

***Interactive comment on* “Strong correspondence between nitrogen isotope composition of foliage and chlorin across a rainfall gradient: Implications for paleo-reconstruction of the nitrogen cycle” by Sara K. E. Goulden et al.**

Anonymous Referee #2

Received and published: 5 June 2019

General comments:

Goulden et al present a novel approach to understand terrestrial N dynamics by using compound specific analysis. The results show that $^{15}\text{N}_{\text{pheo}}$ is potentially a better proxy than bulk properties. The results and approaches are convincing and it definitely fits within this journal's topics. Nevertheless, as the authors also pointed out more detailed work especially in terms of the age of the material they have been working is needed to better constrain the limitations. Overall, I am impressed by the techniques used and the promising proxy presented in this study, and yet below I list some minor

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issues I realised.

- Structurally: there are some paragraphs with only one sentence - I am not sure this is within the journal template, I recommend the authors to structure the manuscript with more concise paragraphs and better connections between paragraphs. It will be an easier read for everyone. Related to that, there are many sections in the methods and results and none in the discussion. For instance, section 2.2 and 2.3 could be combined. Accordingly, subsections in the discussion also would be better and easier to follow the flow of the discussion as in results.

- it will be probably corrected during the post-review process but still, do not forget to format the citation within the text ex: page 2, line 14 (e.g. (Drake...))

- I highly recommend authors to provide the data to databases where it is easily accessible upon publication. We should be supportive to open science and open data policies.

Introduction & discussion:

I am missing an introduction to compounds used. A nice introduction to pheophytin is only done in the discussion until I reached that point I did not really get why we are looking at pheo rather than chlorins (as the title says) and chl as it was introduced in the introduction. Overall the intro part gave a nice discussion on N dynamics in terrestrial environments, including the PNL where I was hoping to see this also in the discussion. How compound specific isotopic approaches would advance our understanding of N dynamics? What input ^{15}N pheo will provide in terms of all the ongoing discussion? These could be implemented to discussion part in accordance with the introduction. Otherwise, the introduction could be (maybe should be) more technical and focus on more in compounds and isotopic fractionation for instance.

small details and questions:

page 3 line 13:... terrestrial $\delta^{15}\text{N}_{\text{leaf}}$: leaf subscript

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page 4 line 8: is climate a landscape effect? maybe precipitation is a better word?

page 4 paragraph starting from line 15 needs reconstruction, it is not an easy or maybe not well written paragraph.

page 5 line 21: first sentence is a sampling strategy should be in the below section (2.2).

Page 5 lines 29-30: (and generally many more) can authors be more specific?

page 6 line 1: what depth is the deepest soil sample from?

page 7 lines 13 and 15: JAMSTEC acronym should change places. line 15 should be in line 13

page 9 line 31 d15Nptheo - o is missing

page 10 line 6: ...along the soil profile do (?) not deviate

page 12 lines 1-2: citation needed at this sentence where ptheo is introduced.

page 12 paragraph starting with line 22: Can authors provide more info on the ages presented here? where are mentioned other sites here? close by? this paragraph and information given here can be improved.

References: please double check the format some references are all in caps lock

Figures: 1: would it be possible to indicate the vegetation somehow on these maps?

2 & 5: y axis title is cut, missing some part of 15N

Table 1: please add any other info on the sites below the letter like elevation or precipitation.

Table 3: I think the names should be written italics

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-81>, 2019.

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