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Title

Quantifying nitrogen fluxes and their influence on the greenhouse gas balance: recent findings of the NitroEurope Integrated Project.

Authors

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Abstract

The generation of reactive nitrogen (N_r) by human activities to stimulate agricultural productivity and the unintended formation of N_r in combustion processes both have major impacts on the global environment. Effects of excess N_r include the deterioration of air quality, water quality, soil quality and a decline in biodiversity. One of the most controversial impacts of nitrogen, however, is on the greenhouse gas balance. While recent papers have highlighted a possible benefit of nitrogen in enhancing rates of carbon sequestration, there remain many trade-offs between nitrogen and greenhouse gas exchange. The result is that the net effect of N_r on the global radiative balance has yet to be fully quantified.

To better understand these relationships requires intense measurement and modelling of N_r fluxes in order to make the link between different nitrogen forms and their fate in the environment. It is essential to measure fluxes for a wide range of ecosystems considering the biosphere-atmosphere exchange of the N_r components and greenhouse gases, as well as the fixation and denitrification of di-nitrogen. Long-term observations are needed for representative ecosystems, together with results from experiments addressing the responses of the key nitrogen and greenhouse gas fluxes to different global change drivers.

The NitroEurope Integrated Project (in short NEU IP), funded under the 6th Framework Programme of the European Commission, has developed and applied a strategy for quantifying these different terms on multiple scales. With the project nearing completion, this presentation reports some preliminary findings. It highlights the first estimates of net green-house gas exchange for a series of 13 flux 'supersites', complemented by the emerging results of N_r concentrations a large network of 58 'inferential sites', which are being used to estimate nitrogen inputs. In addition to these, new low cost methods to measure nitrogen fluxes will be reported, which have been extensively tested at the 'supersites' and a network of regional sites, which extend the European representativity of the results. Results from this 3-tier flux network will be are underpinned by emerging findings from an extensive network of manipulation sites, and by modelling at plot, landscape and European scales. Finally the talk will illustrate how nitrogen mitigation techniques are being considered at the European scale, including an estimation of the scale of costs involved in simultaneously mitigating nitrous oxide, ammonia and nitrate losses.