



Evidence for high N-turnover rate in agricultural soil by N₂O production and consumption

A. Neftel (1), C. Flechard (1) and F. Conen (2)

(1) Air Pollution/Climate Group Agroscope FAL, Zürich, Switzerland, (2) Environmental Geosciences, University of Basel (albrecht.neftel@fal.admin.ch)

The “Hole in the pipe” model first proposed by Firestone and Davidson (1989) is the standard model to visualize the formation of NO and N₂O in the soil. Biological nitrification and denitrification are the dominant processes responsible for the production of N₂O in soils. While nitrification is an aerobic process caused mainly by autotrophic bacteria and is believed to produce NO and N₂O, both N₂O and NO can be produced and consumed by denitrification. N₂O is believed to be an obligatory intermediate in denitrification. It is commonly assumed that complete reduction to N₂ occurs only under greatly reduced O₂ availability.

Systematic investigations of the appearance of N₂O consumption in the Swiss CarboEurope Grassland site Oensingen from quasi continuous measurements of the N₂O concentration profile on the open pore space down to 50 cm below surface as well as laboratory investigations give evidence for a persistent N₂O consumption process that is also present under aerobic conditions. It can be described with a first order rate constant. The associated turnover of N in the soil amounts to more than 20 kg N ha⁻¹y⁻¹ thus a substantial fraction of the yearly N-turnover