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Evaluation of Organic Aerosol Formation and Apportionment in a polluted Megacity

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Pollution from megacities and large urban areas is important not only for local effects on health, visibility, and ecosystems but also because of their collective influence on atmospheric chemistry and radiative forcing in regional and global scale. Organic species account for a large fraction of the submicron aerosol mass at most megacities. Urban areas are large sources of organic aerosols and their precursors. Nevertheless, the contributions of primary (POA) and secondary organic aerosol (SOA) have been difficult to quantify. In this study, new primary and secondary organic aerosol modules were added to PMCAMx, a three dimensional chemical transport model (Gaydos et al., 2007). The new modeling framework is based on the volatility basis-set approach (Lane et al., 2007): both primary and secondary organic components are assumed to be semivolatile and photochemically reactive and are distributed in logarithmically spaced volatility bins. The emission inventory is modified and the POA emissions are distributed by volatility based on dilution experiments (Robinson et al., 2007). PMCAMx is applied in the Mexico City Metropolitan Area during April 2003 and March 2006. The model predictions are compared with Aerodyne's Aerosol Mass Spectrometer (AMS) observations from the MCMA and MILAGRO campaigns respectively. Furthermore, the predicted concentrations over Mexico City are compared against measurements from a High-Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS) which was onboard the NSF/NCAR C-130 aircraft as part of the MILAGRO field campaign (DeCarlo et al., 2008). The organic aerosol (OA) to CO ratio is used as an indicator in order to evaluate the photo-oxidation of the predicted OA after its horizontal and vertical advection.

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