Biogeosciences

Discussions

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Interactive comment on "Plant controls on post-fire nitrogen availability in a pine savanna" *by* Cari D. Ficken and Justin P. Wright

Anonymous Referee #1

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General comments

The study presented in this paper investigates soil nitrogen availability in longleaf pine savanna after prescribed burning. This piece of work fits within the scope of Biogeosciences as it studies nitrogen (N) pool sizes and transformations in an open canopy savanna-like ecosystem. The paper presents a novel dataset of weekly data points spanning across a pre- and post-fire period of nine weeks. The description of the study site and scientific methods applied are clearly articulated.

The authors could improve model description for pool sizes and cycling rates by including more details. The paper is well written with a logic structure and concisely summarised in the abstract.

However, in my opinion, the results do not sufficiently support the interpretations in

the discussion, as the chosen setup of study sites does not seem adequate. Firstly, the aim of this study was to present data about the effects of prescribed fire on soil N dynamics; yet, one of the three treatment sites (B2) was affected by wildfire and had a shortened fire return interval compared to the other two sites. Secondly, the two sites affected by prescribed fire had very different responses to fire in terms of vegetation re-sprouting and different standing biomass stocks prior to fire. While the authors related the differences in magnitude of the mineral N pulse to these site differences the number of independent sites (N=2, with three replicate soil cores per site and week) seems too small to support the overall conclusion proposed in the paper - that plant uptake regulates post-fire N availability; especially given the high variance within site pre- and post-burn data and between sites.

Specific comments

The authors may consider revising Figure 1 as the schematic illustration of the paired-core sampling design is not readily understood. For example, it is unclear what the single circle below week 9 represents, is it the last sample for the measurement of pool size? It might be better to depict paired-soil cores for all nine weeks or omit the figure altogether as the sampling design is sufficiently explained in section 2.2.

Authorities for plant species names should be included when species are mentioned for the first time.

In the methods section, the description of the Bayesian hierarchical models would benefit from including more details, specifically: - Site effects (intercepts for B1-B3) should be reported - Did the authors standardise the coefficients? - What is the underlying distribution for $\beta 0i,j$? - Should the formula in 3b have a minus before $\beta 6iy0i,j$ as the initial concentration is subtracted from the incubated concentration? - Using the rjags package, how many chains and iterations were run? How was convergence tested? - Does $\sigma \sim unif(0,100)$ relate to both models or just the cycling rates model?

On page 15 (line 19), please state how soon following fire vegetation re-sprouted in

sites B1 and B2.

On page 18 (line 4), should it read "...and sharp increases in soil temperature with depth..." instead of decline?

In the discussion on page 18 (line 27) authors refer to the preference of plants in pine savanna for uptake of ammonium. It would be good to include a reference confirming this statement about uptake preference in this ecosystem as the authors argue that plant preference for ammonium uptake could explain the relatively large nitrate pool sizes relative to ammonium.

Temperature is an important influential factor on N transformation processes (MIN, NIT) and soil temperatures might change after fire due to the blackened surface promoting increased heat absorption. The authors could discuss whether they consider soil temperature to have an effect on N transformation processes in the context of their study.

Technical corrections

Page 5, line 17: delete 'in'. Page 9, line 1: correct the word 'through'. Page 10, line 23: correct reference to figures to '3-4' instead of '2-3'. Page 11, line 7: correct figure number in brackets to Figure 5. Page 17, line 9: delete first 'ash' in sentence.