Geophysical Research Abstracts
Vol. 17, EGU2015-9713-1, 2015
EGU General Assembly 2015

Modelling global nitrogen export to ground and surface water from natural ecosystems: impact of N deposition, climate, and CO_2 concentration

Maarten Braakhekke (1), Karin Rebel (1), Stefan Dekker (1), Rens van Beek (2), Marc Bierkens (2), Ben Smith (3), and Martin Wassen (1)

(1) Utrecht university, Copernicus Institute of Sustainable Development, Utrecht, Netherlands (m.c.braakhekke@uu.nl), (2) Department of Physical Geography, Utrecht University, Utrecht, the Netherlands, (3) Department of Physical Geography and Ecosystem Science, Lund University, Lund, Sweden

For large regions in the world strong increases in atmospheric nitrogen (N) deposition are predicted as a result of emissions from fossil fuel combustion and food production. This will cause many previously N limited ecosystems to become N saturated, leading to increased export to ground and surface water and negative impacts on the environment and human health. However, precise N export fluxes are difficult to predict. Due to its strong link to carbon, N in vegetation and soil is also determined by productivity, as affected by rising atmospheric CO_2 concentration and temperature, and denitrification. Furthermore, the N concentration of water delivered to streams depends strongly on local hydrological conditions.

We aim to study how N delivery to ground and surface water is affected by changes in environmental factors. To this end we are developing a global dynamic modelling system that integrates representations of N cycling in vegetation and soil, and N delivery to ground and surface water. This will be achieved by coupling the dynamic global vegetation model LPJ-GUESS, which includes representations of N cycling, as well as croplands and pasture, to the global water balance model PCR-GLOBWB, which simulates surface runoff, interflow, groundwater recharge, and baseflow. This coupling will allow us to trace N across different systems and estimate the input of N into the riverine system which can be used as input for river biogeochemical models.

We will present large scale estimates of N leaching and transport to ground and surface water for natural ecosystems in different biomes, based on a loose coupling of the two models. Furthermore, by means of a factorial model experiment we will explore how these fluxes are influenced by N deposition, temperature, and CO_2 concentration.