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Interactive comment on “Unusually negative nitrogen isotopic compositions ($\delta^{15}\text{N}$) of mangroves and lichens in an oligotrophic, microbially-influenced ecosystem” by et al.

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Review of Fogel et al.

General Comments

This paper presents an unusually detailed picture of nitrogen isotope compositions in mangrove systems as it seeks to explain very high variability in $\delta^{15}\text{N}$ in mangrove leaves. Explaining unusually low $\delta^{15}\text{N}$ (-10 to -20‰) in P-limited mangroves is one focus of the work. Although leaf $\delta^{15}\text{N}$ ranged from -21.6‰ to 2.4‰, the means among different tree types sampled only ranged from -6.8‰ (dwarf trees) to -0.6‰ (fringe trees). The authors make a good case for ammo-

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nia/ammonium in the air being the source for the very ^{15}N -depleted leaves of some mangrove trees, although their arguments would have been helped by reference to studies of actual N uptake (e.g., Farquhar et al. 1980, *Plant Physiol.* 66:710-714, On the Gaseous Exchange of Ammonia between Leaves and the Environment: Determination of the Ammonia Compensation Point). The much higher (9per mille) ^{15}N content of finer roots than of leaves and other plant parts in a single dwarf mangrove was quite interesting and worth further exploration in the future. This suggests two possible explanations: different N sources in this case for fine roots vs. other N sources (e.g., sediment-derived N vs. atmospheric N), or 2) fractionation during N movement within trees. The 2nd possibility appears unlikely to this large extent (9per mille). However, these results are from only a single tree, although similar results are mentioned in passing.

Overall, the paper makes a solid case that several mechanisms other than soil N source isotopic signatures and mycorrhizal processes may control plant ^{15}N patterns in mangrove systems. This paper points the way towards quantitative assessment of plant-atmosphere N fluxes as one fruitful avenue for providing us with a more complete picture of the causes of plant isotopic patterns.

Specific Comments

The effect of P fertilization on increasing foliar $\delta^{15}\text{N}$ is also quite interesting. Including information on whether trees were N or P-limited would have been useful for context, based on N:P stoichiometry. Fertilizing with P increased foliar ^{15}N by 2.7 to 7.7per mille in dwarf trees (Table 4), whereas fertilizing dwarf trees with N decreased ^{15}N by 3 to 5per mille. Could N uptake processes shift from passive to active with P addition? Certainly decreased foliar ^{15}N with N addition fits with increased fractionation against ^{15}N on uptake with higher available N concentrations, as recorded in bacteria, fungi, and plants (Fogel and Cifuentes 1993, Macko and Engel, eds, *Organic Geochemistry*, Henn and Chapela 2004 *New Phytologist* 162 (3) , 771-781, Isotopic fractionation during ammonium assimilation by basidiomycete fungi and its implications for natural

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nitrogen isotope patterns, K. S. Emmerton, T. V. Callaghan, H. E. Jones, J. R. Leake, A. Michelsen, D. J. Read (2001) Assimilation and isotopic fractionation of nitrogen by mycorrhizal and nonmycorrhizal subarctic plants, *New Phytologist* 151 (2) , 513-524; Emmerton K.S., Callaghan T.V., Jones H.E., Leake, J.R., Michelsen A., Read D.J. (2001a). Assimilation and isotopic fractionation of nitrogen by mycorrhizal fungi. *New Phytologist* 151, 503-511.). And P-fertilization, by making N more limiting, may lead to lower available N concentrations and accordingly less fractionation against ^{15}N on uptake, and therefore higher ^{15}N signatures (as recorded here).

Technical Comments:

Language issues:

The paper needs editing. It would have been helped by a friendly review or two before submission to tighten up the language.

‘isotopically depleted’ should generally be replaced by ‘ ^{15}N -depleted’; if that is what is meant.

nouns followed by adjectives in phrases generally need a hyphen to separate them (e.g., ^{15}N -depleted, P-limited, growth-limited)

No apostrophes (e.g., 939/21).

Include p-value, n if r-squared values given (e.g., 947/23).

Abstract

2nd sentence needs work.

939/11. change the $\delta^{15}\text{N}$ to that

Introduction

19. remove first or

20. reasonable for straightforward

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First paragraph needs a closing sentence.

940/5. $\delta^{15}\text{N}$ have been found to $\delta^{15}\text{N}$ = $\delta^{15}\text{N}$; can $\delta^{15}\text{N}$; . A better ref here (than Handley and Scrimgeour) would be Handley et al. 1999 (Handley, L. L., A. T. Austin, et al. (1999). $\delta^{15}\text{N}$; The N-15 natural abundance ($\delta^{15}\text{N}$) of ecosystem samples reflects measures of water availability. *Australian Journal of Plant Physiology* 26(2): 185-199.) or Amundsen et al. 2003 (Amundson R, Austin AT, Schuur EAG, Yoo K, Matzek V, Kendall C, Uebersax A, Brenner D, Baisden WT (2003) Global patterns of the isotopic composition of soil and plant nitrogen. *Global Biogeochemical Cycles* 17:1031-1041), as presenting a broad overview of ^{15}N patterns in plants.

16. C_3 plants $\delta^{13}\text{C}$; , vascular plants better? were non- C_3 plants present?

19-21. sentence needs rewriting.

23. These authors found that leaves of *R. mangle* trees...

25. positive $\delta^{15}\text{N}$ values, whereas controls without fertilizer.... (delete $\delta^{15}\text{N}$; compared... The $\delta^{15}\text{N}$;))

948/16. $\delta^{15}\text{N}$; it has been postulated $\delta^{15}\text{N}$; needs a ref.

951/4-6. Causation unclear. Could trees putting less energy belowground become P-limited?

Table 1. std dev. of $\delta^{13}\text{C}$ of transition seems high based on given range of 3.7.

Table 2. put footnote in heading, P-values given so significance designation not needed.

$\delta^{13}\text{C}$ values add little to paper, could delete without detracting from story as presently presented. (although high $\delta^{13}\text{C}$ of microbial mats was especially interesting).

per mille needs to be added to column headings or table headings.

Table 4. need to explain P, C, N, and $\delta^{15}\text{N}$; at $\delta^{15}\text{N}$; designation. Table 6. meaning

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of ammonium std.?

Figures. Axes need labeling (done in correction). No need for two separate plots, could combine.

In figures, hash marks should generally point inward.

Figure 5. ammonia-sensing

Additional edits have been done directly on a hardcopy of the MS and mailed to the authors.

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5, S123–S127, 2008

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