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Interactive comment on "Shift of seed mass and fruit type spectra along longitudinal gradient: high water availability and growth allometry" *by* Shunli Yu et al.

Anonymous Referee #4

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General comments

In this work, the authors present a study of the variations in seed mass and other seed parameters as a function of geographic gradients in inner Mongolia and northeastern China, at the community level. The authors collected a unique dataset along many (>20) sites. These data are presented and summarized and mechanistic hypothesis of underlying processes are suggested.

I appreciated reviewing this work: the paper is interesting and well written, the effort invested in data recollection is commendable and the data collected have to potential to inform theoretical models coupling seeds features with environmental variables. Below

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I provide different remarks on the text, as it can be sometimes vague and could be condensed to make the main ideas of the article more understandable and digestible by the readership.

The critical aspects concern

1. the use that is done of the data and the gap between the mechanisms involved and the methodology used
2. the fact that several times the text makes mention of a variable X strongly associated to Y, but refers to a figure that does not directly explicit this link
3. text mentioning the wrong figure
4. a discussion that ends being a bit lost in generalities and does not properly highlight the value of this work
5. generally speaking, it is difficult to define the limits of this work: what was done before the study, why this work was necessary, what has be done and what can be said with the data at hand, and what remains to be done.

Specific comments

1. The main point of this article seems to be to describe and summarize a number of seeds parameters (mass, phylum etc) and their relationship with geographic (longitude, latitude) and environmental (temperature, precipitation) variables.

   The nature of the work seems to be in nature more descriptive than functional, what is perfectly normal and expected, as the community needs data sets that are well presented and summarized to fit appropriate models. However, the authors tend to draw hypothesis and conclusions that can be quite remote from the data and methods used here, and sometimes subject to interpretation. With no

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particularly elaborate inferential framework and no genetic data to aliment these models, it is expected that one may not always be able to link some variable to a distant mechanism. However, the connection between involved mechanism suggested by the authors (eg., selection) and the data (no genetic data) is extremely lose, making it difficult for the reader to trust the statement or to understand the limits and merits of the work (eg., l.371: "*we suggested that transition between dry fruits and fleshy fruits in response to environmental variations may also be genetically simple, involving suppression and re-expression of only a few genes*" or, l.376 "*This proves that the environment affects seed mass in the community context independent of phylogenetic constraint*"). In the absence of formal modeling or inferential framework, making such statement is indefensible.

2. A map of the area representing the main habitats and the sampling sites would complement the Table 1 fairly well, as it would allow the part of the readership that is not familiar with the biogeography of China to have a better sense of the geographic scales and ecological transitions underlying this work.

3. Reading the introduction, l.72 "*this article presents a novel mechanistic framework that integrates previous theory and hypotheses (related to climate, phylogeny, water conduction systems and other traits related to water balance) to evaluate seed mass variation among species or communities (Figure 1)*": it is unclear what is novel in this mechanistic framework, please precise. Also, this is the only time that this figure is referred (or at least correctly, see following remark) in the whole text. If this framework is worth mentioning in the abstract, we would expect further mention in the manuscript.

4. The article makes numerous general statements about the effects of "*decreasing*", "*declining*", "*increasing*" latitudes or longitudes on the flora. For example l.25: "*Due to greater water availability and increasing leaf area, much more photosynthate and allometric growth then ultimately increase the community average*

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seed mass along rising longitude (or declining latitude or elevation)". Such statements are announced in a very general context, but are actually limited to the area of study as many areas of the world have ecological transitions happening in the reverse longitudinal trend. Please make sure that the context of the area of study is made clear. I personally found expressions such as "*from east to west*" (l.94) more intuitive.

5. Some terminology may be unclear for people foreign to the field interested by this work (eg, a mathematician, statistician or computer scientist interested by your model/data). Helping them understanding the interest of this work could be done simply by having a box briefly explaining terms like Âń *growth form*Âż , "*allometry growth theory*", "*photosynthate*" (for this last term, a brief theory is given way too late, by the end of the discussion, l.365).

6. Too many figures were not correctly referred in the text (eg. l.183). Please check that each reference to a Figure number is actually linked to the correct figure.

7. l.113-114. Mixing seeds together is a loss of data, and I would actually be curious to know how the seeds traits change according to the mother individuals too. Ideally, we want the sampled seeds traits to be independently and identically distributed variables for a same location. That is, we hope that the variation between mother plants at a same location does not overwhelm the variation between sites. Having access to the distribution of seed traits for each mother plant at each location may have enabled interesting insight on this level of variation, and does not seem too complicated to implement (if seeds are harvested directly on the mother plant) and to test statistically.

8. Table 1: Please add in the legend the complete names and/or a brief descriptive of the variables MAP, MAT, K-value, evaporation and vegetation types, so the table can be self-explanatory

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9. Table 2 :Reading this table is rather difficult. Maybe the readability could be enhanced by splitting the woody and the herbaceous columns into two sub-column, rather than separating the variables richness and percentage by a slash bar.

10. Figure 3 : Please split this figure into two sub-figures (eg, 3A and 3B) for future references. The bottom figure could be made less ambiguous by slightly spacing the fleshy fruits and dry fruits bars so they don't overlap. More generally, the clarity of the manuscript could be enhanced by providing adequate labeling of Figure AND sub-figures.

11. l.380 Linking data to theory through a formal model is always useful and welcome and appreciable in biology. Here the authors provide an explicit model linking average seed mass variation to biological parameters in the discussion, but this model does not take any part in the general scientific method. Details and comments about the model are rather sparse. It is unclear how much related to the results this theory is, or how useful it is in explaining the data at hand, or what data is missing for this model to be useful. I would suggest to rewrite this paragraph. The easy way would be to remove this part, as it does not help the user understanding the interest of the work. That could be detrimental if this model has a real interest for this kind of work, or could be an easy extension of the work. In that case I would advise to provide a more ample description of the theory : how the model relates to the work presented here, how the data presented in this work could be used to inform the model, and why this has not be done, what remains to be done for this model to be useful, and references to adequate literature around this theory. l.391 "*strange patterns*" is a rather . . . strange expression for a scientific paper ;) Please replace this expression and provide a clearer explanation about what part of your results are surprising and why, and how they could have been affected by the heterogeneous distribution of groundwater in desertic sampling areas and what could be done to solve this problem. More generally, this whole paragraph sounds a bit blurry and does not promote

the quality of the discussion or the interest of the work. We advise the authors to rewrite this paragraph, with a clear statement of what could have affected the quality/results of the work, in what aspects and to what extend, what could be done to remove these limitations, and what would be too difficult/expensive to implement. l.402. I would end the sentence just before "however,".

12. The conclusion needs rewriting. In the first sentence ("*Mean seed mass, seed dispersal spectra, fruit type spectra and plant growth forms of five community types vary significantly along a longitudinal gradient, with the lowest average seed mass and the smallest proportion of species dispersed by vertebrates occurring at the middle longitude (typical grasslands)*",l.397), it is difficult to understand if the authors are making a general statement, or are describing the patterns observed in their dataset. Please clarify. The second sentence is a long list of general factors at the end of which one may wonder what factor was left out and why. It does not make a good job at summarizing the thoughts the authors have about their work, or at conveying larger implications of the study, or placing the study within the context of past research. The last sentences are very arid, and deserve more explanations (eg., what are the "*important implications in understanding origin and evolution of species with large seeds or fleshy fruits*" ?, l.405).

Technical corrections

- l.20 The variations of average seed mass display high congruent with transition of growth forms : this sentence seems incorrect.
- l.39 relating to plant habits do you mean habitats ?
- l.61 "Average seed mass is expected to decrease with declining longitude . . . to desert ecosystems" : this sentence does not make sense at a global scale, and seems to hold only for some regions, please precise.

- l.98 "were selected at random" : at random is not statistically rigorous, even if widely used in biological fields. You maybe mean "sampled uniformly at random" ?
- l.106 please provide adequate citation for the worldclim database and the raster package.
- l.126 "the dispersal mode represents seeds from ..." a word seems to be missing ?
- l.278 "display" you mean "displays" ?
- l.269 Please chose to address the variable "mean seed mass" as singular (mass) or plural (masses) and make it consistent along the text.
- l.272 : "see results" : please name the specific tables or figures to consult, and explicit better the sentence "MAT and MAP may be responsible ..."
- l.274 : I had to read the cited article abstract (Moles et al 2014) to understand why you cited it. Please provide a more explicit explanation on how your findings contrast the results found by Moles 2014.
- l.306. The authors mention Âń typical grasslands and desert grasslands Âż and refer to Figure 4, but it seems a mistake, as Figure 6 seems a better fit. Please go through each Figure refered in the article and make sure that you refer to the right figures and tables.
- l.309. Are the authors citing Figure 6 in the article of Yu et al, 2017 ? The typing does not seem correct, I would rather say "see Figure 6 in Yu et al. 2017" or "Zu et al, 2017, Fig. 6 ". If the authors use latex, you can use brackets to include words before and/after a citation : something like citep[see eg,][, Fig. 6](Yu2017)

- l.310 "The increasing prevalence of fleshy-fruited species with increasing canopy coverage (Table 2)". Table 2 does not refer explicitly to fleshy fruited species, making the relationship with canopy coverage implicit. Please refer to the adequate result, or provide a better explanation, so the reader does not have to interpret what is meant. The same remark holds for l.318 and mention to Figure 3.
- l.359 Please provide citation for CO2 concentration homogeneity and small fluctuations. Same for solar radiation.
- l.360. I never heard of the term "partition out", but I'm no native speaker either. Maybe a synonym would make things clearer ?
- l. 377 independent of : independently of ?
- l. 378 : "the five communities ..." The interest of this statement is unclear. Please elaborate.

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