Bi-directional exchange of ammonia in a pine forest ecosystem – a model sensitivity analysis

Alexander Moravek, Amy Hrdina, and Jennifer Murphy

Department of Chemistry, University of Toronto, Canada (a.moravek@utoronto.ca)

Ammonia (NH_3) is a key component in the global nitrogen cycle and of great importance for atmospheric chemistry, neutralizing atmospheric acids and leading to the formation of aerosol particles. For understanding the role of NH_3 in both natural and anthropogenically influenced environments, the knowledge of processes regulating its exchange between ecosystems and the atmosphere is essential. A two-layer canopy compensation point model is used to evaluate the NH_3 exchange in a pine forest in the Colorado Rocky Mountains. The net flux comprises the NH_3 exchange of leaf stomata, its deposition to leaf cuticles and exchange with the forest ground. As key parameters the model uses in-canopy NH_3 mixing ratios as well as leaf and soil emission potentials measured at the site in summer 2015. A sensitivity analysis is performed to evaluate the major exchange pathways as well as the model's constraints. In addition, the NH_3 exchange is examined for an extended range of environmental conditions, such as droughts or varying concentrations of atmospheric pollutants, in order to investigate their influence on the overall net exchange.