Geophysical Research Abstracts,
Vol. 10, EGU2008-A-00344, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-00344
EGU General Assembly 2008

Terrestrial nitrogen cycle simulation with a dynamic global vegetation model

Xu-Ri(1,2), I.C. Prentice(3)

(1) Max-Planck Institute for Meteorology, D-20146 Hamburg, Germany, (2) Institute of Tibetan Plateau Research, Chinese Academy of Science, Beijing 100085, P.R. China, (3) QUEST, Department of Earth Science, University of Bristol, Bristol BS8 1RJ, UK (Email: xu-ri@itpcas.ac.cn or xingxuri@yahoo.com / Phone: +86-10-62849535 / Fax: +86-10-6284 9886)

Abstract: A global scale **Dy**namic **N**itrogen scheme (DyN) has been developed and incorporated into the Lund-Posdam-Jena Dynamic Global Vegetation Model (LPJ). DyN is a comprehensive process-based model of the cycling of N through and within terrestrial ecosystems, with fully interactive coupling to vegetation and C dynamics. The model represents the uptake, allocation and turnover of N in plants, and soil N transformations including mineralization, N_2fixation, nitrification and denitrification, NH_3 volatilization, N leaching, and N_2, N_2O and NO production and emission. Modeled global patterns of site-scale nitrogen fluxes and reservoirs are highly correlated to observations reported from different biomes. The simulation of site-scale net primary production and soil carbon content was improved relative to the original LPJ, which lacked an interactive N cycle, especially in the temporal and boreal regions. Annual N uptake by global natural vegetation was simulated as 1.084 Pg N yr^{-1}, with a range from $<$1 g N $m^{-2}yr^{-1}$ (polar desert) to 24$\sim$36.5 g N $m^{-2}yr^{-1}$ (tropical forest). Simulated global patterns of annual N uptake agree closely with the previous study by Melillo et al., (1993). The model estimates global total nitrogen storage potentials in vegetation (5.3 Pg N), litter (4.6 Pg N) and soil ($\geq$67 Pg as organic N and 0.94 Pg as inorganic N). Simulated global pattern of soil N storage are consistent with the previous analysis by Post et al., (1985). Deserts were simulated to store 460 Tg N (up to 0.262 kg N m^{-2}) as NO_3^-, contributing 80% of the global total NO_3^- inventory of 580 Tg N. This model result is in agreement with a recent finding of a large NO_3^-pool

beneath deserts. Inorganic soil N (0.94 Pg N) globally is a small reservoir, comprising only 1.6% of the global soil N content of 1.5m soil depth, but the ratio has a very high spatial variability and in hot desert regions inorganic NO_3^- is estimated to be the dominant form of stored N in soil.