THAILAND

OBSERVATIONAL ACTIVITIES

Column measurements of ozone

Dobson No. 90 is mainly used for total ozone observations at Bangkok (13.67N, 100.62E). The latest inter-comparison was undertaken in March 2006 at Tsukuba, Japan. This inter-comparison was supported by JMA experts and WMO Scientific Advisory Group on ozone. Routine processing of total ozone is done using the Windobson software package, developed by Koji Miyagawa of JMA, and Dobson by Martin Stanek of CHMI.

Brewer spectrophotometers No.120 and 121 have been used as ground based measurements for total and profile ozone, SO2, NO2, Aerosol Optical Depth and UV spectra in Bangkok and Songkhla (7.2N, 100.6E) since 1997. Data analysis is done using O3Brewer and UVBrewer software.

Profile measurements of ozone

Ozone profiles have been retrieved regularly using Dobson and Brewer umkehr measurements. Data analysis is done using WOUDC software.

UV measurements

Spectral UV radiation measurements have been carried out with Brewer spectrophotometer in Bangkok and Songkhla since 1997. To enhance temporal resolution, a broadband UV radiometer will be installed at Bangkok in 2008.

Calibration activities

Dobson Inter-comparisons have been undertaken at Tsukuba in 1996 and 2006. Brewer spectrophotometers were maintained and calibrated by the International Ozone Service in 2000, 2004, and 2005 and 2008.

RESULTS FROM OBSERVATIONS AND ANALYSIS

The trend of long term ozone is updated as figures below;

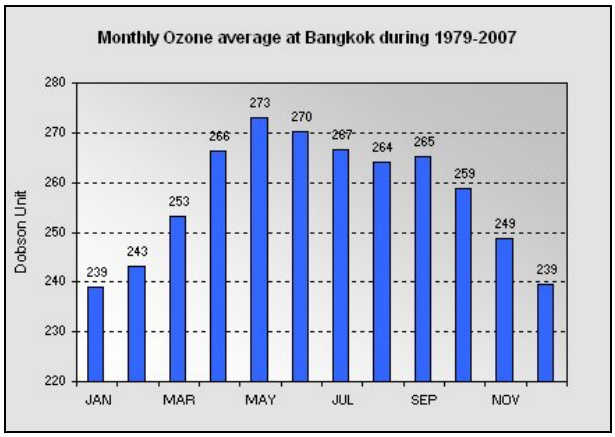


Fig. 1: Seasonal ozone trend

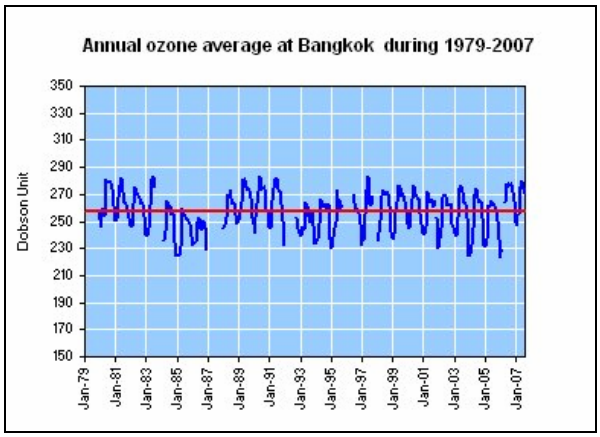
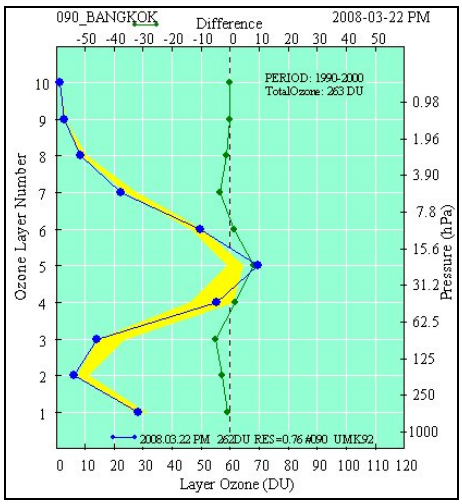


Fig. 2: Long-term trend of monthly average ozone



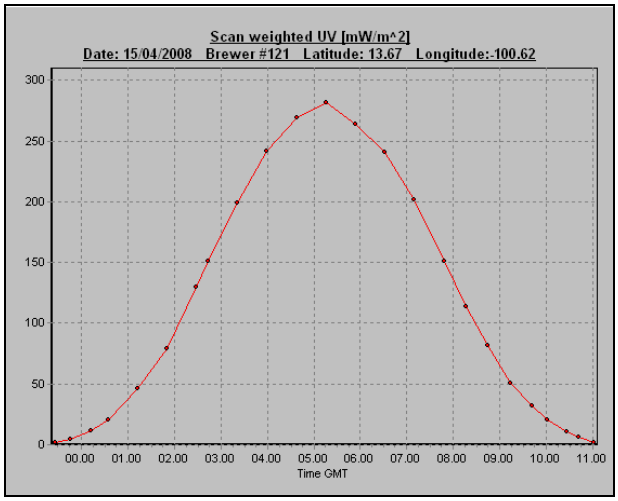


Fig. 3: Dobson Ozone profile, Mar 23

Fig. 4: Erythemal UV, Bangkok, on April 15, 2008

Ozone profiles obtained from Umkehr Dobson and Brewer measurements have been operated routinely and distributed to the public via internet.

UV index levels are normally extreme in mid-day over most of the country. UV indices usually range between 7 to 14.

THEORY, MODELLING, AND OTHER RESEARCH

Daily ozone and UV index modeling and forecasting is in use today. However, there is on-going research on the relationship between ozone and its effects on UV radiation, cloud cover and aerosol properties. This research is supported by the Joint Graduate School of Energy and Environment, with the goal of improving modeling.

DISSEMINATION OF RESULTS

Data reporting

Ozone and UV data is deposited regularly to the WMO World Ozone and Ultraviolet Data Centre in Toronto. Solar radiation data is deposited regularly to the WMO World Radiation Data Centre in St. Petersburg.

Information to the public

Ozone and UV radiation monitoring and forecasts are published via internet at http://ozone.tmd.go.th. An example forecast, from April 19, 2008, 12:00 is shown in Fig. 5.

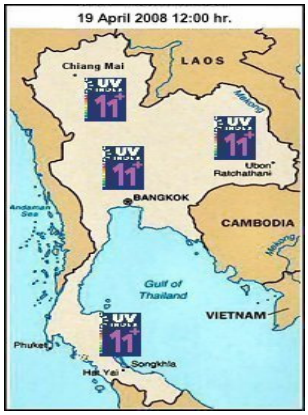


Fig. 5: A UV Index map.

Relevant scientific papers

Sudhibrabha S, Exell RHB, Sukawat D (2006) Ultraviolet Forecasting in Thailand, ScienceAsia Vol. 32 No 2, pp. 107-114.

Sudhibrabha S, Exell RHB, Sukawat D (2004) Ozone and UV Index Forecasting, Proceedings of the JGSEE and Kyoto University Joint International Conference on "Sustainable Energy and Environment (SEE)", 1-3 December 2004, Hua Hin, Thailand, pp.766-770.

Sudhibrabha S, Exell RHB, Sukawat D (2004) Preliminary Forecast of Ozone and UV over Thailand, Proceedings of the XX Quadrennial Ozone Symposium, 1-8 June 2004, Kos, Greece, pp. 1157-1158.

Vanichnukhroh P, Sukawat D, Sudhibrabha S (2004) Ozone Profile in the Climate of Thailand, Proceedings of the JGSEE and Kyoto University Joint International Conference on "Sustainable Energy and Environment (SEE)", 1-3 December 2004, Hua Hin, Thailand. pp. 763-765

PROJECTS AND COLLABORATION

As a member of the Vienna Convention and Montreal Protocol since July 7, 1989, the Thai government, through the Department of Industrial Works, has taken action to protect the ozone layer. The Thai government continues to phase out the use of Ozone Depletion Substances, and also continues to promote increased public awareness of the issue of ozone depletion.

Thai Meteorological Department has monitored and performed research on the ozone layer since 1979. It continues to extend its national radiation monitoring network, which will achieve nationwide coverage in 2008. As Bangkok is A GAW station it will have enhanced capabilities to monitor ozone, radiation, aerosol, and clouds.

FUTURE PLANS

Although Thailand is not a high-latitude country, the Thai government has encouraged and supported studies related to anthropogenic ozone depletion, natural variation in ozone concentration and its relation to climate change, and the forecasting of UV radiation. Thailand plans to improve its ozone monitoring capabilities by increasing the number of monitoring stations and by upgrading its instrumentation.

NEEDS AND RECOMMENDATIONS

Although sufficient support is available for Dobson spectrophotometer #90 from the experts at JMA and the WMO Scientific Advisory Group on Ozone, TMD has had some difficulties obtaining maintenance and calibration support for Brewer spectrophotometers #120 and #121. TMD would be able to better utilize its Brewer instruments if better support services for the Brewer spectrophotometer were available in Asia. Ultimately, TMD would like to develop the capability to maintain itself, and to calibrate its Brewer instruments using Dobson spectrophotometers at a standard reference site in Bangkok.

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