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Global terrestrial N2O budget for present and future

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Nitrogen (N) plays an important role in plant productivity and physiology and is the main limiting nutrient in a majority of the terrestrial ecosystems. The enhanced input of anthropogenic reactive nitrogen (Nr) in agriculture have enhanced global food production, but with adverse effects on biodiversity and water quality, and substantially increased emissions of N trace gases that affect air quality and climate. Emissions of N gases affects the climate, either through cloud forming nitrogen oxides (NO_x) gases or as greenhouse gases, where nitrous oxide (N2O) is the most important being approximately 300 times more potent than carbon dioxide (CO_2).
In this study we use the process-based global vegetation model Lund-Potsdam-Jena General Ecosystem Simulator (LPJ-GUESS) (Olin et al. 2015) that recently have incorporated a new soil N transformation scheme, adopted from Xu-Ri and Prentice (2008), which makes it possible to study the N2O emission respond to changes in climate and CO_2 concentration as well as anthropogenic N enhancements on a global scale. We present here results from the validation of the new model against site-scale N2O measurements from agricultural and non-agricultural ecosystems. We will also present results from a study to examine how land use, land use change and anthropogenic N fertilisation influence historical and future global N2O emissions.
This new development represents a key component within future projects in CMIP6 (LUMIP) and in EC-Earth for the EU Horizon 2020 project CRESCENDO.

Olin, S., Lindeskog, M., Pugh, T., Schurgers, G., Mischurow, M., Wårlind, D., Zaehle, S., Stocker, B., Smith, B. and Arneth, A. 2015. Soil carbon management in large-scale Earth system modelling: implications for crop yields and nitrogen leaching. Earth System Dynamics, 6, 745-768.
Xu-Ri and Prentice IC. 2008. Terrestrial nitrogen cycle simulation with a dynamic global vegetation model. Global Change Biology, 14, 1745–1764.