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Interactive comment on "A climate network perspective of the intertropical convergence zone" *by* Frederik Wolf et al.

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Response to Anonymous Referee # 3

We gratefully appreciate the generally positive impression of the reviewer regarding the presentation of our study. Furthermore, we thank them for the useful suggestions to further elaborate on the clustering method considered in our study.

Comment of the reviewer: *My only concern is about the hierarchical clustering, which provides results that depend on the approach considered, such as single or maximum linkage or the Ward method. I suggest the authors to verify whether the results change*

when these methods are considered in the data clustering step.

We thank the reviewer for giving us the opportunity to comment further on the choice of our clustering method.

In our work, we have utilized hierarchical clustering with a single linkage approach for grouping different models in a statistically meaningful way. This choice has been motivated by the fact that we have been interested in merging the most similar models into the same groups. With only a low number of models included in the study, employing the single linkage method ensures that models exhibiting comparable zonal network distributions end up in the same model cluster.

In addition to the single linkage approach, we have also employed the widely used alternatives of complete linkage and average linkage, i.e., grouping according to the largest or mean distances among pairs of elements from the clusters to be merged instead of the minimum distance used for the single linkage approach. In our original manuscript, we had decided to not report the corresponding results, since those different options have led to rather dissimilar dendrograms and, hence, group structures. The finding is however not surprising at all, but a common feature of hierarchical cluster analysis. In the following, we will further detail the observed differences.

In general, unlike the single linkage method, the two other alternatives resulted in clusters that have been hardly interpretable to us. As the most striking feature, they essentially separated individual outliers from a large group including the remaining models. In this regard, at least a considerable part of the obtained clusters have been found robust under those variations of the methodology, i.e., some combinations of models always appeared in the same group independent of the linkage strategy used.

For complete linkage clustering (which uses the farthest pairs of models as a criterion for grouping), the outliers essentially determine the clustering procedere and prevent certain cluster configurations to become resolved by the method. For the average link-

age approach, it is likely that the specific distribution of similarity scores (see Fig. 5) causes the dissimilar outcome as compared to the single linkage clustering. Specifically, models belonging to the same cluster under the single linkage approach only show minor differences in their mutual similarity. By considering the average of all pairwise similarities, models with rather low mutual similarity potentially have a large influence on the resulting cluster structure.

Besides those different hierarchical clustering approaches, there would be further methodological alternatives to hierarchical (like Ward's method mentioned by the reviewer, or the centroid method) as well as non-hierarchical clustering methods (including partitioning approaches like k-means, spectral clustering, and many more options). Given the relatively small size of our set of models, it appears to us being of less interest to test a larger variety of possible approaches and select one that provides the "optimal" group configuration according to some established statistical model selection criteria.

We will use the opportunity of revising our manuscript to include a more thorough discussion of this aspect as a part of Section 2.4 focusing on the robustness of our findings.