OA15) Forecast of Total Ozone in Eastern Asia

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1. Introduction

Total ozone on time-scale from hours to several days has been shown to be correlated with lower stratospheric temperatures, 500 hPa geopotential heights, winds, tropopause pressure (or height), and isentrophic potential vorticity near the tropopause (Kim *et al.*, 2002, Moon *et al.*, 2002).

The purpose of this study is to identify and predict the effects of total ozone over Eastern Asia. To forecast a short-term variations in total ozone, we are to introduce multiple regression model which is one of the most general class of models for forecasting a time series using multiple variable.

2. Data

The units of total column ozone are Dobson Units (DU). One DU is equivalent to 1 milliatmosphere centimeter (m-atm-cm) or 10^{-3}cm of pure ozone at STP. Conversions are possible to transform the total column DU to local ozone SI units. The data of total ozone for the regression are used in daily TOMS data during the given period in Eastern Asia (http://jwocky.gsfc.nasa.gov/news/ news.html). In particular, it was used with the meteorological data of MM5(Meteorological Mesoscale Model 5).

3. Forecast of total ozone in Eastern Asia

Total ozone data between Brewer or Dobson spectrometer and TOMS were compared There are distinct differences between ground-based Brewer or Dobson spectrometer and nadir-viewing TOMS, but the correlation coefficient between both daily total ozone data was presented high more than 0.95. It is showed that next-day ozone at each meteorological site which can't observe the ground-based total ozone can be forecasted by using the daily TOMS data. A statistical model was examined to forecast the daily variation of total ozone that presents time series during a given period of May and July in 2005.
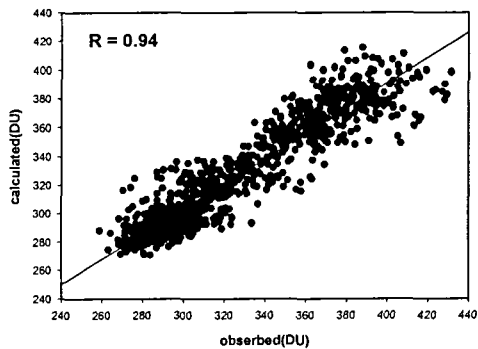
Figure presents daily time series plot of total ozone fitted and forecasted by the multiple regression model in Eastern Asia during the clear days in May and July in 2005. The model is composed by using both the yesterday total ozone data of TOMS and the tomorrow maximum temperature of MM5 for the given period, Daily averaged total ozone of short-term forecasted by the multiple regression model is useful for forecasting hourly mean UV-B irradiance. In this way, we can forecast the long-term variation of total ozone more than a year in Eastern Asia or other countries.

5. Conclusions

The total amount of ozone has been analyzed and forecasted by using statistical methods with TOMS and MM5. The long-term daily trend of total ozone interpolated by TOMS at Seoul, Pohang, and Jeju for the period of 24 yr (1979~2002) is decreasing. In particular, detection of trends in UV-B radiation associated with decreases or increases of total ozone can be further complicated by changes in cloudiness, by local pollution, and by difficulties in keeping the detection instrument in precisely the same operating condition over many years. Therefore, we need to forecast the variation by using valid models of total ozone and UV-B irradiance by readily available meteorological parameters of MM5.

Acknowledgements

References

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