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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.

P. Rosenkranz et al.

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We do agree with the reviewer that the explanation of aerobic denitrification is speculative. It would be very helpful if we would succeed to get a soil showing N2O uptake into the laboratory. We have several times tried to do so, but the N2O uptake activity disappeared when transferring the soil to the lab. Most likely this has something to do with the cutting of fine roots and thus, with the additional supply of easy decomposable substrate to the soil microorganism population. However, we have ongoing research and hope that we get a better understanding of the involved mechanisms in due time. We are aware of the problems associated with the 15N pool dilution method and do know the papers by e.g. Berntson and Aber, 2000 or Davidson et al., 2003. They report about a fast abiotic immobilization of nitrate especially in forest soils with high organic carbon contents. To avoid part of this problem we did our first extraction

after 16 hours (T0). The second extraction (T1) was after 40 h. The recovery rate of the added 15N nitrate was with 77-96% quite high. We added a sentence to the MM section to address this issue and marked T0 and T1 in the text.

The in contrast to other publications rather low 15N enrichment was chosen in accordance with the Risø National Laboratory to guarantee optimal isotope ratio analyses. Earlier experiments do not indicate that a low labeling will result in an under- or overestimation of gross rates.

For labelling we added 2 μg N 100 g-1 soil fresh weight. This information is now given in the methods chapter. Furthermore, we added a sentence on the effect of labelling on the ammonium and nitrate pool: "Due to the rather low in-situ ammonium or nitrate concentrations in the soil (see Table 3) labelling resulted in a significant increase of the anorganic N pools. However, since by the 15N pool dilution technique method the product and not the substrate pool of the investigated process is labelled, i.e. for ammonification the ammonium pool and for nitrification the nitrate pool, this should not have any effect on the magnitude of the rate itself."

We added 3 ml H2O to 100g fresh soil while labeling procedure and mention also this information now in the methods chapter. Since the mean water content of fresh soil samples was approx. 25% w/w water additions of 3 ml for labeling only changed soil moisture moderately by approx. 3% w/w. Also this clarification is now provided in the Material and Method section.

Reference:

Berntson G.M., Aber J.D.: Fast nitrate immobilization in N saturated temperate forest soils; SOIL BIOLOGY & BIOCHEMISTRY 32 (2): 151-156; 2000

Davidson E.A., Chorover J., Dail D.B.: A mechanism of abiotic immobilization of nitrate in forest ecosystems: the ferrous wheel hypothesis; GLOBAL CHANGE BIOLOGY 9 (2): 228-236; 2003

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