# *Interactive comment on* "Refining multi-model projections of temperature extremes by evaluation against land–atmosphere coupling diagnostics" *by* Sebastian Sippel et al.

**Anonymous Referee #2**

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The manuscript by Sippel et al. addresses the reduction of ensemble temperature projections by using best estimates of soil moisture-temperature coupling diagnostics under current climate conditions. Although the technique itself has been applied in several other studies, the current application is novel and the results are highly relevant for our understanding of projections of temperature extremes. The manuscript is generally well-written and results are presented in a concise manner. The work seems technically sound, and I could not detect any major flaws in the reasoning and/or analysis, although some minor points were identified that will need to be addressed. Therefore, I believe the manuscript can be accepted for publication after minor revisions.

I have the following remarks/observations:

- VAC is based on the 30/70th percentile, whereas the authors consider the 90th percentile of TXx. Please motivate if and why this is justified and consistent (coupling might be different for highest percentiles).

- While the manuscript has a balanced number of display items, I found the link between the information displayed and that discussed in the text weak. Many sub-panels are never mentioned or discussed, and too much is left for the reader to interpret. Please make sure all relevant information in the figures is referred to, as well as all figures and sub-panels themselves. In particular a more in depth-discussion of the results in Figures 5 and 6 is needed.

- The selection of references doesn't always to justice to work that other groups have been doing in this area or on this specific topic. In the introduction on weighing models in large ensembles (Page 3, lines 8–12), some examples are provide but interestingly the ones most relevant to the current work are not cited (i.e. Fischer et al., 2012 and Stegehuis et al., 2013). In this way, the suggestion is made that this study is the first to apply model selection on temperature extremes. Please include references to these works. Also, model selection/weighing has been applied to other aspects/fields such as snow albedo feedback (Hall and Qu, 2006) and hydrological drought projection (Van Huijgevoort el al., 2014). When discussing the vegetation-atmosphere coupling index (VAC), the authors refer to previous work from the group (e.g. Seneviratne et al., 2006; Lorenz et al., 2012) from which VAC was developed, but not to other alternative indices that are based on a similar philosophy (for instance the metric developed by Miralles et al., 2012, although this paper is cited in a different context).

**References**

Hall, A. & X. Qu (2006) Using the current seasonal cycle to constrain snow albedo feedback in future climate change. *Geophys. Res. Lett.*, 33, L030502, doi:10.1029/2005GL025127.

Van Huijgevoort, M.H.G., et al. (2014) Identification of changes in hydrological drought characteristics from a multi-GCM driven ensemble constrained by observed discharge. *J. Hydrol.*, 512, 421–434.

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