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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.

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Anonymous Referee #4

In this manuscript the authors report the fine root lifespans of three typical Inner Mongolia grasslands based on the root monitoring period of two growing seasons and reflect results in regard to the measured soil traits, soluble sugars and aboveground net primary production. The authors conclude that the differences were mainly determined by contents of soluble sugars in roots. This is quite daring as the sugar concentrations were measured only once (?) during the study, at unknown time point, and from an unknown distribution and proportion of roots/species.

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We included the information on the sampling roots for determination of concentrations of soluble sugars in the revised manuscript. We also included the analyses of correlation between root longevity and BNPP/ANPP in the revised manuscript by re-plotting Figure 5 as suggested by the reviewer. The results of stepwise multiple regression reveal that BNPP/ANPP and contents of soluble sugars in roots can account for 66% variation of root longevity. We included these information in the revised manuscript (Fig. 5 and lines 310-316).

The manuscript is pretty clear, although a lot of repetition, thus a linguistic revision would improve the fluency of the text. Also, there are quite a lot open questions regarding the materials & methods of the study and lastly, your review to the current literature could be a bit wider: you cite 14 times to McCormack papers although there are many other relevant publications from the area and also from the grasslands.

We included additioanl references as suggested by the reviewer (e.g., Gill & Jackson, 2000; Chen et al., 2013; Majdi & Ohrvik, 2004; Leppalammi-kujansuu et al., 2014 (lines 73-74, lines 384-385; lines 472-474; lines 480-481; lines 489-491; lines 504-506).

Abstract: The abstract is good and clear. However, the sentence "Root lifespan.." (11-15) is clumsy and should be rephrased.

We re-worded the sentence (lines 32-34).

Introduction:

The paragraphs are very long. There are carelessness with the citations (e.g. citing to the first name, citing Mccormack / McCormack).

We carefully checked and corrected the typing errors (line 95).

In the first paragraph, “Root” is a major source..?

We changed the “Root” to “Roots” (line 46)

In the second paragraph (18-28, I found disturbing the effusive use of linking words

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(However, In particularly, Therefore, However, Moreover, In addition). Their use is good as such but in the beginning of every sentence, it is too much.

We revised this paragraph by minimizing use of linking words (lines 97-102).

The sentence (13-17) should be rephrased.

We rephrased the sentence (line 77-79).

L22 stating that a few studies have quantified root lifespan & plant communities: : : you should refer to more than one article. The last paragraph: what is this unit hm2? There is a lot of repetition: e.g. the word “grassland” recurs in EVERY sentence.

We included more references in the revised manuscript as suggested by the reviewer. We revised the paragraph by deleting the repetition. The unit of hm2 was replaced by ha (line 86).

Materials and methods:

Data analysis and statistics: The number of ‘selected roots’ in the seasonal differences comparison is more than in the whole data? How can this be possible?

We revised these sentences to clarify this point in the revised manuscript (lines 236-238).

L10: You selected the root that were included in the analysis? Based on what? Or did you take three filming sessions for spring roots (1st, 15th and 30th)? Three filming sessions for the summer roots (1st, 15th and 31st)? What about the autumn roots? You should clarify a bit of these filming times. I big concern is the short period of time between the last autumn filming (10.9?) and the end of the study (20.10). There is only one month and ten days for those new-born roots to die. And according to your results (or maybe that is the reason?!), most of them will not as the lifespan for the autumn-born roots was the longest -> a lot of roots will be censored in the Kaplan-Meier analysis, weakening the reliability of the survival analysis. Or did you include

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only the roots from the first growing season autumn-filming? Should be clarified.

We have to use the local climate for arbitrarily assigning roots in different seasons. We revised these sentences by including the total number of roots used for evaluation of different grassland types on root longevity (lines 238-242).

Results:

3.1 - This paragraph is hard to read. More reader-friendly way to present the differences of the sites would be to describe the sites by collecting the features together, like: Compared to the two other grassland S. breviflora seemed to represent slightly poorer soil conditions as it contained less water, inorganic nitrogen, soil organic matter and higher pH than the two other grasslands. Only regarding the potassium concentration and the soil bulk density, the sites did not differ.

We revised the paragraph (lines 262-263).

3.2 – Mean lifespan? Why mean instead of median? Add also confidence intervals for the root ages.

Because the root lifespan is abnormal distribution, the mean root lifespan rather than median root lifespan was used in our study. The confidence intervals for root lifespan was given in the Table 2.

3.3 - You had glass walls on the 0-10, 10-20 and 20-30 cm depths. You could report root distribution among these layers and in case there are enough roots, and check out whether the root lifespan remains same for the roots growing near the surface compared to the roots growing deeper in the soil? What about the root growth and the distribution on root diameters? Varying root diameters could also explain differences in root lifespan.

The overall objective of the present study is to compare the root lifespan of three Stipa communities, so we pooled the root lifespan of three soil layers. The soil traits used in the study were from 0-30 cm soils. The use pooled root lifespan across the 0-30 cm

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soils allows us to do the analyses of correlations between root lifespan and soil traits.

What are the exact numbers (and Cis) for the root lifespans for the seasons & sites? You don't give them not in the Fig 3 nor in the text.

We included this information in Table 2.

According the Fig. 3 all roots born in the first spring died in three months; so I guess this curves in the figure 2 (a) includes both spring-born roots from the both years? You could mention it.

Yes, the reviewer is correct, that data shown in Figure 2 contained all roots observed in the window, while data in Figure 3 showed those roots born in different seasons across the two years. The inclusion of Table 2 in the revised manuscript may help readers to understand this point.

Figures and tables:

no need to write "determined by SAS". This information everyone can read from the M & M.

We deleted "determined by SAS".

Table 1: "with bars as standard errors"? Write open the abbreviations AP and AK.

We made changes accordingly.

Figure 3: No need to mention the methods, except perhaps in the beginning: "Kaplan-Meier survival curves and ..."

We revised the Figure legend.

Figure 4: one bracket too much or too few. Number of n should be mentioned.

We revised the figure legend.

Figure 5: I would really much like to know how the three sites place along these axis.

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Identify them, please. And the spelling mistake in the legend (obtained).

We re-plotted the Figure 5, and fixed the typo.

Interactive comment on Biogeosciences Discuss., 12, 19999, 2015.