

***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.**

Anonymous Referee #2

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This study presented interesting data on intra-plant variations in ^{15}N of *Nitraria tangutorum* in northwestern China. Plant ^{15}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 ^{15}N variations across plant species or sites with different soil N properties. Therefore, it is crucial to study mechanisms underlying the intra-plant ^{15}N variations. The Introduction section is concise and well written, and presenting the significance of studies on factors governing the within-plant ^{15}N variation, such as N pool in plant

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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.

General comments: It is unclear why the authors measured P and C concentrations (and the ratios) and examined the relation between P and plant 15N. To explore the intra-plant 15N 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. In addition, most of the arguments in Discussion were concerning not intra- but inter-plant 15N 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 15N variation, no evidence was presented. 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). 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 13C, 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.

Minor comments: P18772L8: A reference would be needed. P18773L19-22: Other mechanisms, such as amino acid synthesis, also can affect plant 15N.

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