

## ***Interactive comment on “The interaction between nitrogen and phosphorous is a strong predictor of intra-plant variation in nitrogen isotope composition in a desert species” by J. Zhang et al.***

**J. Zhang et al.**

lianhong-gu@ornl.gov

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Response to Anonymous Referee #2

Comment: This study presented interesting data on intra-plant variations in  $\delta^{15}\text{N}$  of *Nitraria tangutorum* in northwestern China. Plant  $\delta^{15}\text{N}$  has been widely used in various studies on plant physiology and N cycles, because it can provide information about N pathways through ecosystems. As the authors clearly state in Introduction, most of these studies examine  $\delta^{15}\text{N}$  variations across plant species or sites with different soil N properties. Therefore, it is crucial to study mechanisms underlying the intra-plant  $\delta^{15}\text{N}$  variations. Response: We thank this referee for supporting our study and for the

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critical and insightful comments and suggestions.

Comment: The Introduction section is concise and well written, and presenting the significance of studies on factors governing the within-plant  $\delta^{15}\text{N}$  variation, such as N pool in plant tissues. However, the results presented in this study (C, N, P concentrations of each organ) seem not adequate to explore the mechanisms that the authors intended to reveal and consequently I could not find convincing arguments in the current version of the manuscript. I think that there are number of issues to be addressed before recommendation can be made for publication in Biogeosciences. Response: We agree with this referee completely in that the mechanisms responsible for the patterns and relationships in intra-plant  $\delta^{15}\text{N}$  variations first reported in this paper cannot be revealed by the data contained in our study. We have revised the manuscript accordingly to make clear the point that any suggestion for the mechanisms is necessarily speculative and have to be tested in additional experiments.

Comment: General comments: It is unclear why the authors measured P and C concentrations (and the ratios) and examined the relation between P and plant  $\delta^{15}\text{N}$ . To explore the intra-plant  $\delta^{15}\text{N}$  variation, it seems to be important to investigate N pools in each organ as the authors mention in the third paragraph of Introduction. Please add explanations about the rationale of the C, N, and P measurements of each organ. Response: We have revised the Introduction to explain why C and P were also measured in addition to N, mostly from P and N interaction point of view in biochemistry. This is not a hypothesis-driven study in which manipulative experiments are conducted to refute or verify a well-defined notion constructed based on previous knowledge. Rather it could be considered as a data and curiosity-driven research that investigates possibilities. In the former case, an educated hypothesis justifies measurements a priori while in the latter findings give value to measurements a posteriori. Both approaches are important for scientific research. Arguably the latter may be becoming more important as new technologies have been dramatically increasing our capacity to obtain new data. Just some thoughts to share with this referee.

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Comment: In addition, most of the arguments in Discussion were concerning not intra- but inter-plant  $\delta^{15}\text{N}$  variations across sites with different soil N properties or among plants associated with mycorrhizal fungi. Although the authors propose that N volatilization from plant organs is a factor determining the  $^{15}\text{N}$  variation, no evidence was presented. Response: Few studies have been done on intra-plant  $\delta^{15}\text{N}$  variations as compared with inter-plant  $\delta^{15}\text{N}$  variations, not to mention the mechanisms responsible for intra-plant  $\delta^{15}\text{N}$  variations. We have revised the Discussion section to make sure that N volatilization is only a hypothesis proposed to explain the observed patterns and the discussion on inter-plant  $\delta^{15}\text{N}$  variations only serves to promote awareness that intra-plant variations could complicate interpretation of data on inter-plant variations.

Comment: It would be necessary to reorganize this manuscript to make arguments based on the obtained results and relevant studies (e.g., Cernusak, Winter & Turner 2009 *Plant Physiology* 151: 1667-1676; Gauthier et al. 2013, *Plant Cell Environ* 36: 128-137). Response: Thank you for making us aware of these two studies. We have adopted this suggestion in the revision.

Comment: Finally, I noticed that Materials and Methods section of this manuscript seems to be quite similar to the previous manuscript on intra-plant variations in  $^{13}\text{C}$ , which the authors have published in this journal. I believe that copying sentences word for word of previous manuscripts should be avoided even if the authors were identical and citations were properly indicated. Response: We have revised the Materials and Methods section to minimize unnecessary repetition of information published in our previous study. But it is our view that if the same materials and methods are used in different studies, the description of the same materials and methods should be precisely consistent, which may warrant the use of the same words or sentences in different papers if confusion or unclarity can arise from a varied expression.

Comment: Minor comments: P18772L8: A reference would be needed. P18773L19-22: Other mechanisms, such as amino acid synthesis, also can affect plant  $^{15}\text{N}$ . Re-C9155

Response: Suggestions adopted.

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