bg-2023-38-AC1

We thank Reviewer 1 for carefully reading and commenting our manuscript. Below are our responses in blue, with the original reviewers' comments in black.

The current manuscript addresses relevant scientific questions within the scope of the journal: testing the effects of increased N deposition on acidification processes in a well-buffered ecosystem. This is a concept not enough explore so far, which gives high scientific relevance to the paper. The hypothesis are clear, well described, and fully addressed through methods and assumptions, that are clearly explained.

We appreciate the reviewer's recognition of our manuscript's contribution to ecological research.

- line 14-15, Although it is known from previous studies, the text here it is not clear enough about the N addition. Please clarify if N treatment is 22 kgN greater than the ambient N deposition (C treatment), that was 12 kgN at the beginning of the study, or if it represented 22 kgN compared to 12 kgN of ambient deposition.

Indeed, these are 22 kg as treatment on top of 12 kg of ambient deposition. The abstract will be improved to make it clear that 22 kg is the additional input.

- line 139-145: It could be also clarified a little.

Especially the time course was not clear, with one-year of measurements preceding the start of the N treatment. The text will be amended to explain what we mean with this calibration period.

Deposition. *Although N deposition and cycling is not key for the study, some further data a discussion on this issue could improve the understanding or, at least, allow further interpretation of the results. Particularly, the nitrate concentration response in runoff could be related to N cycling dynamics that can be connected to saturation processes. Knowing that N leaching is addressed in previous studies, not much information would needed here, but some of it would be appreciated. Particularly, a historic evolution of N deposition comparing both treatments would be appreciated. Moreover, in this study, throughfall deposition (if available) would be of greater relevance than bulk deposition since it represents a direct input into the soil.*

It is certainly a good idea to recall here the main results obtained about nitrate leaching. In this regard, we can distinguish three main periods over the course of our experiment: (1) immediate response due to preferential water flow through the soil, (2) progressive N saturation and (3) several years of increased leaching after girdling, then felling part of the trees. These results are already published in more detail but will shortly be recalled when we discuss nitrate leaching in the present contribution.

As it also partly represents dry deposition, throughfall is indeed a valuable information. It is already given in the material and methods and will be added to the introduction and also to the abstract.

- line 15, line 92, line 130: the deposition value referred here is from the beginning of the study

N deposition did not change much over the course of the experiment, but it is indeed better to write explicitly that the given numbers are from the beginning of the experiment.

- line 130: total deposition and N retention in the catchments are also available from previous studies. The authors might consider if these data could be relevant here.

This point is also justified and can be answered in the same context as the 3 previous ones.

- lines 273-280: deposition data from other studies are referred here. Since it is stated that precipitation has not significantly changed in the valley, the changes in N concentration in rain are correctly assumed to be reflected in deposition values. However, some data on measured deposition trends would be appreciate here.

Indeed, even if the trend in precipitation in not statistically significant, it still slightly modifies the trend of the fluxes compared to the concentrations. We will include these trends in Tab. S1.

Nitrate leaching. *lines 297-299: This is just a question. It is stated that "NO_3^- can have an acidifying effect if leached together with base cations, leading to their replacement by H^+ or Al^{3+} on the exchange complexes". This effect is observed in N treatment in the increase of NO_3 leaching, that is related to the strong increase in soil acidity on the mounds. Should it be also related to an increased leaching of base cations that matches the NO_3 leaching but that cannot be observed in the current graphics?*

Ca^{2+} is the dominant cation in runoff water. It can be seen (Fig. 6) that Ca^{2+} concentrations decrease more in the control catchment than in the N-treated catchment. Additional NO_3^- leaching from the treated catchment can partly (only partly) explain this difference in Ca^{2+} trends. A short indication about this will be added here in the discussion.

Figure 1. *I understand that trenches in catchment 1 are present in the same way as in catchment 2 (around the entire perimeter) but it is not drawn in the picture.*

On its upper part, catchment 1 (control) is delimited by a natural water divide. As the contour lines drawn on the graph are barely visible, a short explanation will be added to the legend of the figure.

Please consider the following suggestions. *(Detailed comments not repeated here)*

All these comments are useful and will be taken into account. Only the 4th one (about decomposition) does not contain any particular action to be taken. The sentence was thus just considered with a particular attention within the overall language editing of the whole manuscript.