Geophysical Research Abstracts
Vol. 14, EGU2012-10286, 2012
EGU General Assembly 2012

Megacity NO_x emissions and lifetimes probed from space

S. Beirle (1), K.F. Boersma (2,3), U. Platt (4), M. Lawrence (5), and T. Wagner (1)

(1) MPI Chemie Mainz, Satellite remote sensing, Mainz, Germany (steffen.beirle@mpic.de), (2) KNMI, De Bilt, The Netherlands, (3) Eindhoven University of Technology, Eindhoven, The Netherlands, (4) IUP Uni Heidelberg, Germany, (5) IASS, Potsdam, Germany

Megacity emission inventories, based on bottom-up estimates, are still highly uncertain, in particular in developing countries. Satellite observations have been demonstrated to allow regional and global top-down emission estimates of nitrogen oxides (NO_x=NO+NO_2), but require poorly quantified a-priori information on the lifetime of NO_x.
Here we present a new method for the determination of megacity NO_x emissions and lifetimes from satellite measurements. Mean patterns of NO_2 tropospheric columns are analyzed separately for a set of different wind direction sectors. From the combined use of the observed total burden and the downwind evolution of NO_2, mean NO_x photochemical lifetimes and total emissions are derived simultaneously.
Typical daytime lifetimes of about 4 hours are found for several megacities at low and mid- latitudes, corresponding to mean OH concentrations of $\sim$6e6 molec/cm3 around noon. The derived emissions are generally in good agreement with bottom-up inventories, but are significantly higher in e.g. the case of Riyadh (Saudi Arabia).
The presented method works best for isolated "hot spots" of NO_x emissions. For megacities in the vicinity (in terms of some hundred km) of other strong sources, like e.g. Paris, modified approaches are necessary. We will present different approaches, and the estimated emissions+uncertainties will be discussed in perspective of existing, bottom-up emission inventories.