

# EGYPT

## 1- INTRODUCTION

The involvement of Egypt in ozone monitoring and research dates to 1967 with the establishment of Dobson spectrophotometer No. 96 in Cairo.

*The Egyptian Meteorological Authority (EMA) monitoring activities is as follows:*

- Total column ozone using Dobson and Brewer instruments.
- Vertical profiling of ozone obtained with the Umkehr method.
- Surface ozone measurements
- The broadband UV and UV-B radiation measurements

*Scientists at the Research Department in EMA research activities include the following topics:*

- Ozone distribution, variation and its trend.
- Effect of ozone on the climate variability.
- Principle components affect on the distribution of ozone and UV-radiation.
- UV observation, analysis and forecast.
- Surface ozone and SO<sub>2</sub> observations.

## 2. MONITORING AND MEASUREMENTS:

### 2.1 Stratospheric ozone

At Egypt, only EMA is responsible for measurements of column ozone amount and operates the main total ozone-monitoring network. EMA at 1967 started to measure ozone by Dobson spectrophotometer No. 96 at Cairo. At 1973 Cairo became Regional Ozone Center (ROC) with Dobson No. 96 for ozone stations at North Africa and Middle East. Ozone amount measured over tropical area by Dobson Spectrophotometer No. 69 at Aswan (Upper Egypt) since 1984. The Brewer Spectrophotometer Mark II No. 143 operated EMA at Mrsa Mtrouh station (north coast of Egypt) is also used to monitor ozone, SO<sub>2</sub> and UV-B radiation since November 1998. One new ozone station at Hurghada (27.28°N) has been established during the past three years in Egypt. Total amount of ozone over Hurghada (GAW station) will be measured by Dobson spectrophotometer No. 59 from November 2000. The present EMA network of ozone measurements consist of the following:

	Aswan	Hurghada	Cairo	M. Mtrouh
WMO No.	62414	62464	62371	62306
WOUDC ID.	245	409	152	376
Latitude	23.97°N	27.28°N	30.08°N	31.33°N
Longitude	32.78°E	33.75°E	31.28°E	27.22°E
Height (meter)	193	007	037	035
Instrument	Dobson # 069	Dobson # 059	Dobson # 096	Brewer # 143
Started at	December 1984	November 2000	October 1967	November 1998
Last Calibration	1999 – Swiss	2000 – Germany	2001– Germany	NEED

*Table (1): The Egyptian Ozone Stations.*

Routine measurements of total ozone are made a number of times per day (at different air masses) by trained personnel at all the above stations. Whenever sky conditions permit, Umkehr observations are also made to compute the vertical distribution of ozone. Scientists of ozone from EMA taking into consideration the maintenance and calibration of the Dobson instruments

regularly. The ozone data collected from the network at ROC. Data files of ozone are transmitted regularly with SO<sub>2</sub> to World Ozone and Ultraviolet Data Center (WO<sub>3</sub>UDC) in Toronto, Canada. EMA cooperate with Thessaloniki University in Greece and WMO in the WMO-GO<sub>3</sub>OS Ozone Mapping Center. The program includes the exchange in near- real time total ozone data for preparation of the daily ozone maps of the Northern Hemisphere.

Trend of ozone total amount increased through the last three years over all ozone stations at Egypt, as fig. (4). Before this period, the trend of ozone decreased but not significant (figures (2,3)). Fig. (1) show the monthly variation of total amount of ozone over Egypt with a maximum value at spring over Cairo and Mutrouh and at summer over Aswan.

## 2.2 Surface ozone

In Egypt surface ozone measurements outside urban regions, at Hurghada which is an official WMO Global Atmospheric Watch (GAW) station and at Sidi Branni (31.37°N, 25.53°E). EMA also measured surface ozone in cooperation with the Egyptian Environmental Information System (EEIS) at 14 locations in Greater Cairo, which is polluted, and urban city. This project is to establish a sustainable standard quality of environment over Greater Cairo.

South Valley University with EMA started to measure surface ozone at Qena (26.20°N, 32.75°E) from April 2000.

## 2.3 UV radiation

Early in 1989, EMA have been operating an overall UV monitoring network for measurements, on a continuous basis, of the solar UV radiation. Eppley Ultraviolet Radiometer (Photometer) is used routinely for measurements of sun and sky broadband UV radiation at Cairo and Aswan.

EMA take the measurements of biologically effective solar UV-B radiation using UVB-1 pyranometer at Cairo, Aswan and Rafaah and using Brewer Mark II at Mersa Mtrouh. EMA in cooperation with South Valley University have been measured the broadband UV and UV-B radiation at Qena from April 2000. The present network of UV and VU-B radiation measurements shown in table (2) as the following:

	Aswan	Qena	Cairo	Rafaah	M. Mtrouh
WMO No.	62414	62403	62371	62335	62306
Latitude	23.97°N	26.20°N	30.08°N	31.22°N	376
Longitude	32.78°E	32.75°E	31.28°E	34.20°E	31.33°N
Height (m)	193.0	095.9	037.0	073.3	27.22°E
UV Instrument	Eppley Radiometer	Eppley Radiometer	Eppley Radiometer		
UV-B Instrument	UVB-1 pyranometer	UVB-1 pyranometer	UVB-1 pyranometer	UVB-1 pyranometer	Brewer Mark II
Started at	08/1989 (UV) 09/1998(UVB)	04/2000 (UV) 04/2000(UVB)	03/1989 (UV) 05/1996(UVB)	06/2000(UVB)	11/1998(UVB)

Table (2): The Egyptian UV and UV-B radiation Stations.

## 3. PROPOSALS AND NEEDS:

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

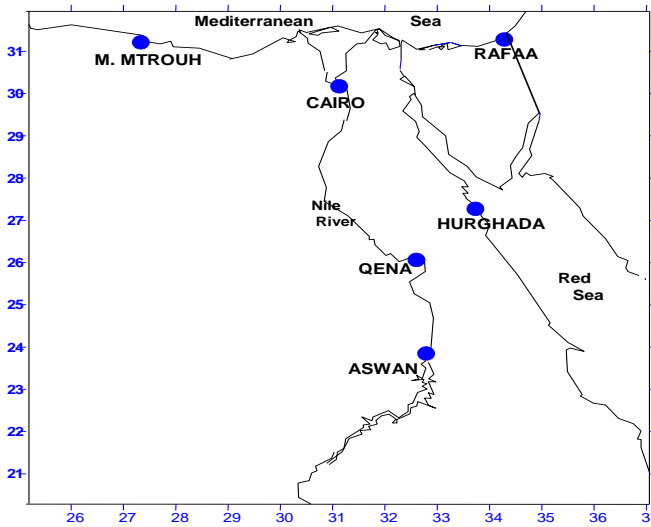
#### 4. RESEARCH ACTIVITY:

*I-In cooperation between EMA and Meteorological Department, faculty of science, Cairo University carries out in ozone field the following Thesis:*

- Studies on Ozone Layer in relation to Climate.
- Ozone Layer in relation to Atmospheric Dynamics and Photochemistry.
- Some Characteristics of Ozone Changes related to Tropopause Fold during Mediterranean Cyclogenesis.
- Variation of Mean Zonal Winds relating to the Ozone Hole.
- Physical and Chemical Characteristic of Air Pollution over Egypt.
- UV Index Analysis and Forecast.

*II-Through the last three years Scientists at EMA carry out the following researches:*

- Abdel Basst, H. and A. Gahein (2000) : Diagnostic study on the relation between ozone and potential vorticity. Quadrennial Ozone Symposium, pp.305, August 2000, Sapporo, Japan.
- EL-Asrag, A. M., A. S. Zaki and W. M. Sharobiem (1999): Statistical analyses of global ozone by EOF and long-term change of aerosols. Long-term Changes and Trends in the Atmosphere, 16-19 Feb.1999, Pune, India.
- El-Hussainy, F.M., W.M. Sharobiem and D.M. Ahmed (2001) : Surface ozone observations over Egypt. Meteorological and Sustainable Development Conference, 2-4 April 2001, Cairo, Egypt.
- Gahein, A. and H. Abdel Basst (2000) : On relation between ozone and cyclogenesis : case study. Quadrennial Ozone Symposium, pp.395, August 2000, Sapporo, Japan.
- 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.Geophys. Res.-Atmospheres (under press).
- Korany, M. H., W. M. Sharobiem and A. A. Gahein (2001) : Spectral ultraviolet radiation measurements over Matrouh. Meteorological and Sustainable Development Conference, 2-4 April, 2001, Cairo, Egypt.
- Shakour, A. A. and A. S. Zaki (1999) : The relation between sulfur dioxide and sulfate in Cairo atmosphere. Central European Journal of Occupational and Environmental Medicines, vol. 4, 2, pp82.
- Sharobiem, W.M. and A. Gahein(2000): Comparison between Dobson, Brewer and TOMS total ozone measurements at Cairo and Aswan. Meteorological and Sustainable Development Conference, 2-4 February 2001, Cairo, Egypt.
- Sharobiem, W.M. and M.H. Korany (2000): Eclipse and the change of ozone and radiation components. Meteorological and Sustainable Development Conference, 2-4 February 2001, Cairo, Egypt.
- Sharobiem, W.M. and A.M. El-Asrag (2000) : Principle components affect on the distribution of ozone and UV-radiation over Egypt. Quadrennial Ozone Symposium,pp.639, August 2000, Sapporo, Japan.
- Sharobiem, W.M. (2000): Principle components of the distribution of ozone and UV-radiation over Egypt. 6<sup>th</sup> biennial Brewer workshop, August 2000, Tokyo, Japan.
- Zaki, A.S. and W.M. Sharobiem (1999): Long-term change of ozone and UV over Egypt. Non-CO2 gases, 8-10 September 1999, Noordwijkerhout, the Netherlands.



Ozone and UV radiation stations in Egypt

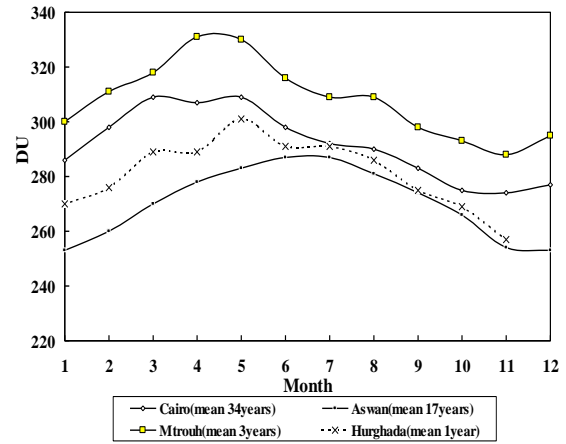


Fig.(1): Monthly variation of total ozone amount over Egypt

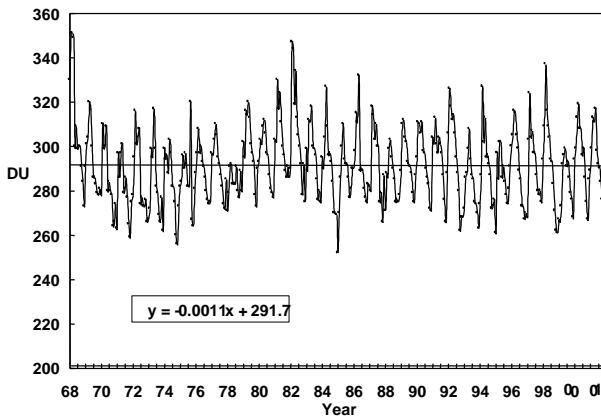


Fig.(2): Variation and trend of total ozone at Cairo from Jan. 1968 to Dec. 2001.

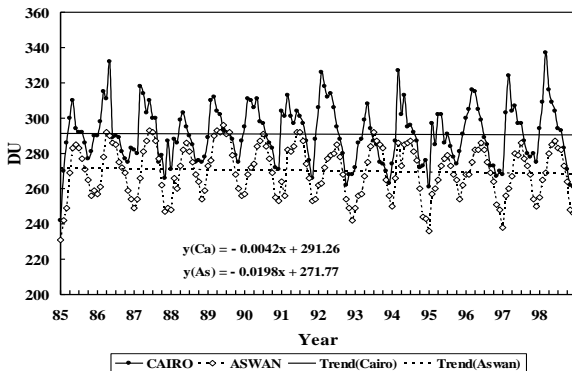


Fig.(3): Variation and trend of total ozone amount at Cairo and Aswan from 1985 to Dec.2001.

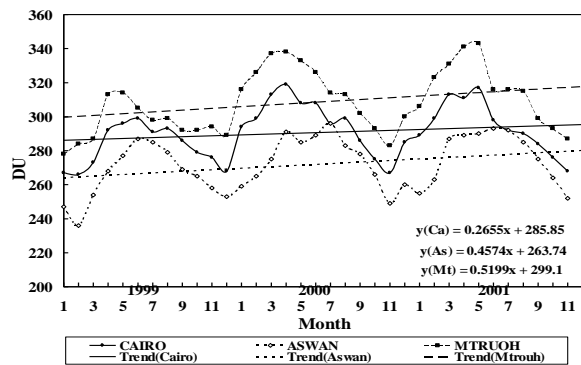


Fig.(4): Variation and trend of total ozone amount Over Egypt from Jan. 1999 to Dec.2001.