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Interactive comment on "Century-scale wood nitrogen isotope trajectories from an oak savanna with variable fire frequencies" *by* Matthew Trumper et al.

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The manuscript by Trumper et al. reports on a fascinating study examining the 15N enrichment in the savanna oak wood rings under the influence of fire events of different frequency. The basis of this study is the assumption that 15N levels in the wood are determined by the 15N enrichments of the taken-up N. Thus, interrogating the wood 15N enrichments, the authors may catch a glimpse of the effect of fire frequency on the soil N cycling or directly N availability in the soil. They demonstrated once more that the complex contributions of various processes in the nitrogen cycle make impossible assigning the same pattern of 15N enrichments to different trees/plots. This has been

the case, even if the trees were from plots that look similar in overstory vegetation, topography, and soil properties (1st part of the hypothesis). Maybe it depends a bit more on the soil properties. The authors may want to show the soil characteristics in the four plots. The 2nd part of the hypothesis, based on the assumption that soil N availability decreases (on long timescale) after burning, predicts a decrease in the wood 15N proportionally to the fire frequency. My major concern is that the experimental design does not enable precise statistical testing of this hypothesis. This is because there are no replicates for the treatments (only one plot with four trees) and the plots, localised at different distances, bring a high heterogeneity in the analysis anyhow. I do not think that the way the authors try to present the testing of this hypothesis is the most adequate. I am surprised by the regression analysis between a continuous (delta15N) and a categorical (Year)variable. I suggest evaluating the effect of time but no differences among treatments, using the trees as replicates in a repeated measured ANOVA. We all know the high variability among measurements that make the data difficult to meet the normality assumptions of ANOVA, but you can give a try. There is also a possibility to use GLMM and consider the tree as a random factor. I see in the text different p-values or expressions referring to the comparison among treatments (i.e., stands). I do not understand how were those comparisons done. I miss a table/figure presenting the mean value or min, median, max of data in each plot at each time point. The authors acknowledged that the fire differentially affects N soil cycle on a short vs long timescale. I have understood the reason, but I have missed the algorithm of their selection of the two samples per decade.

Specific comments Page 2-line 18: The main factor is the reduced losses that result in a lower enrichment of the soil N pools, the mycorrhizal transfer is added to that. Fig 1 & Fig 2: Fig 1 is almost identical with the figure from van der Sleen et al. 2017 (you probably need the copyright). The predictions shown in Fig. 2 are based on your box additions to the Fig 1. Maybe it would be sufficient enough to include those boxes as an inset in Fig 2. Page 3-lines 6-7: I think the soil N availability matters in those patterns. Maybe it is worth it to discuss the low N availability that is the case at CCESR. Page

6-line 19: a mean value of ring width would be helpful. Page 6-line 20: Is this an issue here? The inter-ring 15N mobility is relatively restricted to the youngest rings. Page 8-line 20: the regime shift detection analysis is less known to some readers. Could you please add a short explanatory phrase. Page 9-line 3: In the case you used a nonparametric test, the median value is more appropriate to be shown. Page 9-lines 10-20: please specify where are all these data displayed. Figure 5: please also include the heartwood-sapwood transition in the left panel. Page 12-line 27: The correlation figure between N and delta15N could be of interest as the negative correlation is a bit unexpected. Page 13-line 1: but see Meerts 2002(doi.org/10.1051/forest:2002059) and Martin et al. 2014 (doi.org/10.1111/nph.12943).

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