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Accuracy and trends in OMI observations of stratospheric NO_2

Ruud Dirksen (1), Folkert Boersma (1), Dmitry Ionov (2), Pieternel Levelt (1), and Hennie Kelder (3)

(1) KNMI, Climate research and Seismology, Atmospheric composition research division, De Bilt, Netherlands (dirksen@knmi.nl), (2) Research Institute of Physics, St. Petersburg State University, St. Petersburg, Russia, (3) Department of Applied Physics, Eindhoven University of Technology, Eindhoven, Netherlands

Since its launch in 2004 the Ozone Monitoring Instrument (OMI) has collected a 5+ year record of atmospheric trace gas measurements. One of the data products is the tropospheric and stratospheric NO_2 column. Accurate satellite observations of stratospheric NO_2 are important for two reasons: firstly, because it plays a key role in the photochemistry of stratospheric ozone and it is crucial to know whether there is a trend in stratospheric NO_2. Secondly, errors in the stratospheric column will lead to an over- or underestimation of the tropospheric column.

We validated the OMI stratospheric columns with measurements from the SAOZ (Systeme d'Analyse par Observations Zénithales) system and from NDACC (Network for the detection of Atmospheric Composition Change). The measurement sites range from the Arctic to the Antarctic and are predominantly situated at pristine locations, so that the observed columns are hardly affected by tropospheric contributions. As independent measurement technique we also used data from three FTIR stations that are collocated with zenith sky instruments. The validation study for the year 2005 indicated that OMI captures spatial and seasonal variability of stratospheric NO_2 on the global scale, and showed a slight overestimation of OMI stratospheric NO_2 columns in comparison to independent data ($<3\text{x}10^{14}$ molec/cm^2).

With its high spatial resolution and daily global coverage OMI makes a valuable contribution to the study of stratospheric NO_2. OMI provides detailed observations of variations in the global NO_2 field from the seasonal to the hourly time scale. We will show seasonal trends, sudden variations in NO_2 concentration associated with stratospheric wave activity, and the diurnal variation that is measured from space by multiple daily overpasses at high latitudes. The multiple overpass data shows that the daytime increase rate of stratospheric NO_2 peaks in spring for high latitude stations just outside the vortex. We conclude by presenting the OMI observed trend in stratospheric NO_2 from the 5+ data record and evaluate our results against independent data.