Biogeosciences
Discussions

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Interactive
comment

# *Interactive comment on* "Research Paper: Detecting climatically driven phylogenetic and morphological divergence among spruce species (*Picea*) worldwide" *by* Guo-Hong Wang et al.

**Guo-Hong Wang et al.**

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Major Comment:

[Comment] I read the manuscript "Detecting climatically driven phylogenetic and morphological divergence among spruce species (Picea) worldwide" with delight. The manuscript explored the relationship between climate and the phylogenetic and morphological divergence of Picea species in the Northern Hemisphere, based on 3388 georeferenced distribution sites. Temperature and precipitation parameters were the main driving factors for the primary divergence of spruce phylogeny and morphology, respectively. The climatic data extracted from current spruce locations captured the ecological divergence among spruces. These results suggested that the primary di-

vergence of morphology and phylogeny among the spruces tended to be driven by different selective pressures. The data and methods are appropriate for this study; the manuscript is well organized and presented. I found that the manuscript has a merit for publication in the journal Biogeosciences, pending on the authors can address my following concerns. My major concern is that if the climatic data used in this manuscript can represent the local climate of the distribution sites. The Worlclim dataset has been widely used in biogeographic studies. It can be used to surrogate the local climate in plain areas. However, it cannot represent the local climate in the mountainous regions because of the coarse resolution (about 1km). In the mountainous regions, 1 km distance may cover an elevational interval of hundreds of meters (and therefore introduce several degrees of difference in temperature). The authors need to discuss the caveat of using this dataset.

[Response] This is a good question. The coarse resolution (about 1km) of climate data from The Worlclim dataset would likely weaken the potential to interpret spruce distribution and divergence. Discussion of the caveat of using this dataset is absolutely needed and will be done when we get the chance to revise this MS. Thank you!

Nevertheless, we have the confidence that the climate data from The WorlClim dataset used in this study is suitable for interpreting the overall pattern, i.e., the first several splits that represent "the primary trigger" that led to the divergence of among spruce, which are the major findings of this study. As we can see from Fig.1 (a, b), instead of elevation gradient, the geographical distribution of both the three phylogenetic clades and the morphological groups (quadrangular leaves versus flattened leaves) is largely determined by horizontal gradients (latitude and longitude). Specifically, clade-1 is a Eurasian clade and clade-2 is a North American clade, while clade-3 is an Asian clade with only one North American species. As for as the morphological groups, spruces flattened leaves tend to occur in eastern Asia and the beach area of the northern America, while spruce with quadrangular leaves distribute in the rest part of the whole distribution range. Given this base, the 1km-resolution of climate data we used in this

study should be robust to interpret this large scale pattern.

We confess this dataset may give rise to some uncertainties in the context of the detection of some subtle variation such as within-species variation or among elevation-sensitive species. In this case, although the splits at the terminal nodes are between species, that is to say that we don't have any within-species variation, the caveat with respect to the dataset must be discussed. Further works that focus on the driving force underlying the variation of within-species or among elevation-sensitive species should use high resolution climate data.

Specific points:

[Comment 1] Line 66: "Nearly 34 species" should be "Thirty-four species"

[Response] We will make this change as suggested.

[Comment 2] Line 83: "niche conservatism" is not a process, but a pattern (result of the processes)

[Response] Agree! We will change the "process" to "pattern" in the revised manuscript.

[Comment 3] Line 130: "Between 34 and 35 species" is conflict to the "34 species" (line 66) Line 132 (and other areas): "flora of China" should be "Flora of China"

[Response] Thank you. We will make this change as suggested.

[Comment 4] Line 145, 148, 152: delete "approximately"

[Response] Thank you. We will make this change as suggested.

[Comment 5] Line 159-166: set abbreviations for the climatic variables (and use the abbreviations afterwards)

[Response] Thank you. We will make this change as suggested.

[Comment 6] Line 216-224: move to the "Materials and Methods" section

Reference

Harris I, Jones PD, Osborn TJ, Lister DH (2014) Updated high-resolution grids of monthly climatic observations - the CRU TS3.10 Dataset. International Journal of Climatology, 34, 623-642.

Hijmans RJ, Cameron SE, Parra JL, Jones PG, Jarvis A (2005) Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology, 25, 1965-1978.

Kriticos DJ, Webber BL, Leriche A, Ota N, Macadam I, Bathols J, Scott JK (2012) CliMond: global high-resolution historical and future scenario climate surfaces for bioclimatic modelling. Methods in Ecology and Evolution, 3, 53-64.

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