

Interactive comment on “Oceanic origins for wintertime Euro-Atlantic blocking” by Ayako Yamamoto et al.

Anonymous Referee #2

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Review of "Oceanic origins for wintertime Euro-Atlantic blocking" by Yamamoto et al, submitted to WCD

The authors present an innovative study on the contribution of moist diabatic processes to blocking in the Euro-Atlantic sector. By means of diagnostics based on Lagrangian particle dispersion model calculations, they highlight the link between ocean basins and different pathways to support the low-PV core of blockings. The study fits well into the scope of WCD, is overall well-structured and well written. There are some specific aspects as detailed below. Since a reconsideration of the method and discussion part, and revision of figures could induce substantial changes to the manuscript, I recommend major revisions.

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1. Provide a better connection on the literature regarding moisture origin diagnostics, and method description for the Lagrangian particle calculations. Stohl and James (2004, 2005) have previously used FLEXPART to study moisture sources from specific humidity changes along trajectories. Sodemann et al. (2008) and later studies introduced modifications to this approach to quantitatively estimate final contributions to precipitation at an arrival domain, taking the sequence of moisture increases/decreases into account. In their approach, the authors now consider all location with positive LHF during at least one time step as a moisture source, irrespective of the sequence of events thereafter. How likely is it then for example that evaporation identified in the Pacific still contributes substantially to water vapour when airmasses also enter the boundary layer over the Atlantic? I think the approach of the authors does at present not allow to clearly conclude on this question. A more balanced discussion of the results regarding the two-basin pathway is therefore needed.
2. Improve presentation of several figures, as detailed in the Minor Comments below.
3. Improve writing regarding use of English grammar (in particular regarding the article "the").

Minor comments

- L. 7 (also L. 63): massive amount: consider to specify how large, or moderate statement
- L. 64: swift, massive, large: consider to specify these qualitative statements further,
- L. 139: and/or: unclear which one is valid, please rephrase
- L. 140: immature/onset: unclear which one is valid, please rephrase

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Figure 2: A drawback of the approach in this study is that number densities are displayed, rather than actual contributions of the latent heat flux to the blocking. This limitation should be included in Sec. 6 (Discussion). (It may be that Fig. 7 contains such information, but it is not clear from the writing).

Sec. 3.1: The text leading through Fig. 3 and 4 is hard to follow, are all 12 panels in both figures really needed? Maybe a comparison with histograms comparing above/within boundary layer points could be a clearer illustration of the property changes?

Figure 6: Grey contours are hardly visible. Maps missing coordinates and labels. Could the information for two of the three altitudes be moved to the appendix?

Figure 7: Please add missing coordinates to maps. It is not clear from the writing how this result has been obtained.

Figure 8: Please add missing figure labels. Please add a legend to the figure.

Figure 9: The visual presentation of this figure is poor. Please consider showing regular lat-lon, height-lon, height-lat plots instead, and provide information about the spread. Maybe the figure is not needed at all? Missing panel labels.

Figure 11: Please add missing coordinates to the maps.

Figure 12: Color pattern masks trajectory locations, please redesign figure, if the figure is really needed. Maybe it can be included as supplementary material?

Figure 13: Increase contrast of grid lines and size of figure text.

Figure 14: Include labels with all panels, consider splitting in two figures. The Pacific perspective does not fit seamlessly with the title of the manuscript, consider relocating to supplementary material, changing the title, or motivating more clearly.

References

Stohl, A., and P. James, 2004: A Lagrangian analysis of the atmospheric branch of the

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global water cycle. Part I: Method description, validation, and demonstration for the August 2002 flooding in central Europe. *J. Hydrometeor.*, 5, 656–678.

Stohl, A., and P. James, 2005: A Lagrangian Analysis of the Atmospheric Branch of the Global Water Cycle. Part II: Moisture Transports between Earth's Ocean Basins and River Catchments. *J. Hydrometeor.*, 6, 961–984, <https://doi.org/10.1175/JHM470.1>.

Sodemann, H., C. Schwierz, and H. Wernli, 2008: Interannual variability of Greenland winter precipitation sources: Lagrangian moisture diagnostic and North Atlantic Oscillation influence. *J. Geophys. Res.*, 113, D03107, <https://doi.org/10.1029/2007JD008503>.

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