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

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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.