EGYPT

OBSERVATIONAL ACTIVITIES

Column measurements of ozone

At Egypt, only Egyptian Meteorological Authority (EMA) is responsible for measurements of column ozone amount and operates the main total ozone-monitoring network. Long-term daily observations of total ozone have been performed at the regional ozone center of EMA at Cairo (30.08ºN, 31.28ºE) with the Dobson Spectrophotometer (D096) since 1967. Since 1984 second Dobson instrument (D069) has been maintained at Aswan (23.97ºN, 32.87ºE) to measure the amount of ozone over tropical area. At the late of 1998 Brewer Spectrophotometer mark II (B143) has been maintained at Matrouh (31.33ºN, 27.22ºE) to measure the total ozone and SO_2 over northwest coast area of Egypt. With the end of 1999 third Dobson Spectrophotometer (D059) has been maintained at Hurghada (27.28°N. 33.75ºE) to measure the amount of ozone over Red sea area.

Vertical Distribution of Ozone

Vertical distribution of ozone in the atmosphere is measured with Dobson and Brewer Spectrophotometers (Umkehr method) at Aswan, Matrouh and Hurghada. The N-values are stored in the ozone database at EMA and they are also deposited in the WOUDC, Toronto.

Surface ozone

EMA measure surface ozone outside urban regions, at Hurghada (27.28°N. 33.75ºE) which is an official WMO Global Atmospheric Watch (GAW) station. Also EMA measure surface ozone at Sidi Branni (31.37ºN, 25.53ºE). South Valley University (SVU) in cooperation EMA has been measured surface ozone at Qena (26.20ºN, 32.75ºE).

UV measurements

Broadband measurements

EMA take the measurements of broadband UV solar radiation using Eppley Ultraviolet Radiometer at Cairo and Aswan since 1989. Also EMA in cooperation with SVU have been measured the broadband UV radiation at Qena since 2000.

Narrowband filter instruments

EMA measured the biologically effective solar UV-B radiation by UVB-1 Pyranometer at Cairo, Aswan since 1998 and at Rafaah (31.22ºN, 34.20ºE) since 2000. The measurements of the global UV-B are performed with the Brewer single monochromator for different solar zenith angles at Matrouh. Also EMA in cooperation with SVU have been measured the UV-B radiation at Qena since 2000.

The present network of measurements of ozone and UV radiation at Egypt are shown in Table (1).

Table (1): Operational network of ozone and UV radiation at Egypt.

Type of observation	*Location*	*Org.*	*Instrument*	*Start*
Total Ozone Column	*Cairo*	*EMA*	*Dobson No. 096*	*1967*
	Aswan	*EMA*	*Dobson No. 069*	*1984*
	Matrouh	*EMA*	*Brewer No. 143*	*1998*
	Hurghada	*EMA*	*Dobson No. 059*	*2000*
Ozone Vertical Profile (Umkehr)	*Aswan*	*EMA*	*Dobson No. 069*	*1984*
	Matrouh	*EMA*	*Brewer No. 143*	*1998*
	Hurghada	*EMA*	*Dobson No. 059*	*2000*
UV Radiation	*Cairo*	*EMA*	*Eppley Radiometer*	*1989*
	Aswan	*EMA*	*Eppley Radiometer*	*1989*
	Qena	*SVU*	*Eppley Radiometer*	*2000*
UV-B Radiation	*Cairo*	*EMA*	*UVB-1 Pyranometer*	*1996*
	Aswan	*EMA*	*UVB-1 Pyranometer*	*1998*
	Matrouh	***EMA***	*Brewer No. 143*	*1998*
	Rafaah	*EMA*	*UVB-1 Pyranometer*	*2000*
	Qena	*SVU*	*UVB-1 Pyranometer*	*2000*

Calibration activities

Calibration of instruments

All Dobson instruments are regularly calibrated every 4 years towards world standard. EMA ozone scientists taking into consideration the maintenance and calibration of the Dobson instruments regularly

The WMO and EMA in close cooperation and assistance of the USA National Oceanic and Atmospheric Administration's Climate Monitoring and Diagnostics Laboratory (NOAA/CMDL) organized the International comparison of Dobson Spectrophotometers at Dahab, Egypt 23 February – 12 March, 2004. Further assistance was provided by the German Weather Service's European Dobson Regional Calibration Center (DWD-RDCC/E) and by the Czech Hydro-meteorological Institute's Solar and Ozone Observatory (SOO-HK). It was a campaign to maintain the network of Dobson ozone spectrophotometers operated in the Africa region (R1). Comparison Dobson spectrophotometers from Algeria (D011), Botswana (D015), Kenya (D018), Seychelles (D057), Egypt (D096, D069, D059), South Africa (D089) and Nigeria (Shimatzu 5703) towards the World Secondary Dobson Standard Instrument (WSSI) No. 65 from NOAA/CMDL's World Dobson Calibration Center (WDCC) Boulder, Co, USA, to determine the existing calibration level. European Regional Standard (D064) also participated for calibration verification. Sixteen specialists from five countries and the WMO Secretariat participated at the Intercomparison. This action is a fulfillment of WMO/GAW/QC requirements for monitoring of atmospheric total ozone.

Training of the Brewer operators

EMA in co-operation with WMO carries out a training programme for operators of ozone Arab countries. At 2004 EMA trained three operators from El Emirate country for installation, calibration and operation of Brewer spectrophotometer.

RESULTS FROM OBSERVATIONS AND ANALYSIS

Variation and Trend of ozone

EMA studied the trend of ozone at Cairo, Aswan, Matrouh and Hurghada for different periods, shown in table (2). The highest values of negative trend were found through the period from January 1990 to December 1995 over Egyptian ozone stations especial over Cairo. While the highest values of positive trend was found after 1999. Figure (1) represents the monthly variation

and trend of ozone at Cairo from October 1967 to December 2004 while Figure (2) represents the monthly variation and trend of ozone at Aswan from December 1984 to December 2004.

Table (2): Ozone trend at Egyptian ozone stations for different periods.

Period of Trend	Cairo	Aswan	Matrouh	Hurghada
01/1970 – 12/1980	0.0859			
01/1985 – 12/1990	0.0372	0.1343		
01/1985 – 12/1995	-0.0274	-0.0174		
01/1990 – 12/1995	-0.2201	-0.1273		
01/1990 – 12/2000	-0.0434	-0.0246		
01/1995 – 12/2000	-0.0006	0.092		
01/1999 – 12/2004	0.1216	0.1211	0.5844	
Beginning – 12/2004	0.0009	0.0066	0.6354	0.0301

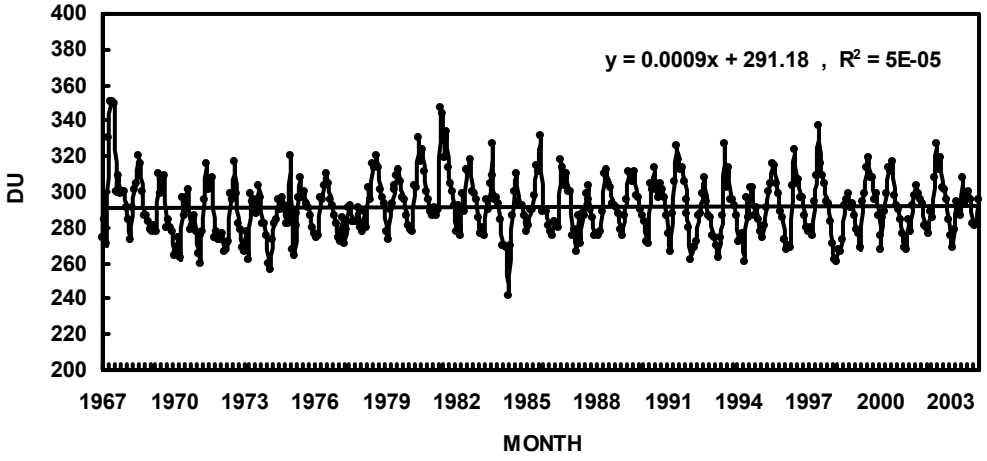

Figure (1): Monthly variation and trend of ozone at Cairo from Oct. 1967 to Dec. 2004.

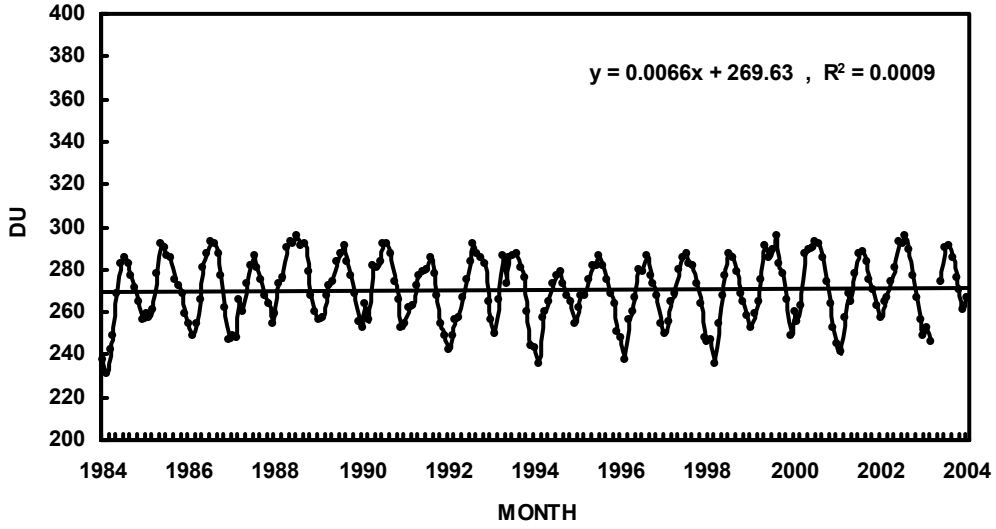

Figure (2): Monthly variation and trend of ozone at Aswan from Dec. 1984 to Dec. 2004.

Variation and Trend of ozone and UVB at Matrouh:

Figure (3) represent the monthly variations and trends of Ozone and UVB at Matrouh from November 1998 to December 2004. The Ozone amounts take the maximum value at spring while the UVB radiation takes the maximum value at summer. From the end of 1999 the trend of ozone amount increased while the trend of UVB radiation decreased.

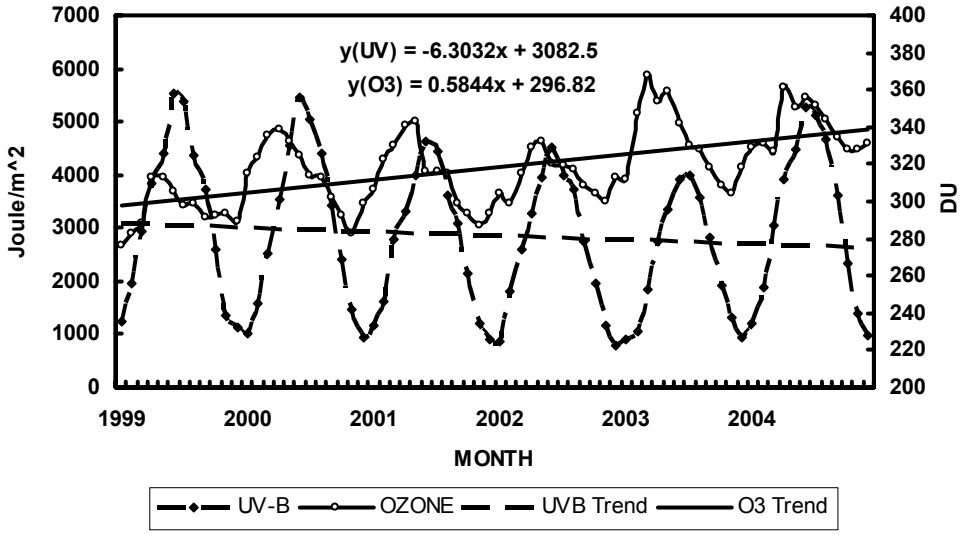

Figure (3): Monthly variations and trends of Ozone and UVB at Matrouh from 01/1999-12/2004.

THEORY, MODELLING AND OTHER RESEARCH

EMA study the analysis and forecast of UVB radiation over 4-sites at Egypt and compare with Erythemal of UVB measured by TOMS.

DISSEMINATION OF RESULTS

Data reporting

The ozone data collected from the network of Egyptian ozone stations by EMA at Cairo regional ozone center monthly. Data files of ozone are transmitted regularly with SO_2 to World Ozone Data Center (WOUDC) in Toronto, Canada.

Egyptian Environmental Agency Affairs (EEAA) monitoring Ozone Depleting Substances (ODS's) as CFCs, Halons, CC14, C2H3CL3, HCFCs, HBFCs, CH2BrCl and CH3Br. EEAA sent the annual data of ODS's to Ozone Secretariat of UNEP, Kenya and Multiliteral Fund (MLF), Canada.

Information to the public

Matrouh lie on the coast of NW Egypt and summer resort. The scans are used for calculation of actual values of UV Index (UVI) daily presented for the public during the seasons especially the summer season. UVI is a numerical risk scale and a way of describing the daily danger from solar UVB radiation. The EPA used the following classification of the UV exposure level based on the UV index (0-2 minimal, 3-4 low, 5-6 moderate, 7-9 high and >10 very high).UVB insulation displays a daytime variation with maximum at solar noon, figure (4) and variation with months take a maximum at summer months (figure 5c). UVB protection is critical during summer and especially so in the hours around solar noon. A person being out in the sun during midday hours more than ten minutes if you are without protection.

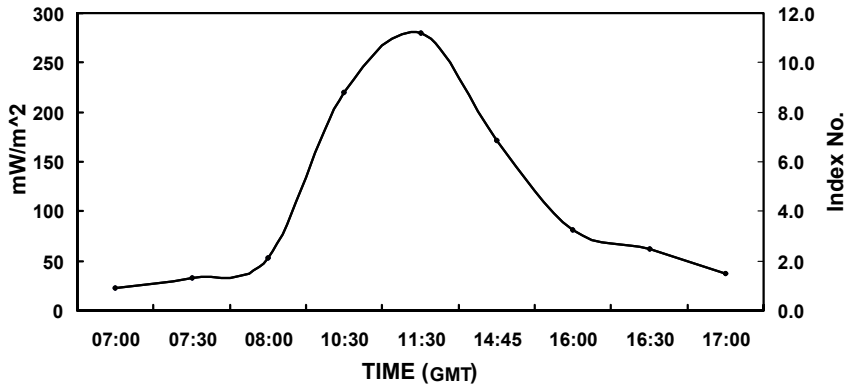

Figure (4): Diurnal variation of DUV and UVI on a clear summer day over Matrouh.

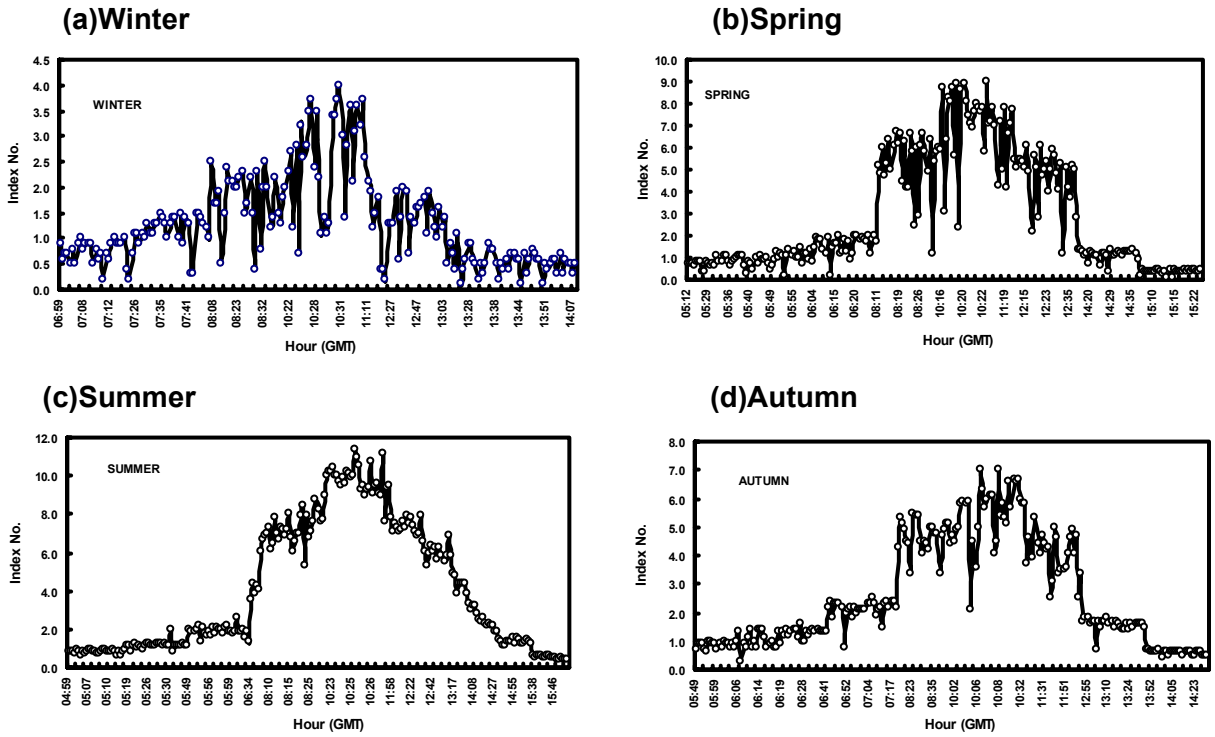

Figure (5): Diurnal variation of UV index over Matrouh at different seasons.

Relevant scientific papers

Through the last three years Scientists at EMA carry out a large number of papers have been published in various journals. Most recent ones are:

Kourtidis, C. Zerefos, S.Rapsomanikis, V.Simeonov, D.Balis, E.Kosmidis, P.E.Perros, D.Melas, A.Thompson, J.Witte, B.Calpini, B. Rappenglueck, I.Isaksen, W.M. Sharobiem, A.Papayannis, P.Fabian, N.Mihalopoulos, H.Gimm and R. Drakou: Regional levels of ozone in the troposphere over Eastern Mediterranean . J. Geophysical Research, D(18), 8140-8152, 2002.

Sharobiem, W.M. and F.M. El-Hussainy: Sulfur dioxide observations and trends over Egypt. 7th Workshop on meteorological and sustainable development, 10-13 March 2002, Cairo, Egypt.

-El-Hussainy, F.M., W.M. Sharobiem: Atmospheric sulfur dioxide values and trend. Al-Azhar Bull. Science, Vol. 13, No. 1(June), 127-146, 2002.

Sharobiem, W.M.: Stratospheric ozone variations and trends over Egypt. 28th International conference for statistic computer science and its applications, 12-17 April 2003, Cairo, Egypt.

Hafez, Y.Y. and S.M. Robaa: Comparative studies of total ozone values over Cairo and Aswan, Egypt. J. Enfineering and Applied Science, vol. 50, No. 5, Oct. 2003, pp.861-874.

Sharobiem, W.M.: The good time to exposure to UVB irradiance at northwest coast of Egypt. Atmospheric Ozone. Proceeding of the Quadrennial Ozone Symposium, June 2004, Kos, Greece.

Sharobiem, W.M., A. S. Zakey and A. Y. El-Sayed (2004): Contribution of weather elements on surface ozone and sulfur dioxide at polluted area. 9th Workshop on meteorological and sustainable development, 28-29 April 2004, Cairo, Egypt.

Sharobiem, W.M.: Relation between Atmospheric Ozone and UVB radiation over Egypt. Meteorological Research Bulletin, EGYPT. Vol. 19. January 2005. pp. 100-113.

Sharobiem, W.M. (2005): Ozone and UV-B Measurements and Trend over Matrouh, Egypt. 9 th Biennial WMO/MSC Brewer Users Group Meeting. Delft, Netherlands, May 31 – June 3, 2005

PROJECTS AND COLLABORATION

EMA in cooperation with South Valley University (SVU) have been measured the broadband UV and UV-B radiation and other meteorological parameters.

National projects through the National Ozone Unit in EEAA to phasing out ODS's as phase out plane of CFC's and Methyl Bromide. Also projects of Halon Bank and Solvent project.

FUTURE PLANS

EMA co-operate with the Czech Hydro-meteorological Institute's Solar and Ozone Observatory (SOO-HK) for develop Dobson instruments at Cairo, Aswan and Hurghada. Where the data take by Semiautomatic Dobson Data Recorder.

The WMO and EMA in close cooperation and assistance of the International Ozone Services Inc., Toronto, Canada organized the Calibration of Brewer instrument at Matrouh next October 2005.

National phase out plan in EEAA for ODS's.

NEEDS AND RECOMMENDATIONS

- We are in great need for scientific research programme in ozone and climate change model.
- We will appreciate assistance to start measurements of vertical ozone distribution advice to elaborate a by ozonesonde especially at Aswan station (tropical area).
- We need technical and financial assistance for the regular calibration of Brewer with the traveling standard.

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