RETREIVAL OF TROPOSPHERIC NITROGEN DIOXIDE VERTICAL COLUMN DENSITY DURING THE 2008 SUMMER OLYMPIC GAMES IN BEIJING

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1. INTRODUCTION

Nitrogen dioxide (NO_2) plays a key role in the chemistry of the atmosphere. It participates in the control of the strong oxidant, ozone and the strongest atmospheric oxidizing agent [1] [2]. The main sources of troposphere NO_2 are emissions from fossil fuel combustion and biomass burning. The Global Ozone Monitoring Experiment (GOME) instrument on the Second European Remote Sensing Satellite (ERS-2) launched in April, 1995 allows the retrieval of Vertical Column Density (VCD) of NO_2 on a global scale. After then, the similar instruments such as SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY), Ozone Monitoring Instrument (OMI) and GOME2 have been launched. The tropospheric NO_2 VCD maps derived from these instruments have been used to study many scientific applications, pollution emissions and pollutant distribution. During the 2008 Summer Olympic Games in Beijing, NO_2 is one main air pollutant which should be monitored. In this paper, the NO_2 inverse algorithm, the Differential Optical Absorption Spectroscopy (DOAS) [3], from satellite measurements and the results using this method are presented.

2. ALGOITHM FOR TROPOSPHERIC NO_2 VCD RETRIEVAL

Based on the space borne measurements, the DOAS method determines the NO_2 Slant Column Density (SCD) along the light path through the atmosphere in a given spectral window between 425 and 450 nm. After the removing the smooth part (broadband absorption and scattering) and Ring effect, NO_2 SCD was derived based on a spectral fit of NO_2 to a reflectance spectrum. After getting the SCD, it is necessary to convert SCD to a total VCD by using the air mass factor (AMF) [4~6], which is calculated with the atmospheric radiative transfer model. As the satellite observes both the troposphere and the stratosphere, tropospheric NO_2 column concentration is derived by subtracting stratospheric NO_2 column concentration from total VCD [7]. The stratospheric part of the NO_2 can also be estimated using the global chemical transport models MM5 and CMAQ [8].

3. RESULT

All the cloud free OMI 1b data from June to August in 2008 over Beijing have been downloaded to retrieve NO_2 SCD. After converting SCD to VCD and the separation of stratosphere and troposphere, the tropospheric NO_2 VCD is derived. The results have been validated by corresponding results provided by in situ ground-based MAX-DOAS measurements.

4. CONCLUSION

The results show 1) the tropospheric NO_2 VCD in Beijing is about the same as that in other cities nearby in June,2008;2) from July 1, the tropospheric NO_2 VCD in Beijing decreases significantly, however, it changes little in other cities nearby;3) the tropospheric NO_2 VCD in Beijing increases a little in August,2008,which is much lower than that in other cities around ,such as Tianjin,Tangshan.

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