

Interactive comment on “Responses of leaf traits to climatic gradients: adaptive variation vs. compositional shifts” by T.-T. Meng et al.

Anonymous Referee #3

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This article provides an impressive dataset and very insightful analysis of the modulation of plant functional traits within and between functional groups according to environmental conditions broadly related to moisture availability and temperature. Although several studies on this subject exist, few can provide such a large, uniformly measured dataset together with high quality environmental data. The analysis is aimed at disentangling the effects of adaptive trait shifts within functional types (PFT) versus PFT replacement along environmental gradients on trait variability. This question is extremely relevant not only to improve our understanding of Functional trait modulation in general but also due to the (still) frequent and arguably problematic use of the PFT concepts in dynamic vegetation models.

Specific comments: The paper is very well written and generally easy to follow. Apart

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from some minor points which are outlined in "technical corrections", I have only three main points of critique. Firstly, the relative lack of discussion of the issues related to the use of plant functional groups, such as inferring functional similarity in groups where trait syndromes vary widely and functional group membership may be dependent on environmental conditions (e.g. species generally known as growing in tree form growing in shrub-like forms in harsher environments). Although this is addressed to some extent, e.g. on page 7096, I think such a fundamental issue should be highlighted even more. This is particularly important since the conclusions seem to point towards the authors interpreting their study as being supportive of the PGT concept, when their results could easily be interpreted otherwise. Related to this, I miss references to species-specific, or at least genus specific trait differences. Again, this is briefly mentioned in the discussion but without providing any data or analyses. Although repeating the analyses performed on species rather than functional group level might change the scope of this work too much, at least giving an indication to the degree of within as opposed to between species functional variability in their data would add a lot to the paper. Secondly, the argumentation for using GDD0 instead of e.g. the Principle Component scores of axes one or MAT, which has a higher loading than GDD0 on the first axis, is insufficient. There are good reasons for using GDD0 but the authors should clarify these. Also, since a lot of traits are highly dependent on soil nutrient status and other environmental conditions, which have not been measured in this study, their likely effect should at least be mentioned. Finally, unless I have overlooked this, no statistical tests of differences between the linear model regression fits have been performed. The authors talk about "significant differences" (e.g.pp. 7104 line 16) but it is not clear how significance can be inferred without such tests.

Technical corrections: Pp. 7099 - line 11: clarify what you did in case of the very small leaves at the driest sites. Pp. 7099 - line 15: how many leaves were scanned? Pp. 7100 - line 14: the results of the country-wide PCA should be provided in the appendix. Pp. 7101 - line 1: clarify how you divided the variables into bins - how did you decide on the size of the bins? Pp. 7101 - line 6: GLM should be GZLM to avoid confusion

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between General linear models (GLM) and the Generalized linear models (GZLM) used here. Pp. 7105 - line 25: please provide references to the "previous studies". Figure 1: if possible, please choose another colour scheme to cater for red-green blindness, it would be very useful if you could code the plot symbols according to region Please check your spelling of "broadleaf" in the figure captions. It would be useful to include a table with the number of species per site to give the reader an idea of differences in the geographic spread of the species you measured and whether the PFT within certain regions are represented by many or few species.

Interactive comment on Biogeosciences Discuss., 12, 7093, 2015.

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