

Interactive comment on “Pure stands of temperate forest tree species modify soil respiration and N turnover” by N. Brüggemann et al.

Anonymous Referee #3

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General comments:

The study provides results on the gross N mineralisation, gross nitrification, and CO₂ production in a sandy soil where pure stands of five different tree species were grown. The topic of this manuscript - effects of tree species on C and N transformation in soil - is within the scope of Biogeoscience. The authors found that rates of C mineralization, gross N mineralization, and gross nitrification were generally higher in the organic layers than in A horizons. Additionally, it was shown that rates of C mineralization, gross N mineralization, and gross nitrification were highest in the organic layer under spruce. There was no clear tree specie effect in the Ah horizon. The authors concluded that the tree specie is an important factor influencing C and N transformations in soils. The experiment and the results are explained clearly. The methods were applied correctly and are suitable to evaluate key processes of the soil nitrogen cycle. However,

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the scientific significance of the results is below average, since the presentation of the results is only descriptive. The differences between the tree species or between the O and A horizon were only described but they were not explained or discussed adequately. Thus, this study does hardly improve the knowledge why differences between tree species occurred. The general conclusion that there is a tree specie effect on soil C and N transformation is not new. Additionally, the ecological significance of the results is not clear since the results were only related to kg soil. The results should be also related to a unit surface area (e.g. m², ha) to obtain information whether the rates of the measured processes are different between the stands. Additionally, the rates can be related to a mass unit Corg or Nt. These measures provide better information about the specific availability of soil C and N in the samples. The tree specie effect on N transformation in the Ah horizon is not clear (missing letters in Fig. 3); it might be an interesting result that there were no differences in the Ah horizon.

Specific comments:

1. Information on litter quality is missing. This information is crucial to understand differences between tree species 2. The authors state that they minimized disturbance of soil samples. However, samples were sieved before the incubation. This pretreatment may influence rates of C and N transformation considerably. Critical discussion on this point is missing.
3. The C and N transformation rates in the organic layer can be strongly influenced by the progress and the dynamics of decomposition of fresh litter from the last year. Since the seasonal variability of mineralization rates of fresh litter is high, it is not sure that two sampling dates are enough to describe C and N mineralization in the organic layer.
4. Pooling all available data for regression analysis (Fig. 4) resulted in a highly skewed distribution (far away from a normal distribution) and it is obvious that the correlation is caused by the data from the humus layer. The relation is not valid for samples from the Ah horizon. Thus, pooling of all data seems not to be the appropriate method to

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analyze these results.

5. Section 4.1: The authors describe in general how tree species may influence C and N transformation processes but the importance of these factors in the present study remains unclear. It was concluded that the thickness of the litter layer reflected litter quality and microbial activity but the influence of the thickness of the litter layer was not evaluated. It was speculated that tree specie effects were the result of differences in microclimate. However, this was not proven or explained by the results of this study (lowest temperature under spruce but highest C and N turnover).

6. Tab. 2: The maximum water holding capacity in the mineral soil should be similar in April and July, however, Tab. 2 indicates large differences at some sites (e.g. oak). Are these changes of mWHC (e.g. from 70% to 53%) reliable?

This paper is nicely written but due to the insufficient data evaluation and missing discussion and explanation of the tree specie effects (e.g. including more specific data about tree litter quality from literature) the scientific significance of the manuscript is poor. The conclusion that tree species can influence C and N transformation and that the humus layer is the most active part of the soil profile is not new and was described in several studies.

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