Geophysical Research Abstracts
Vol. 12, EGU2010-2595, 2010
EGU General Assembly 2010


# Aerosol pollution potential of major population centers

Daniel Kunkel (1), Mark G. Lawrence (1,*), Astrid Kerkweg (2), Holger Tost (1), Patrick Jöckel (3), Stephan Borrmann (1,2)

(1) Max-Planck Institute for Chemistry, Mainz, Germany , (2) Institute for Atmospheric Physics, Johannes-Gutenberg University, Mainz, Germany, (3) German Aerospace Center, Oberpfaffenhofen, Germany, (*) currently at: Institute for Atmospheric Physics, Johannes-Gutenberg University, Mainz, Germany

Emissions from major population centers (MPCs), including megacities, are becoming more and more important for the global burden of air pollutants. Once emitted to the atmosphere, aerosols from MPCs are expected to show differences in their transport and deposition, depending on the aerosol size and the geographical location of the MPC, which will result in differences in their potential to pollute the surface and the atmosphere locally and at downwind locations.

Several simulations for passive aerosol tracers, i.e. with no interactions between individual tracers, are conducted for emissions from 39 selected MPCs. Using the global chemistry circulation model EMAC (ECHAM5-MESSy-Atmospheric-Chemistry), four different sizes of aerosol tracers (0.1, 1.0, 2.5, and 10.0 $\mu$m) are emitted with the same constant emission flux for each MPC. The aerosol tracers undergo transport and dry and wet deposition; sensitivity simulations with different assumptions about the aerosol solubility are performed.

The analysis focuses on major transport pathways, either to nearby or remote lower atmospheric levels, or to the upper troposphere, and on the deposition location, strength, and kind of deposition. Larger particles tend to more effectively result in pollution buildup and to be deposited in greater amounts near their sources, whereas smaller particles are transported more to remote locations, at both low and high altitudes. The 0.1 and 1.0 $\mu$m radius aerosols tend to behave similarly to each other, while the 2.5 $\mu$m aerosols represent a transition between these smaller aerosols and the behavior of the 10 $\mu$m size class.

The analysis presented here provides an effective comparison of how individual megacities pollute themselves and their environment, particularly in light of differences in regional geographical and meteorological characteristics.