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Comment on wcd-2022-37

Derek J. Posselt (Referee)

Referee comment on "Warm conveyor belts in present-day and future climate simulations – Part 2: Role of potential vorticity production for cyclone intensification" by Hanin Binder et al., Weather Clim. Dynam. Discuss., <https://doi.org/10.5194/wcd-2022-37-RC1>, 2022

Review of

Warm conveyor belts in present-day and future climate simulations. Part II: Role of potential vorticity production for cyclone intensification

by

H. Binder, H. Joos, M. Sprenger, and H. Wernli

Summary:

This paper describes an analysis of cyclones and WCBs in the ERA-Interim analysis, compared with output from an ensemble of climate model simulations in present day and future climate conditions. The authors use established storm and WCB identification techniques to examine how storms and WCBs may change in future climates, with an eye toward the role of diabatically produced potential vorticity. They conclude that the climate model produces a realistic spectrum of storms and WCBs, relative to reanalysis. There are increases in WCB strength, especially in the southern hemisphere, and these increases may be related (in the SH specifically) to increases in the strength of the most intense storms. In both hemispheres, increased WCB strength correlates with increased storm deepening rates.

I found this paper to be well written, and the analyses well conceived. The research is a natural extension of the already impressive body of work conducted by the authors on this

topic, and is an important contribution to our understanding of how extreme weather events may change in future climate states.

I have only a one minor comment for the authors to consider.

In a follow-up to their 2018 paper, Tierney et al. (2019) indicated that there were potential relationships between the non-monotonic response of storm EKE and the presence of convection (and the potential effect on PV phase locking). I wonder what effect changes in convection in future climates might have on the WCBs and storm intensity and intensification presented here? The authors do note that convective parameterization differences make comparison between reanalysis and climate models challenging (and the parameterizations themselves make analysis of convection difficult), but perhaps they could comment on the possible role of convection in future ETC / WCB changes?

References:

Tierney, G. T., D. J. Posselt, and J. F. Booth, 2019: The Impact of Coriolis Approximations on the Environmental Sensitivity of Idealized Extratropical Cyclones. *Clim. Dyn.*, 53, 7065-7080. <https://doi.org/10.1007/s00382-019-04976-x>