

Interactive comment on “Divergence of above- and belowground C and N pool within predominant plant species along two precipitation gradients in north China” by X. H. Ye et al.

Anonymous Referee #3

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Review of Ye et al., “Divergence of above and belowground C and N pool within predominant plant species along two precipitation gradients in North China”

Ye et al. investigate a potential decoupling between aboveground and belowground C and N cycling with increasing aridity. They hypothesize plants allocate a greater fraction of biomass to roots while increasing the N content of aboveground biomass in drier conditions. This could be important because grazing would have a larger impact on plants with a smaller but N-enriched aboveground component. They tested this effect by measuring above- and belowground C and N in 3 plants along 2 MAP transects in Inner Mongolia. They found the different species showed different responses to increasing aridity, with one species increasing belowground biomass allocation and

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another increasing leaf N content.

I found the paper to be generally well written, and the hypothesis and potential implications were clearly stated. The data collected address an interesting and important problem and should be published in principle. However, I have some issues with the interpretation of the data, as discussed below. I therefore recommend publication of the manuscript after major revisions.

General comments: -The conclusion discussed starting on line 325 (decreasing aboveground allocation to biomass that is richer in N as aridity gets more severe) is not supported by the data. Only *A. ordosica* had significantly decreasing aboveground biomass, and only *S. grandis* had significantly increasing leaf [N] with increasing aridity. None of the 3 plants showed both decreasing aboveground biomass and higher leaf [N] with aridity. Statements that the effects were “balanced” (eg line 318) to maintain a constant %N aboveground are similarly problematic, as one or both effects were not significant.

-Please address potential effects of differences in nutrient availability. Any systematic difference in N availability among the sites would also affect [N] in both leaves and roots. You would also expect greater belowground biomass allocation with greater N limitation to aid in nutrient acquisition. This possibility should be discussed in the manuscript.

-It appears from the figures that overall, the %biomass and %N aboveground is actually higher at low MAP, due to higher %aboveground biomass in *S. grandis* compared to other species. Could a shift in the plant community toward more drought-tolerant plants like *S. grandis* produce the opposite of the hypothesized effect?

-The figures are cluttered with unnecessary and insignificant trend lines, complicating their interpretation. I suggest removing the insignificant lines and providing r^2 and p values for the significant trends on the figure or in the caption.

Specific comments: Line 84: Increasing biomass but decreasing N allocation- you are basically hypothesizing increased C:N in the roots. Has this been observed? Roots are still living cells and have N requirements of their own. How elastic can the C:N be?

Line 120, 122: "Mean annual precipitation" should be abbreviated "MAP"

Line 184: I'm not familiar with the method used for C analysis, and the citation provided is to a book that's not immediately available. Please provide an additional sentence or two about the method, and consider including the calibration vs. the elemental analyzer as supplementary material with the manuscript.

Line 212: This statement is not clear and doesn't appear to be supported by the data. *S. bungeana* vs. MAP is the only significant relationship shown in Fig. 3B.

Line 232: Leaf C content appears to be constant with MAP in Fig. 4. Please cite statistics showing significant relationship.

Line 256: "Similar" should read "smaller"

Line 295: This effect was only significant in 1 of the 3 species tested.

Line 323: I don't understand where the statement "There was much more C above-ground in mesic vs. dry place" is coming from. That relationship does not appear to be significant.

Figure 2: Define the criteria used for determining "similar annual and seasonal patterns of precipitation and temperature" used in the inset.

Interactive comment on Biogeosciences Discuss., 11, 14173, 2014.