Predicting fine inorganic aerosols in Mexico City during winter 2005: deliquescence branch.

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Keywords: thermodynamic equilibrium, deliquescence, crustal species

INTRODUCTION
Atmospheric pollution in the México City Basin (MC) due to high levels of ozone (O3) and aerosols (particulate matter, PM) has become a significant issue for its nearly 20 million of inhabitants (Molina and Molina, 2002). PM levels exceed the Mexican PM10 (PM with aerodynamic diameter ≤ 10 µm) 24-h standard on most of the days of the year (Edgerton et al., 1999). Although the Mexican PM2.5 (PM with aerodynamic diameter ≤ 2.5 µm) 24-h standard of 65 µg m⁻³ has been introduced very recently (November, 2005), PM2.5 levels have been recorded well above acceptable limits. Atmospheric aerosols reduce local visibility, air quality and have adverse effects on human health. As the chemical composition of fine PM is also important in this respect, knowledge of these two parameters (size/composition) is essential to assess their role in several atmospheric processes occurring in the atmosphere. Airborne PM is composed by inorganic salts, organic material, crustal elements and trace metals. Inorganics may account up to 50% or more of total fine particulate matter. It has been commonly assumed that in the coarse fraction of PM (particles with dp > 2.5 µm), where dust is an important constituent of airborne PM, crustal species, such as Ca, K, and Mg are abundant (Ansari and Pandis, 2000). It has been shown, however, in recent studies in this megacity (Moya et al., 2006) that these constituents are of relevance in the PM2.5 size fraction as well.

Simulating the aerosol size and composition is an invaluable tool in increasing our understanding of aerosol behavior and in determining its role in several atmospheric processes. Measurements of the chemical composition of aerosols and their gas-phase precursors in this polluted area are essential to provide information regarding the aerosol partitioning between the gas and particulate phases and to validate aerosol models.

In this work predictions of the partitioning of nitrate and ammonium between the gas and aerosol phases, under Mexico City conditions and applying SCAPE thermodynamic model are presented.

RESULTS
Overall, four-hour average PM1, PM2.5 nitrate and ammonium concentrations are predicted within 30-60% for cases where the relative humidity (RH) is within moderate values (40-70%). For the afternoon sampling periods (RH’s: 20-35%), the deliquescence branch seems to introduce some errors in predicting aerosol behavior. By considering un update water activity database, model performance significantly improves for these conditions.

ACKNOWLEDGEMENTS
This work has been funded by the National Oceanic and Atmospheric Administration (NOAA-US) under contract NMRAC000-5-04017 (A. Nenes) and by the National Council for Science and Technology (CONACyT-Mexico) under contract J51782 (M. Moya). Support of PAPIIT-UNAM grant (reference: IN107306) is also acknowledged.

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