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Simulated organic aerosol partition during the MEGAPOLI Campaign in the Greater Paris Region

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In the framework of the FP7 / EU project MEGAPOLI, an intensive campaign was launched in the Greater Paris Region in July, 2009 and in January/February 2010. The major objective of these measurements was to quantify the different sources of organic aerosol (OA) within a megacity and to better understand the interaction of secondary organic aerosol (SOA) formation with the gas phase. Organic aerosol (OA) is a major component of urban aerosol, but the contribution of different formation pathways is still difficult to quantify.

In this work, the Volatility-basis-set (VBS) approach (Shrivastava et al., 2008; Murphy and Pandis., 2009) has been integrated into the regional chemistry transport model CHIMERE and applied to simulations of primary and secondary aerosol formation during the summer and winter MEGAPOLI campaigns within the Greater Paris region. These simulations are compared to aerosol mass spectrometer (AMS) measurements distinguishing between HOA (hydrocarbon-like OA, corresponding to primary OA) and OOA (oxidized OA, corresponding to secondary OA) performed at three ground stations (SIRTA, LHVP and Golf), on board of the French ATR-42 aircraft, and to PILS water soluble and insoluble OA measurements performed at SIRTA and LHVP.

The VBS scheme predicts lower urban and plume concentrations of primary OA than does a traditional scheme, due to partial evaporation of POA when air masses dilute. Taking into account evaporation yields, the simulation results become in better agreement with measurements. Especially, it avoids a large unobserved OA peak during morning hours. For the summer period, the VBS scheme predicts significant build-up of oxidised POA (from evaporation, oxidation, and recondensation of POA). This fraction constitutes, together with SOA of biogenic origin, the major part of secondary organic aerosol, while SOA build-up from aromatic compounds and alkenes oxidation is predicted to be much smaller. The presence of oxidised POA is qualitatively confirmed by the fact that part of the secondary organic aerosol from AMS measurements appears in the water insoluble OA fraction of PILS measurements. Third, simulations will be analysed to evaluate the in-situ versus advection origin of organic aerosols within the Paris region.

Reference

Murphy, B.N. and Pandis, S.N.: Simulating the Formation of Semivolatile Primary and Secondary Organic Aerosol in a Regional Chemical Transport Model, Environ. Sci. Technol. 2009, 43, 4722-4728

Shrivastava et al.: Effects of gas particle partitioning and aging of primary emissions on urban and regional organic aerosol concentrations, J. Geophys Res, 2008, 113, D18301