Geophysical Research Abstracts
Vol. 19, EGU2017-10862, 2017
EGU General Assembly 2017

Long-term MAX-DOAS measurement of aerosol and trace gases in the Environmental Research Station Schneefernerhaus, Germany

Zhuoru Wang (1,2), Nan Hao (1), François Hendrick (3), Michel Van Roozendael (3), Udo Frieß (4), Robert Holla (5), Adrian Doicu (1), and Thomas Trautmann (1)

(1) Institut für Methodik der Fernerkundung (IMF), German Aerospace Center (DLR), Weßling, Germany (zhuoru.wang@dlr.de), (2) Faculty of Civil, Geo and Environmental Engineering (BGU), Technical University of Munich (TUM), Munich, Germany, (3) Belgian Institute for Space Aeronomy (BIRA-IASB), Brussels, Belgium, (4) Institute of Environmental Physics (IUP), University of Heidelberg, Heidelberg, Germany, (5) German Meteorological Office (DWD), Hohenpeißenberg, Germany

The Environmental Research Station Schneefernerhaus (Umwelt Forschungsstation Schneefernerhaus, UFS) is located immediately under the summit of Zugspitze (2962 m), the highest mountain of Germany, at a height of 2650 m. The UFS is a rare observation site in Germany with mostly clean and unpolluted air. It is ideal for both stratospheric composition measurements and trace gas measurements in the free-troposphere. It is optimal for detecting pollution events in the free-troposphere, which are indications of short- or long-range transport of air pollutants.

A MAX-DOAS instrument has been working in the UFS since February 2011. With the zenith spectrum of each cycle used as the reference, the differential slant column densities (DSCDs) of trace gases are calculated from the spectra with Differential Optical Absorption Spectroscopy (DOAS) method. The DSCDs of both O_4 and NO_2 are calculated in two different wavelength intervals, 338-370 nm in the UV region and 440-490 nm in the VIS region. For HCHO and other trace gases, optimal fitting windows have been determined.

The aerosol vertical profiles and AODs are derived from O_4 DSCDs using both the bePRO retrieval algorithm and the HEIPRO retrieval algorithm. The two algorithms are both based on the optimal estimation technique. BePRO uses the LIDOR radiative transfer model as the forward model, while HEIPRO uses the SCIATRAN radiative transfer model. The vertical column densities (VCDs) as well as vertical profiles of trace gases are then derived from the DSCDs of trace gases and the aerosol profiles, also using both bePRO and HEIPRO.

This work presents the results of the MAX-DOAS measurement in the UFS from 2012 to 2016, including aerosol, NO_2, and HCHO, etc. The vertical profiles as well as the seasonal and diurnal variation patterns of tropospheric aerosol and trace gases will be shown. The cloud screening method based on the MAX-DOAS measurement in the UFS will also be discussed. In the end, high NO_2 episodes in the UFS due to long range transport of air pollutants will be presented.