Uhrner U. / University of Technology of Graz, Austria

Sensitivity of urban and rural Ammonium-Nitrate Particulate Matter to Precursor Emissions in Southern Germany

and ammonium sulphate. An inorganic fraction of about one third is frequently found in PM10 probes. During an air pollution episode in Stuttgart in February 2005 the inorganic fraction exceeded 40 μgm^{-3}. The inorganic fraction was mainly composed of ammonium nitrate and to a lesser extent of sulphate, indicating a major impact of NOx emissions and photochemical reactions on secondary aerosol formation.
The sensitivity of secondary ammonium nitrate formation was investigated using a box model for the urban area of Stuttgart and the neighbouring rural area Rems-Murr Kreis. A box model was used to simulate atmospheric chemistry and gas/particle partitioning of inorganic compounds. Emissions from the UMEG (2004) emission inventory were used. The evolution of the simulated urban particulate matter (PM) ammonium nitrate was found to be very sensitive to changes in ammonia emissions. Ammonia, rather than nitric acid was the limiting reagent in ammonium nitrate PM formation. In contrast, NOx emissions and hence nitric acid was the limiting reagent in the rural case. Another important parameter in the sensitivity studies is the assumed well mixed layer used within these box model simulations. Decreasing mixing layers lead to stronger ammonium nitrate formation.
The overall behaviour of these model sensitivity studies agrees well with composition resolved PM10 measurements taken next to a busy road (ATV ~80000) in Stuttgart and mixing height computations for the episode.

Short C.V.

From 2006 senior scientist at VKM-THD TU-Graz; Air pollution modelling, secondary aerosols
2004-2006 Post-doc at IfT Leipzig; Secondary aerosols, aerosol dynamics, chemistry and CFD modelling
1999-2004 Scientist and PHD at IfT Leipzig; Aerosol dynamics & atmospheric modelling
1997-1999 Trainee at ECMWF in Reading UK Work on SGS-Orography scheme for forecast models
1997 Graduation in Meteorology at the University of Karlsruhe (TH)

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