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# *Interactive comment on* "Differences in spatial and temporal root lifespan of temperate steppes across Inner Mongolia grasslands" *by* W.-M. Bai et al.

**Anonymous Referee #3**

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General comments

At three types of grasslands dominated by different Stipa species in Inner Mongolia (i.e., typical, semi-arid, and desert steppes), the authors studied the spatial changes in root lifespan and they found the order of root lifespan S. breviflora>S. grandis>S. krylovii. The authors also studied the temporal pattern and they found differences in lifespan among summer-, spring- and autumn-produced roots. The authors attributed the spatial and temporal differences to the differences in soil organic matter, inorganic nitrogen concentrations, aboveground NPP and in particular the soluble sugar content in roots. The authors therefore claimed that ecosystem models for predicting C cycling

need to take into account these spatial and temporal differences.

My major concern is that the authors have overstated the novelty of what they have done. As the authors stated many times in this ms, this is “first” study to compare root lifespan in different grassland types. . ..(e.g., p20010, L15; p20014, L11; and p20000, L7). In my opinion this is a false statement. There are a number of related earlier studies that are not referenced in this MS. just to name a few, (Van der Krift & Berendse, 2002; Tingey et al., 2003; Graefe et al., 2008; Gaudinski et al., 2010; Krasowski et al., 2010; Moser et al., 2010; Quan et al., 2010; Gu et al., 2011; Gluszek et al., 2015). All these publications have strong relevance to this study. This study just selected different species (three Stipa species) and different studied regions (three sites in Inner Mongolia). However, they are not the most important points. Given the differing dominant species and differing climatic and soil conditions, it is not surprising to find differences in root lifespan among three studied sites. As the authors said, their results were “also” “consistent with” the findings in existing publications (e.g., p20011, L4 and L28). In this study, the methods for analysis, the results and the conclusions do not significantly differ from previous studies. The spatial and temporal differences in root lifespan are already well known in ecological science, the current study just chose different species and sites, therefore, provided new data to confirm what we have known. That’s not to say this analysis is good for nothing. But it’s wrong to state that it’s a first of its kind. Rather, it adds to an already rich history of similar work.

Beyond the novelty issues, the authors claimed that they addressed how “botanic, edaphic and climatic factors” (p20002, L6) affect root lifespan, i.e., the “regulatory mechanisms” (p20001, L1). However, these issues have not been really addressed. The authors stated that they conducted a ‘stepwise multiple linear regression’ analysis (p20007, L21) to figure out the most important factors that affect root longevity, but I do not find the statistical results. The authors need to present them in Tables. As shown as Fig. 5, the authors just presented the correlations among root lifespan and SOM, SIN, ANPP and sugar contents. You can’t actually address the “mechanisms” based on



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these correlations/regressions. More importantly, the authors clearly claimed that they sampled 3 sites with 6 replicate plots (p20004, L20) for their analysis. However, as Fig. 5 shown, n=18 of observations for their “bivariate correlation” analysis. Given that only 3 sites (DREEDS, IMGERS and IMAHRS) were investigated, relationships between root lifespan and soil/plant variables (SOM, SIN, ANPP and [sugar]) could hardly be tested and accordingly with different results. The authors have misused sub-replicates in their analysis (n is not 18 but 3!). Due to the small data size, it is certainly not suitable to conduct a bivariate correlation or stepwise multiple regression analysis. In that case, Fig.5 is not correct and the major conclusions of this paper, given the basement of the major purpose on this correlation/regression analysis, are not reliable.

Specific comments

Title: not accurate. Across Inner Mongolia grasslands, there are many steppe types dominated by different species such as Stipa and Leymus. This study just selected 3 sites dominated by Stipa species. Thus the wording of this title is too general.

Introduction: This section is not hypothesis-driven. It is hard to link the objectives to the experimental design and statistical analysis, which, in turn, resulted in a poor structure of the paper.

P20000, L6: Use the full Latin names for the first time and then abbreviation.

P20001, L1: you did not address the “regulator mechanisms” in fact.

L10-12, L19: you did not address these issues either. Moreover, what is your novelty given so many publications as you mentioned?

L19: ‘In particularly’ shall be ‘In particular’

L22: ‘in a regional scale’ shall be ‘at . . .’

L22: ‘few’ does not mean ‘no’

P20002, L6: not addressed either in your study.



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L11: use abbreviation please

L15: to add “of” after ‘types’

L21: add ‘method’ after ‘rhizotron’

M&M section: use FAO soil classification system

According to what did you select the 3 Stipa types? You said that they represent typical, semi-arid and desert steppes respectively. Why do not you identify them based on aridity index?

P20003, L22: in which place of Inner Mongolia?

P20004, L6: space between TheStipa

L19: how many years since excluded from grazing?

P20005, L14-15, use subscripts.

P20007, L13: what is the difference between ‘lifespan’ and ‘longevity’?

L15: it is not suitable to use ‘effects’

Results

P20006, L8: ‘they’=? Refer to what?

L10: add ‘the’ after ‘in’

P20009, L1-4: move to MM section

Discussion: separated by sub-titles.

P20010, L13-15: why use the word ‘first’ repeatedly?

P20011, L1-6: The readers may want to know if there are any other studies have reported the similar or different results, but we did not see such information in the discussion.



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L19: change explored to explore

P20012, L9-12: too long. Re-write it.

L25: speculation.

P20014, L20-23: repeat what have said in Abstract (p20000, L18-20)

References: The authors need to re-check carefully. For example, p20015, L9, L12, 'Leymus chinensis' shall be in Italic.

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