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Interactive comment on "N_2O, NO and CH_4 exchange, and microbial N turnover over a Mediterranean pine forest soil" *by* P. Rosenkranz et al.

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The paper by Rosenkranz et al. presents interesting and valuable measurements on NOx, N2O and CH4 exchange between the atmosphere and the soil of a Mediterranean pine forest. The authors used their well established equipment and found partially surprising results, especially consistent small uptake of N2O. On the methodological site I would like to have more precise information on the setup of the chambers, i.e. how have they been placed on the ground, how deep they have been inserted and how they have been sealed. I also found no indication how long the chamber have been closed and whether the correct functioning has been controlled e.g. with CO2 concentration measurements. The measurement of soil gas profiles with ACCUREL tubes yields important additional information (see also Gut et al., 1998). The N2O

concentration differences on which the evidence of the N2O uptake is based are small, both in the ACCUREL tubes as well as in the chambers. Can the possibility be ruled out that increase of H2O and CO2 concentrations in the gas stream feeded to the GC caused a dilution of N2O that could be misinterpreted as an N2O uptake? Obviously the same question arises for the static chamber measurements.

The authors explain the observed N2O uptake by aerobic denitrification by heterotrophic nitrifiers as suggested by Wrage in conditions with drastic reduced inorganic N-supply. This interpretation is plausible but it has to be mentioned that the chamber flux measurements are net flux values and cannot distinguish between gross production and gross uptake, the same holds for the concentration measurements in the soil tubes. The measured range of gross N-mineralisation is judged as extremely small, but still has a considerable potential for a production of NO and N2O along the nitrification and denitrification chain, my rough estimation gives a potential in the order of 5 mg N m-2d-1. The somewhat surprising fact that the artificial rain has no effect on the N2O fluxes and only a minor effect on the NO flux could also be explained that both the production and the uptake processes has been stimulated and the net effects reminded mostly unchanged with of course the exception of the CH4 fluxes. The absence of continuous soil humidity measurements hinders the quantitative interpretation of the data.

CO2 measurements in the soil profile could support the hypothesis of aerobic conditions. A back to the envelope comparison of the CH4 and N2O fluxes and profiles suggests that the major part of the observed N2O uptake should take place within the organic layer. The diffusivity and the too small N2O gradient in the soil itself seems unable to explain the measured fluxes.

It seems quite risky to conclude from two month of measurements on a systematic sink of this type of Mediterranean forest. Emissions peaks are sporadic and generally related to trigger events such as rain. Because the diffusion limitation is less pronounced compared to uptake longer periods of uptake might easily be dominated by shorter

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emission phases.

I support the publication of this paper and encourage the authors to take into account the suggestions that I made with moderate revisions.

References:

Gut, A., Blatter, A., Fahrni, M., Lehmann, B.E., Neftel, A. and Staffelbach, T. (1998) A new membrane tube technique (METT) for continuous gas measurements in soils. Plant and Soil 198 (1), 79-87.

Interactive comment on Biogeosciences Discussions, 2, 673, 2005.