

Impact of crustal elements on global atmospheric deposition of Nitrogen

STELIOS MYRIOKEFALITAKIS¹, NIKOS DASKALAKIS¹ AND MARIA KANAKIDOU¹

¹ Environmental Chemistry Processes Laboratory, Department of Chemistry, University of Crete, P.O. Box 2208, 71003 Heraklion, Greece; stelios@chemistry.uoc.gr; nick@chemistry.uoc.gr; mariak@chemistry.uoc.gr

Nitrogen (N) deposition plays a significant role in ecosystem functioning and particularly in ocean productivity. Reactive nitrogen also impacts on tropospheric chemistry driving tropospheric ozone production, and on atmospheric acidity. A large number of compounds consist the reactive N pool, like nitrogen oxides, ammonia, nitric acid, organic nitrates, amines, amino-acids etc. Chemical transformations occurring in all phases present in the atmosphere, affect the solubility of reactive nitrogen pool and thus of N-deposition. A significant fraction of N-deposition occurs in the form of particulate matter (PM) deposition. Atmospheric PM is composed of water, inorganic salts, crustal material, organics and trace metals. Important contributors to the dry fine PM are inorganic compounds like ammonium (NH_4^+), and nitrate (NO_3^-), sodium (Na^+), sulfate (SO_4^{2-}) and bisulfate (HSO_4^-). Crustal species like Ca^{2+} , K^+ , Mg^{2+} are major components of dust and can neutralize part of the acidity of the atmosphere (e.g. NO_3^- , SO_4^{2-}). Their presence is thus affecting the partitioning of NO_3^- , SO_4^{2-} and NH_4^+ on atmospheric PM as well as N-solubility and deposition, especially in areas where dust comprises a significant portion of total PM such as the Mediterranean region.

The effect of crustal material on N-containing species deposition is here investigated using the global TM4-ECPL global chemistry-transport model (Myriokefalitakis *et al.*, ACP, 2011; Kanakidou *et al.*, GBC, 2012 and references therein). The model is able to simulate oxidant chemistry, accounting for non-methane volatile organic compounds and all major aerosol components, including secondary aerosols like sulfate, nitrate and secondary organic aerosols. It also accounts for multiphase chemistry in clouds and aerosol water. Gas-particle partitioning of inorganic and crustal components is solved using the ISORROPIA II aerosol thermodynamics model (Fountoukis and Nenes, ACP, 2007). Global simulations have been performed considering and neglecting crustal material for the partitioning of $\text{HNO}_3/\text{NO}_3^-$ and $\text{H}_2\text{SO}_4/\text{SO}_4^{2-}$. Differences between the N-deposition amounts and their solubility are presented and thoroughly discussed.