Tropentag, October 9-11, 2007, Witzenhausen

"Utilisation of diversity in land use systems:
Sustainable and organic approaches to meet human needs"

Immediate Impact of Elevated Nitrogen Input on Trace Gases Emissions in an Old-Growth Lowland Forest in Panama

Hans Wullaert[1], Edzo Veldkamp[2], Marife D. Corre[2]

[1] *University of Mainz, Geographic Institute, Germany*
[2] *Georg-August-Universität Göttingen, Institute for Soil Science and Forest Nutrition (IBW), Germany*

Abstract

In tropical areas, nitrogen (N) emission, transport and deposition are projected to increase rapidly in the next decades. In this study, the consequences of elevated N input on trace gases emissions from a tropical lowland forest soil were evaluated. The study site is located in Gigante Peninsula, Panama, which included control and N addition treatments each with four replicate plots. Urea-N was applied twice in 2006 (April 28 and June 6) at a rate of 31.25 kg N ha^{-1} each application. Nitrous oxide (N_2O), nitric oxide (NO), carbon dioxide (CO_2) and methane (CH_4) fluxes were intensively measured prior to and until one month after the second N application; this measurement period was within the beginning of the rainy season. We observed significantly higher NO emissions from the N-fertilised than the control plots, but N_2O, CO_2 and CH_4 fluxes did not differ. The increased NO fluxes were largely observed during the first week after the second fertilisation, when water-filled pore space (WFPS) has increased as the rainy season progressed. N_2O emissions could possibly increase with N addition when soil moisture further increase into the rainy season. The significant correlation between N_2O + NO fluxes and NH_4^+ levels and the range of WFPS (40–60 %) indicated that N trace gases were possibly predominantly produced by nitrification. The fertiliser- induced N oxide emission was 3 % of the applied N. The CO_2 and CH_4 fluxes indicated that initial N addition did not bring detectable change in microbial decomposition and root respiration for CO_2 emissions and in CH_4 consumption and production for CH_4 fluxes, at least during the early rainy season covered in our measurement.

Keywords: Climate change, denitrification, N cycling, nitrification, tropical lowland forest

Contact Address: Hans Wullaert, University of Mainz, Geographic Institute, Mainz, Germany, e-mail: wullaert@uni-mainz.de