Biogeosciences

Discussions

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Interactive comment on "Effect of iron oxide on nitrification in two agricultural soils with different pH" *by* Xueru Huang et al.

Anonymous Referee #2

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This article examines how pH and iron oxides interact while impacting the effective processes of nitrification, mineralization and immobilization in subtropical agricultural soils under anoxic conditions. The science is good, the article is short and concise (which is good), and is typically in the scope of BGS. In particular, targeting how iron oxides impact nitrification, a key process in many soils but especially in tropical soils where the presence of iron is important, is crucial and little addressed in the literature.

Overall, the English is to be improved (even if not catastrophic); ask a native English speaker or equivalent to proofread the manuscript. Finally, a number of points are also to be improved, listed below:

ABSTRACT: * Line 13: here, and later in the manuscript: please specify the reason why the experiment was done at 100% WHC; * In the abstract in general: Avoid vague

phrases like eg. 'We hypothesized that the effect of Fe oxide on N transformation processes would be different' (line 11); be more specific about the expected effects;

INTRODUCTION: * Here, and in the discussion, there are no details on the potential impact of the processes studied on denitrification rates. Specify in a few lines how your experimental conditions, or the presence of iron in general, likely impact denitrification under anoxic conditions; * Line 23: 'affect'->'affects'; * Lines 23-25: yes, I do agree that the role of iron on nitrification is important and little studied. Also specify how this is especially important for tropical or subtropical ecosystems; * Line 38: 'such as humic substances'-> please specify if this parameter's control on nitrification is through quantity, quality, both?; * Line 40: 'Meiklejohn, 1953'-> please find a more recent reference; * Lines 42-43: 'These findings confirm the relevance of Fe oxides as a key factor in promoting pathways leading to N loss in soils.'-> this is not clear to me. You state in the sentence before that hematite is lowering AOB and AOA, so it is likely not promoting but lowering N loss, as denitrification should be reduced due to lower nitrification...; * Lines 47-49: I don't understand the difference between the two questions: 'Does the presence of Fe oxide influence the rate and amount of nitrification, N mineralization, and N immobilization in soils with different pH?'; and 'How does Fe oxide influence these N transformation processes under different pH in soils with 100 % water holding capacity (WHC)?'. Please be more specific.

MATERIAL AND METHODS: * Line 54: 'days->'days per year'; * Lines 53-59: please be more precise with the description of the studied sites. - Soils are classified as Fluvents, Udifluvents: both (agricultural land vs. hill)? Please describe what it means; - Precise soils management (possibly by citing previous papers on these sites); especially for the high pH site: how many years ('a few') after conversion? What was the amount of N fertilizer before? - Precise the dates of sampling; * Line 62: 'and stored at 4 °C prior to use'-> for how long exactly?; * Line 63: 'passed through a 1 mm sieve'->why not 2mm? * Lines 63-64: 'The results of the chemical properties of soils are shown in Table 1.'-> please put this sentence at the beginning of the 'Soil chemical

parameter' paragraph; * Line 71: 'XRD': please specify the brand of device; * Line 73 and below: please choose a constant term in the manuscript between 'amended with Fe' vs. +Fe' vs. 'Fe treated'; * Line 77: why sieving at 2mm again? (the second time); * Line 82:' free Fe oxides'-> what are they, 'available Fe' in Table 1? If not, they are lacking in Table 1 and 'available Fe' are not described; * Please put paragraph '2.3 Soil chemical analyses' before paragraph '2.2 Preparation of Fe oxide treatments'; * Paragraph '2.4 Experimental design and 15N addition': please specify the total N of samples. Is it 2x2x2x3=24x5 (time kinetics)=120? * Line 90: 'incubated for 6 days at 28 °C.'-> in the dark? * Lines 96-98: please specify in few words the techniques used for colorimetry and diffusion, and the model of machines; * Line 100: 'MBN'. As for the other acronyms, once you defined them, use them always in the subsequent text; * Line 104: 'were'->'was'; * Line 110: 'aprroximately'->' approximately'; * Paragraph '2.8 Statistical analyses': please state how you have checked the normality and homoscedasticity prior to ANOVA; please also specify the post-hoc tests you used;

RESULTS: * Lines 126-128: 'In both low and high pH soils, the NH4+-N concentrations showed a significant decrease after the application of (NH4)2SO4, at both 30.9 and 15.6 mg NH4+-N kg−1 soil at day 1 and 6, respectively, in the higher pH soil with the Fe oxide amendment' -> not clear, please rephrase; * Lines 126-128: please describe the +K15NO3 figures and results; * Lines 137-140: please state what is significant. . .; * Line 145: 'but slightly decreased it in the low pH soil'-> no, it is not significant so there is no decrease;

DISCUSSION: * Line 158: 'suppressed'-> too strong. 'lowered'?; * Line 168: 'Kuroiwa et al., 2011'-> reference lacking; * Line 169: 'it dominates nitrification'->' it generally dominates nitrification'; * Line 176: 'occurance'->' occurrence'; * Generally in the Discussion: please discuss the MBN15N results. . .; and discuss the impact on denitrification process; * Line 183: 'Jansson et al., 1955'-> please find a more recent reference;

TABLE 1: * Legend: 'studied soils' too vague, precise; precise what are fluvent/udifluvents subsamples. . . the two sites? * The statistical data are lacking here! *

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Specify as said above what is 'available Fe';

FIGURE 1: * Legend, line 357: 'moisture of'->'moisture at'; 'concentration'->'concentrations';

FIGURE 2: * Legend: specify Fig 2a and Fig2b after mineralisation and nitrification; * Are you sure that for Fig 2b pH5.1 control and pH 5.1 +Fe are statistically different?

FIGURE 3: * Legend: specify acronyms + Fig 3a and Fig3b after 15N and N.