. Key, Univ of Colorado U.S.A) during the time period from 1982 to 1992.

The methodology of this study is totally devoted to : description on the location of study, measuring methods of greenhouse gases, collecting data from ground and satellite measurements, applied model, computational methods involving theoretical equations and FORTRAN programs (Appendices A, B and D) are designed to calculate the following (a) : net shortwave and longwave radiative fluxes; (b) : rate of temperature change; and (c): equilibrium warming of the most greenhouse gases.

The Streamer radiative transfer model has been applied for calculating the radiative flux components at different altitudes due to changing the concentration of some greenhouse gases (H_2O , CO_2 and O_3), aerosols and

cloud parameters during the period from 1982 to 1992. The modeling output results indicated that H_2O and CO_2 within the shortwave spectral bands and at different solar zenith angles are considerably absorbers for solar radiation within the shortwave bands (0.78-1 and 2.91-4 μm) and (1.64-2.13 μm), respectively, and effective absorbers and emitters for thermal radiation within the longwave bands (4.17-500 μm) and (12.2-19.2 μm), respectively. Whereas O_3 is effective absorber for ultraviolet solar radiation within the UV band (0.28-0.36 μm), while it is also a considerable absorber and emitter for thermal radiation within the IR band (7.94-10.9 μm). The combined effect of all gases in cloud-free and cloudiness sky conditions is investigated. For aerosols, the results indicated that it is a good scatterers for solar radiation and considerably absorber for longwave radiation. Also, the combined effect of all gases including aerosols in cloudless and cloudiness sky conditions are investigated.

The results of cloud radiative forcing indicated that due to the reflection of solar radiation, clouds have negative radiative forcing (cooling). While due to the absorption of longwave radiation, they have positive radiative forcing (heating). The net radiative effect of clouds yield cooling and it is greater at the upper atmosphere than that given at the Earth's surface.

The rate of temperature change per day in the presence of water vapor, carbon dioxide and ozone has been calculated at different altitudes. The results indicated that the radiative heat exchange at tropospheric region by H_2O , CO_2 and O_3 produce cooling of 1.63, 0.26 and 0.01 $^{\circ}\text{C}/\text{day}$, with 85.7, 13.8 and 0.5 % from the total by all gases, respectively. The combined effect of all gases (H_2O , CO_2 and O_3) in cloudless and cloudiness sky conditions at tropospheric region produces cooling of 1.59 and 1.79 $^{\circ}\text{C}/\text{day}$, respectively. Cooling rate near Earth's surface is reduced from 2.12 $^{\circ}\text{C}/\text{day}$ in cloudless conditions to about 1.0 $^{\circ}\text{C}/\text{day}$ in cloudiness sky conditions.

In the stratosphere layers, the rate of temperature change due to ozone effect on thermal radiation is -0.03 $^{\circ}\text{C}/\text{day}$. On other hand, the results of the computed rate of temperature change due to the absorption of ultraviolet solar radiation by ozone at three different solar zenith angles (30°, 45.5° and 75°) shows maxima heating at 40 km of 3.4, 3.18 and 1.95 $^{\circ}\text{C}/\text{day}$, respectively. The net radiative heat exchange due to ozone effect shows