Geophysical Research Abstracts
Vol. 19, EGU2017-13846, 2017
EGU General Assembly 2017

Terrestrial carbon-nitrogen interactions across time-scales

Sönke Zaehle (1,2) and Kerstin Sickel (1)

(1) Max Planck Institute for Biogeochemistry, Biogeochemical Integration Department, Jena, Germany (szaehle@bgc-jena.mpg.de), (2) Michael Stifel Centre Jena for Data-Driven and Simulation Science, Friedrich-Schiller University, Jena, Germany

Through its role in forming amino acids, nitrogen (N) plays a fundamental role in terrestrial biogeochemistry, affecting for instance the photosynthetic rate of a leaf, and the amount of leaf area of a plant; with further consequences for quasi instantaneous terrestrial biophysical properties and fluxes. Because of the high energy requirements of transforming atmospheric N_2 to biologically available form, N is generally thought to be limiting terrestrial productivity. Experimental evidence and modelling studies suggest that in temperate and boreal ecosystems, this N-"limitation" affects plant production at scales from days to decades, and potentially beyond. Whether these interactions play a role at longer timescales, such as during the transition from the last glacial maximum to the holocene, is currently unclear.

To address this question, we present results from a 22000 years long simulation with dynamic global vegetation model including a comprehensive treatment of the terrestrial carbon and nitrogen balance and their interactions (using the OCN-DGVM) driven by monthly, transient climate forcing obtained from the CESM climate model (TRACE). OCN couples carbon and nitrogen processes at the time-scale of hours, but simulates a comprehensive nitrogen balance as well as vegetation dynamics with time-scales of centuries and beyond. We investigate in particular, whether (and at with time scale) carbon-nitrogen interactions cause important lags in the response of the terrestrial biosphere to changed climate, and which processes (such as altered N inputs from fixation or altered losses through leaching and denitrification) contribute to these lags.