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Impact of satellite-derived leaf area index and roughness length maps on modelled reactive nitrogen deposition

Shelley van der Graaf (1), Martijn Schaap (2,3), Jan Willem Erisman (1,4)

(1) Vrije Universiteit Amsterdam, Faculty of Science, Amsterdam, Netherlands , (2) TNO, Climate Air and Sustainability, Utrecht, The Netherlands , (3) Institute for Meteorology, Free University Berlin, Berlin, Germany, (4) Louis Bolk Institute, Driebergen, The Netherlands

The nitrogen cycle has been continuously disrupted by human activity over the past century, resulting in almost a tripling of the total reactive nitrogen fixation in Europe. Consequently, excessive amounts of reactive nitrogen (Nr) have manifested in the environment, leading to multiple adverse effects, such as acidification and eutrophication of terrestrial and aquatic ecosystems. Forms of Nr also play a significant role in the formation of particulate matter, impacting air quality and human health and life expectancy as a result. Chemistry transport models (CTM) are frequently used as tools to simulate the complex chain of processes that determine Nr flows. In these models, the parameterization of the atmosphere-biosphere exchange of Nr is largely based on few surface exchange measurement and is therefore known to be highly uncertain. In addition to this, the input parameters that are used here are often fixed values, only linked to specific land use classes. In an attempt to improve this, a combination of multiple satellite products is used to derive new, time-variant roughness length and leaf area index maps. We evaluated the resulting changes in the modelled deposition of Nr components using the LOTOS-EUROS CTM, focusing on Germany, the Netherlands and Belgium. Implementation of these new input maps led to local changes in the total Nr deposition of up to $\pm$ 30% and a general shift from wet to dry deposition over these areas. The most distinct shifts are observed in land use specific deposition fluxes. Locally, these fluxes show relatively large deviations, affecting estimated critical load exceedances for specific natural ecosystems.