

Reply to

Comment on wcd-2022-38

Anonymous Referee #2

Referee comment on "Warm conveyor belts in present-day and future climate simulations. Part I: Climatology and impacts" by Hanna Joos et al., *Weather Clim. Dynam. Discuss.*, <https://doi.org/10.5194/wcd-2022-38-RC2>, 2022

Synopsis:

In this study the authors investigate how the global frequency, intensity, and characteristics of warm conveyor belts (WCBs) are represented in a state-of-the-art climate model, and how they change in a high emission warming scenario. The study is thorough, considering not only the spatial distribution of the WCBs, but also the changing characteristics and how these relate to the key impacts of WCBs - namely precipitation and large-scale dynamics. I find the paper to be very well written, clear, and easy to read. I have only a few minor comments/edits.

Many thanks for this positive feedback. We are happy that the reviewer thinks that the results will be of interest to the *Weather and Climate Dynamics* readership and that it is well written, clear and easy to read. Still, we appreciate the few minor comments by the reviewer very much and will address them below point by point.

Minor:

Page 3, Lines 13-14: I think it's not clear yet what "corresponding signals" might refer to. I understand having read the paper, but when I first saw this I was unclear. Could this be reworded?

'corresponding' is indeed one of the unnecessary words that found its way into the text. We will just omit it in the revised manuscript. When we wrote the text, of course, we already knew that the cyclone climatologies also exhibit some climate-change-related trends, and we already linked them to the WCB trends – thereby adding 'corresponding'.

Data: Could you say something about the different resolution of the datasets, and whether this has an impact on the results? For example, does the "intensity" of the WCBs, i.e., the number of trajectories in a grid box, depend strongly on the resolution?

This is a good point. Reviewer 1 also asked for further details on the model resolutions of CESM and ERA-Interim. We extend section 2.1 in this sense. ERA-Interim has a horizontal resolution of approximately 80 km, whereas the resolution is, with 100 km, somewhat coarser in the CESM simulations. More important, however, is the difference in the number of vertical levels. Whereas there are 60 levels in ERA-Interim, there are only 30 levels in CESM.

Hence, we do not expect the horizontal resolution to have a big impact on the trajectory calculation that is needed to identify WCBs. More critical is the reduced vertical resolution of CESM compared to ERA-Interim. The geographical patterns of the WCB climatology and

their ascent behaviour agree rather well between the two models. Hence, we are confident that the vertical resolution actually is not substantially affecting the WCB identification. Of course, a systematic analysis on the impact of the resolution on the calculation/identification of WCB trajectories would be interesting, but is beyond the scope of our study. To this aim, climate simulations (with one single model) at different resolutions would be necessary. What we make sure in our analysis is that the starting grid and vertical levels of the trajectories are identical for CESM and ERA-Interim. Further, we also apply exactly the same postprocessing to the trajectories, i.e., with respect to gridding to the 0.5 x 0.5 latitude/longitude grid. In the revised manuscript we will highlight somewhat more that the CESM and ERA-Interim settings are identical, where possible.

Page 6, line 17: “chapter” should be “section”.

Thanks. We will correct it as suggested.