Geophysical Research Abstracts,
Vol. 11, EGU2009-2461, 2009
EGU General Assembly 2009
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Effects of mineral dust on the semivolatile inorganic aerosol components in a polluted Megacity

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Aerosols play a significant role in the atmosphere having adverse impacts on human health and directly affecting air quality, visibility and climate change. One of the most challenging tasks for models is the prediction of the partitioning of the semivolatile inorganic aerosol components (ammonia, nitric acid, hydrochloric acid, etc) between the gas and particulate phases. Moreover, the effects of mineral aerosols in the atmosphere remain largely uncertain. As a result, most current models have serious difficulties in reproducing the observed particulate nitrate and chloride concentrations. The improved aerosol thermodynamic model ISORROPIA II (Fountoukis and Nenes, 2007) simulating explicitly the chemistry of Ca, Mg, and K salts has been linked to the regional chemical transport model PMCAMx (Gaydos et al., 2007). PMCAMx also includes the CMU inorganic aerosol growth module (Gaydos et al., 2003; Koo et al., 2003a) and the VSRM aqueous-phase chemistry module (Fahey and Pandis, 2001). The hybrid approach (Koo et al., 2003b) for modeling aerosol dynamics is applied in order to accurately simulate the inorganic components in the coarse mode. This approach assumes that the smallest particles are in equilibrium, while the condensation/evaporation equation is solved for the larger ones. PMCAMx is applied to the Mexico City Metropolitan Area (MCMA). The emission inventory has been improved and now includes more accurate dust and NaCl emissions. The April 2003 (MCMA Campaign) and the March 2006 (MILAGRO campaign) datasets are used to evaluate the inorganic aerosol module of PMCAMx in order to test our understanding of inorganic aerosol. The results from the new modeling framework are also compared with the results from the previous version of PMCAMx in order to investigate the influence of each of the added features to the formation of the semivolatile inorganic components.

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