UP 4: Atmospheric Chemistry 1

Time: Tuesday 14:50–16:00 Location: HSZ 105

Invited Talk UP 4.1 Tue 14:50 HSZ 105

Capturing Spatial and Temporal Patterns of NO2 in Cities using mobile and stationary DOAS measurements. — •Mark Wenig[1], Sheng Ye[1], Ying Zhu[1], Jia Chen[2], Florian Dietrich[2], Xiao Bi[2], and Ka Lok Chan[3] — [1]Meteorologisches Institut, Ludwig-Maximilinas-Universität München — [2]Fakultät für Elektrotechnik und Informationstechnik, Technische Universität München — [3]Institut für Methodik der Fernerkundung, Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)

The problem of elevated NO2 levels in cities has gained some attention in the public and science in recent years. Urban air quality is typically monitored using a relatively small number or monitoring stations. Those in-situ measurements follow certain guidelines in terms of inlet height and location relative to streets, but the question remains how a limited number of point measurements can capture the spatial variability in cities. In this talk we present two measurement campaigns in Hong Kong and Munich where we utilized a combination of mobile in-situ and stationary remote sensing differential optical absorption spectroscopy (DOAS) instruments. We developed an algorithm to separate spatial and temporal patterns in order to generate pollution maps that represent average NO2 exposure. We use those maps to identify pollution hot spots and capture the weekly cycles of on-road NO2 levels and spatial dependency of long-term changes.

UP 4.2 Tue 15:20 HSZ 105

Individual air pollution exposure assessment using a newly developed smart handheld monitoring device — •Sheng Ye and Mark Wenig — Meteorologisches Institut, Ludwig Maximilians University, Theresienstr. 37, 80333 Munich, Germany

NO2 pollutant in the atmosphere is attracting more and more public attention. People are interested in not only the ambient NO2 levels but also the individual exposure. We developed a sensor-based handheld Air Quality Inspection Box (Airquix) for individual exposure measurements for different pollutants. The Airquix is a portable air monitoring instrument, which is equipped with electrical chemical NO2, O3, NO sensors, NDIR CO2 sensor, OPC PM sensor, environment parameters (T, RH, P), GPS, and a raspberry pi for data logging and display. We use stationary instruments to calibrate the Airquix before and after mobile measurements and achieve a relatively high accuracy, e.g. +/- 5 ppb 5 seconds time resolution for the NO2 measurements. We use several Airquixes to capture different daily activities of different people simultaneously. We distinguish different commutes, in- and outdoor activities and compare the influence of different habits on the personal pollution exposure. The resulting data set can be used for the assessment of health impacts.

UP 4.3 Tue 15:40 HSZ 105

Ozone impact on plant physiology and nitrogen partitioning — •Stefanie Falk[1], Ane Victoria Vollsnes[2], Frode Stordal[1], and Terje Koren Berntsen[1] — [1]University of Oslo, Department of Geosciences — [2]University of Oslo, Department of Biosciences

Ozone is an important trace gas in the Earth's atmosphere. Stratospheric ozone protects all lifeforms on its surface from harmful UV radiation. In the boundary layer, ozone is regarded as a toxic pollutant and cause to an average global loss of yield in the four major crops of about $3-15\,\%$. Future projections indicate that high ozone concentrations may affect food security in the future especially in Asia. Ozone alters the plants photosynthesis through, e.g. reduction of CO_2 uptake (decrease in stomatal/ mesophyll conductance), processing of CO_2 (decrease in enzymes/proteins important for light capture, electron transport, and carboxylation), and enhancement in defense and repair reactions. A key determinant for photosynthesis is the concentration of leaf nitrogen. Each CO_2 processing step has a nitrogen cost associated.

In the absence of ozone, such a nitrogen cost model (LUNA in CLM5.0) has been shown to capture $55-65\,\%$ of the observed variation in the maximum electron transport rate $J_{\max}$ and maximum carboxylation rate V_{cmax}, respectively.

Based on data of deciduous trees from recent peer-reviewed articles, we establish a relationship between accumulative ozone dose (CUO) and the change in nitrogen cost for photosynthesis and show first results.