Geophysical Research Abstracts
Vol. 16, EGU2014-13432-3, 2014
EGU General Assembly 2014

Comparison of ground-based Multi-Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) and satellite DOAS measurements of NO_2 distribution over Ulaanbaatar (Mongolia) during summer 2013

Sebastian Böhnke (1,2), Thomas Behrendt (1,2), Michael Bruse (2), Franz X. Meixner (1), and Buhalqem Mamtimin (1)

(1) Max Planck Institute for Chemistry, Biogeochemistry, Germany (sebastian.boehnke@mpic.de), (2) Department of Geography, Johannes Gutenberg University Mainz

Cities are immense sources of air pollutants; however, emission inventories in many of them still are highly uncertain, particularly in developing countries. Ulaanbaatar is the most populous and polluted area in Mongolia. Tropospheric NO_2 is proved to be harmful to both, the atmospheric environment and human health. It might be meaningful and important to observe pollutant concentrations in an area-integrated form (satellite observations) to create a sound data basis for air quality control measures.
In our study, we preliminary present the results of both satellite and ground-based Differential Optical Absorption Spectroscopy (DOAS) measurements of vertical column densities (VCDs) of NO_2 in Ulaanbaatar (urban area). As a ground validation tool, the MAX-DOAS measurements carried out in Ulaanbaatar (Mongolia) summer 2013 and are applied at 3 different sites in the west of Ulaanbaatar (106.73° E / 47.83° N), the city center (106.92° E / 47.92° N) and in the east (107.12° E / 47.87° N). Additionally, Automatic Weather Stations (AWS) have been set up and ozone was measured by UV absorption technique also at the 3 sites. Preliminary results show that the NO_2 column densities increase during sunset and decrease after sunrise, which is most likely caused by a longer light path resulting from high solar zenith angles (SZA). The maximum DSCDs (Differential Slant Column Densities) are observed around sunset and sunrise (up to 10^{17} molec cm^{-2}, mainly a measurement effect as stated above). The daily minima of the vertical column densities (VCD) appear in the morning and in the afternoon (DSCD $\sim 2 \times 10^{15}$ molec cm^{-2}) while, around noon, a second maximum can be observed (DSCD $\sim 4 \times 10^{16}$ molec cm^{-2}). Satellite data show mean VCDs of about 3×10^{15} molec cm^{-2} in July and a varying agreement with MAX-DOAS measurements.