Geophysical Research Abstracts
Vol. 15, EGU2013-10379, 2013
EGU General Assembly 2013

Space based estimation of nitrogen deposition on ecosystems

Sarah Kew and Laurens Ganzeveld
Earth System Science Group, Wageningen University, Wageningen, Netherlands (sarah.kew@wur.nl)

Nitrogen deposition plays a key role in biogeochemistry through its control of plant photosynthesis, nutrient availability, ecosystem acidification and biodiversity. Though global annual total emissions are relatively well known, N-deposition estimates remain largely uncertain at all scales.

Traditionally, nitrogen dry deposition fluxes are quantified for the long-term (months–years) at the site scale using measured concentrations and estimated dry deposition velocities. Wet deposition is measured more directly by chemical analysis of precipitation samples. In contrast to these site-specific surface observations, space borne remote sensing observations provide column total estimates of NO_2 and NH_X with global coverage and reasonable re-visit intervals. So far little attention has been paid to the potential of using space based measurements to improve N-deposition estimates.

This study presents first results on the development of a prototype system which integrates remote sensing products for column NO_2 and NH_X, precipitation and cloud liquid water, with a 1D atmospheric chemistry model used in an assimilation mode to simulate wet and dry N-deposition on ecosystems.

Crucial to the successful modelling of wet N-deposition fluxes will be a realistic simulation of temporal and spatial variability in precipitation. Consequently, an initial focus has been to assess the model's precipitation performance and ways of attaining the required improvements. We investigate the impact of nudging the hydrological parameters with ECMWF operational data and remotely sensed products and the sensitivity of the wet deposition scheme to the temporal and spatial scale of precipitation. On timescales comparable with the model's integration step, we find observed precipitation shows substantial spatial variability at the model's effective horizontal scale. Whilst the variability in simulated precipitation accumulated over longer time scales is more acceptable, with the current (and generally applied) nudging approach there are implications for capturing the non-linear nature of wet deposition fluxes which we hope to resolve.

The gained experience with the prototype system can ultimately serve setting up a large-scale modelling system to assess N-deposition on ecosystems constrained with remote sensing observations of atmospheric nitrogen and hydrological parameters.