Geophysical Research Abstracts
Vol. 14, EGU2012-48, 2012
EGU General Assembly 2012

Retrieval of tropospheric ozone columns from SCIAMACHY limb-nadir matching observations

F. Ebojie, C. Savigny, A. Ladstätter-Weissenmayer, S. Bötel, M. Weber, R. Alexei, H. Bovensmann, and J. Burrows

University of Bremen, Environmental Physics, Environmental Physics, Germany (felix@iup.physik.uni-bremen.de)

Satellite observations of tropospheric ozone are of critical importance in obtaining a global and more thorough knowledge of the phenomena affecting air quality. Tropospheric ozone has a significant adverse effect on the climate system. In the lower troposphere, during summer, it is a major constituent of photochemical smog and excess of it is toxic to the ecosystem, animal and man. It is equally known as a major oxidant and also involved in the production of other oxidants such as hydroxyl (OH) radicals. In the middle and upper troposphere, ozone acts as a greenhouse gas. The retrieval of tropospheric ozone from UV/VIS/NIR satellite spectrometer such as the Scanning Imaging Absorption spectroMeter for Atmospheric CHartographY (SCIAMACHY) instrument onboard the ESA satellite Envisat is difficult because only about 10 % of the Total Ozone Column (TOC) is in the troposphere. In this analysis we present the retrieval of tropospheric ozone columns from SCIAMACHY limb-nadir matching observations. This technique is a residual approach that involves the subtraction of the stratospheric ozone columns derived from the limb observations from the total ozone columns derived from the nadir observations. The stratospheric ozone columns were derived by integrating the stratospheric ozone profiles from the tropopause, which was obtained from the re-analyses data of the European Centre for Medium-Range Weather Forecasts (ECMWF) in 1.5o x 1.5o x 91 levels based on both the thermal definition of tropopause using the WMO lapse-rate criterion as well as the potential vorticity definition of the tropopause. The total ozone columns were on the other hand retrieved using the Weighting Function DOAS algorithm (WFDOAS) at the spectral window of 326.6 – 334.5 nm. Equally of importance in our analysis is the tropospheric ozone columns derived from the ozonesondes by integrating the tropospheric ozone profiles from the bottom to the top of the troposphere, which was determined from the ozonesondes temperature profile measurements using the WMO lapse rate criterion definition of the thermal tropopause. Our retrievals are compared with retrievals from ozonesondes and other satellites instruments, with results showing good comparability with some slight deviations of about 5 – 10 DU. Finally, some possible sources of error in our analysis are discussed.