

Interactive comment on “Decoupling of above and belowground C and N pools within predominant plant species *Stipa grandis* along a precipitation gradient in Chinese steppe zone” by X. H. Ye et al.

Anonymous Referee #2

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This study explores plant C and N allocation between above and below ground compartments in response to water availability in one species across an aridity gradient in a Chinese steppe. It explores an interesting hypothesis, namely that the proportion of above- and below- ground N remains constant with changes in aridity due to compensating changes in both concentrations and biomass. The study addresses valid questions, and the use of a climate gradient to explore this is appropriate. The authors did find that AG-BG N proportion was relatively constant (although with quite large variation), which is an interesting result. However, the study is very limited in

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scope, with a weak discussion. Therefore I do not consider it suitable for publication in Biogeosciences in the current form.

Specific comments:

pg 5000 ln 21-22 : are there defining features of *Stipa grandis* roots that makes their identification easy? Do vertical cores capture a representative portion of the plant root system?

pg 5000 ln 26: do you have any measurements of standards or some comparison between these methods and more recent methods of elemental analysis?

pg 5001 ln 12: much is made of the fact that *S. grandis* is a predominant species of the steppe, but relative contribution in the study was only 1 - 8 %. Are these sites, and the results, therefore really representative? Analysis from more than one species / functional group could be beneficial to this study (it seems roots at least of all species were collected, but the remainder pooled, which is a bit unfortunate).

pg 5001 ln 18 : looking at the relationship between MAP and proportion of AG biomass (Fig 1b) I wonder if this is really a significant trend with MAP? There appear two distinct groups of data: MAP < ~230 mm where prop AG is constant, and > 230 mm where the proportion decreases with MAP. At this ~ 230 mm point there is the full range. Is this associated with some important change in the landscape that maybe influencing the results (e.g. soil type)? This trend is also evident in all nutrient AG proportion data: less so in the N data, but this means the results have large variation as well.

pg 5001 ln 19 : the proportion of aboveground biomass increases by 22 percentage points with an increase in 100 mm yr⁻¹ precipitation (but see comment above).

pg 5002 ln 17: Why are the P and K data put in an appendix figure and not referred to in the discussion? The paper is limited enough as it is.

Pg. 5003 ln 19 : Results are qualitatively similar to other studies regarding trends in AG-BG biomass allocation with precip. How do they compare quantitatively? Likewise

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for the tissue [N] (and other nutrient) trends.

Pg 5004 ln 13 : The authors raise an interesting possible implication of their results, but only one, and this seems a little speculative and a bit outside the scope of the journal. It is not clear what sort of herbivory or livestock grazing the authors are referring to. If it is grazing for meat consumption (ie net removal of N from the system) they could be correct, if it is for wool or milk this effect will be less, but to confirm this this would require some estimates on the rate of N removal to see if plant uptake would 'not keep up' with the loss. It seems this issue might be something more relevant for a rangeland management focussed journal. I would have thought a discussion on the the implications for some of the points raised at the start of the discussion (eg pg 5003 ln 1-5) might be more relevant, if they could be supported with evidence.

While this study is novel in measuring both tissue concentrations and biomass to get at pool sizes, it is still quite a limited data set. I think additional data (eg additional species; photosynthesis or water use efficiency; soil N) will be necessary before being suitable for publication.

Interactive comment on Biogeosciences Discuss., 10, 4995, 2013.