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Evaluating the N-cycle module of LPJ-GUESS at the site-scale

Katrin Fleischer (1), David Warlind (2), Michiel van der Molen (3), Karin Rebel (4), Jan Willem Erisman (1), Almut Arneth (5), Martin Wassen (4), Ben Smith (2), and Han Dolman (1)

(1) Vrije Universiteit Amsterdam, Earth & Climate, Amsterdam, The Netherlands (k.fleischer@vu.nl), (2) Lunds Universitet, Department of Earth and Ecosystem Sciences, Sweden, (3) Wageningen University and Research Centre, Meteorology and Air Quality Group, The Netherlands, (4) Utrecht University, Environmental Sciences Group, Copernicus Institute of Sustainable Development, Faculty of Geosciences, The Netherlands, (5) IMK - IFU, Institute of Meteorology and Climate Research, Working Group Plant-Atmosphere Interactions group, Germany

Global scale dynamic vegetation models simulate the global C cycle and atmosphere-vegetation interactions, an essential component in the global climate system. The important role of the N-cycle in determining fluxes of carbon and climate dynamics is unequivocally evident. The current generation of ecosystem models include progressively carbon-nitrogen interactions but vary in their representation of important processes. We contribute to this development by evaluating predictions of the newly implemented N-cycle in LPJ-GUESS with direct observations.

Modelled C-fluxes and vegetation characteristics in LPJ-GUESS will be compared to EC-data for 75 FLUXNET forest sites. We assess the inclusion of the N-cycle in LPJ-GUESS by comparing the C-only with the CN-version of the model. Further we compare simulated C and N pool sizes and key biological characteristics (biomass, foliar N and LAI) between the model versions, and compare to site data. Site-specific parameterization of LPJ-GUESS include local meteorology, plant functional type and time of last major disturbance of the sites. The inclusion of local conditions allows predicting C-fluxes and pool sizes with greater accuracy.

We hypothesize that the inclusion of the N-cycle improves model predictions. The benefit of including the N-cycle is expected to differ between forest types, ecosystem types and/or climate regions. This effort will allow identifying the conditions in which dynamic global vegetation models potentially under- or overestimate C fluxes when ignoring the N-cycle dynamics and interactions.

The results will contribute to the development of ecosystem models with fully coupled carbon-nitrogen cycles, and a better understanding of interactions between the C and N cycle in forest ecosystems. These are essential steps towards better and more reliable predictions of the present and future global C and N cycle in times of global change.