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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Heat Transport Pathways into the Arctic and their Connections to Surface Air Temperatures" *by* Daniel Mewes and Christoph Jacobi

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Dear anonymous reviewer #1,

we would like to thank the reviewer for the comments and ideas to improve the manuscript. Below we give some reply for part of the raised points, and will consider carefully all of them in the revised manuscript.

Indeed we used the ERA-Interim data on default pressure levels for vertical Integration. We will acquire the ERA-Interim data on model levels and will integrate the fields starting from there. Following the new calculations, we will clarify the description of the

calculations for the vertical integral.

Concerning the SOM method we used it because it omits linear assumptions for clustering the data. We will describe the process of grouping multiple patterns in more detail and we will consider showing the within cluster variance in the supplementary information. We consider showing the anomalies of the transport patterns. However, some of the patterns are very different and anomaly plots may show a similar distribution like the fluxes themselves. Temperature anomalies for each single pattern will be provided in the supplementary information, after the analysis based on model level data has been conducted.

The shown temperature anomalies were calculated from the winters from 1979-2016 mean. The presented standard deviation for the meridional transport has been computed from daily data. We will consider the statistical tests.

Our general aim was to link distinct directions of transport to the surface temperature. The reviewer raises the concern that no moisture flux has been considered. However, previous analyses have shown that the direction of the transport patterns are similar for moisture transports and the analyzed transports in this manuscript.

Concerning the reviewers idea of looking into vertical averaged / integrated temperature anomalies, we consider performing the analysis. Divergence of the heat flux patterns have not shown patterns that fit with the surface temperature anomalies in an obvious way. But we will consider repeating the analysis of the divergences with the model level data and the vertical averaged temperature anomalies.

The vertically integrated net meridional mass flux must be balanced, the compensation in Figure 4 is not that surprising. But the final result might change with the revised vertical integration.

We thank the reviewer for the other helpful comments, that will be taken into account for a revised version of the manuscript.

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