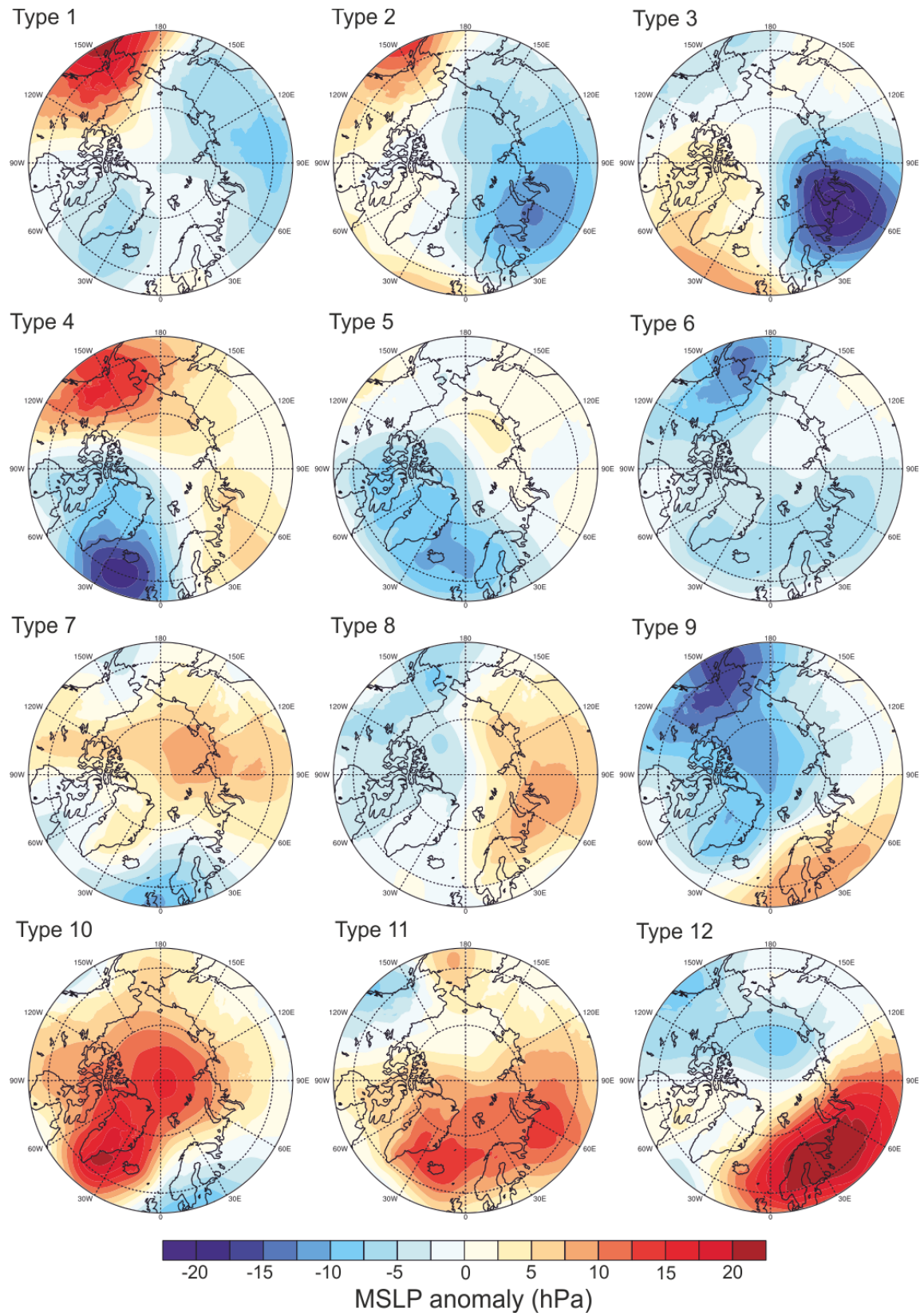*Supplement of*

Winter thermodynamic vertical structure in the Arctic atmosphere linked to large-scale circulation

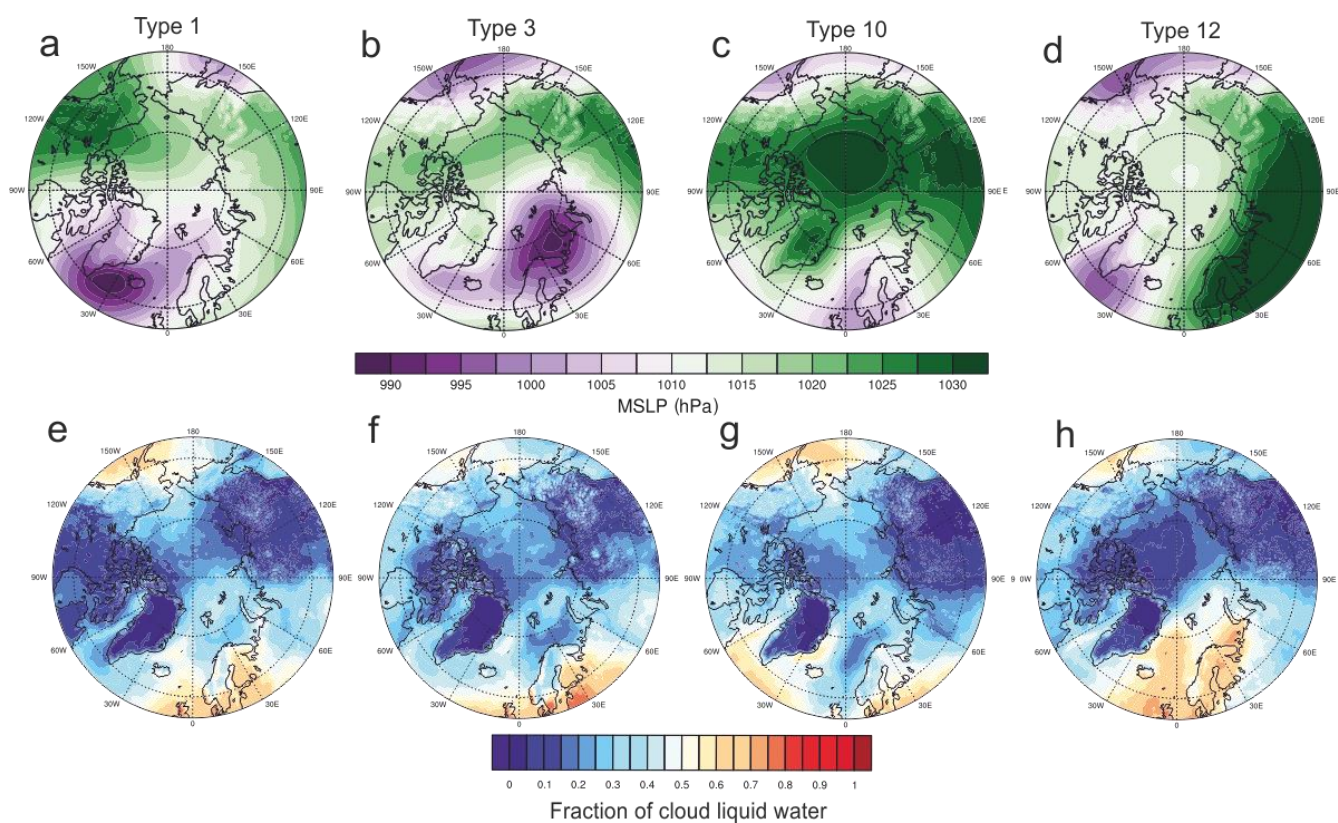**Tiina Nygård et al.**

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Figure S1: Anomaly of mean sea level pressure (MSLP) averaged over the cases belonging to each of the circulation types (SOM nodes) in winters (Dec-Feb) of 2009 – 2018.

Figure S2: Mean sea level pressure (a–d), and fraction of liquid cloud water of the total cloud water (e–h) in four SOM circulation types (indicated on the top of the column) during December–February 2009–2018 based on ERA5.
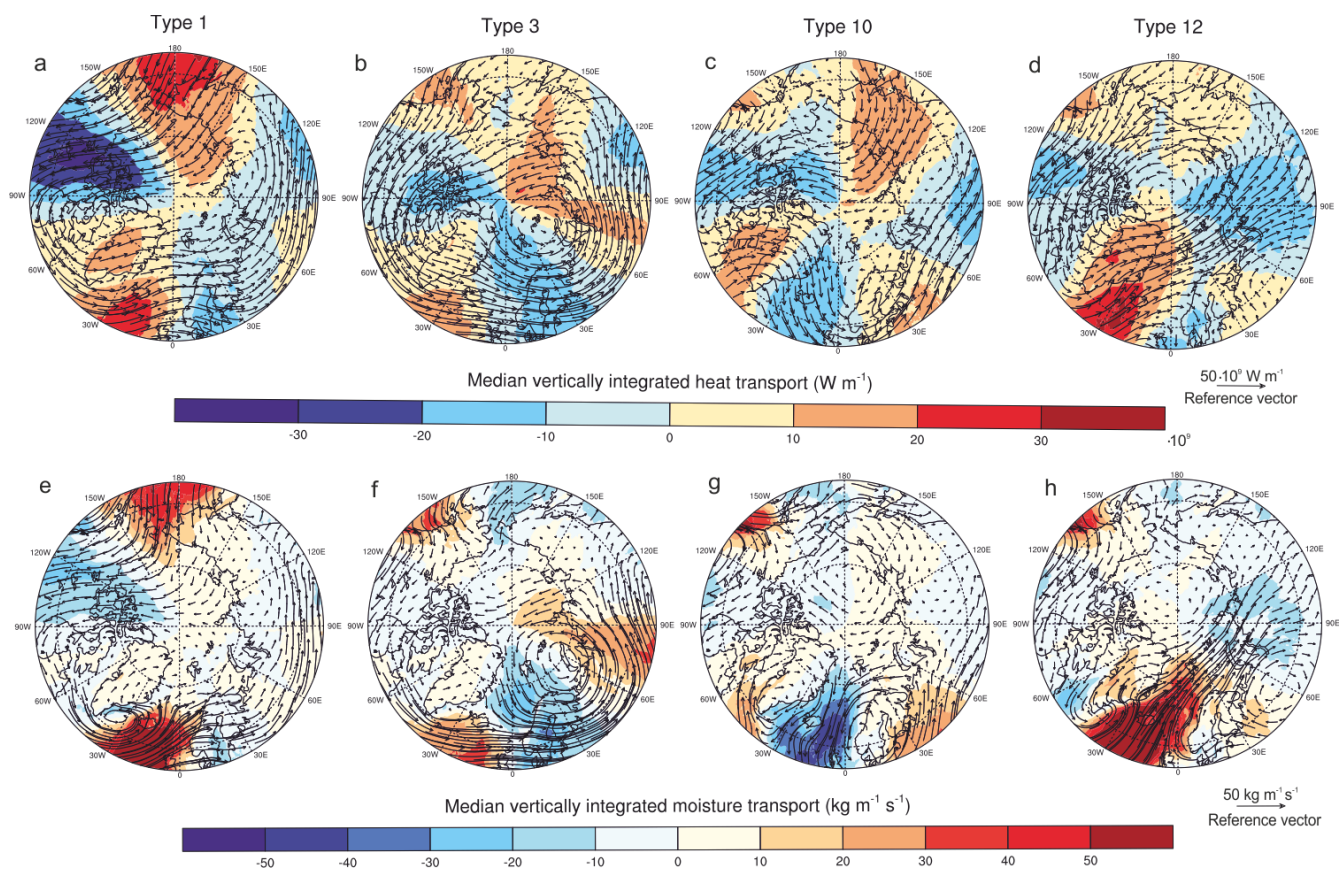
Figure S3: Median vertically integrated heat transport (a–d) and median vertically integrated moisture transport (e–h) in four SOM circulation types (indicated on the top of the column) during December–February 2009–2018 based on ERA5. Vectors show both the zonal and meridional transport whereas the color scale indicates the meridional transport only.
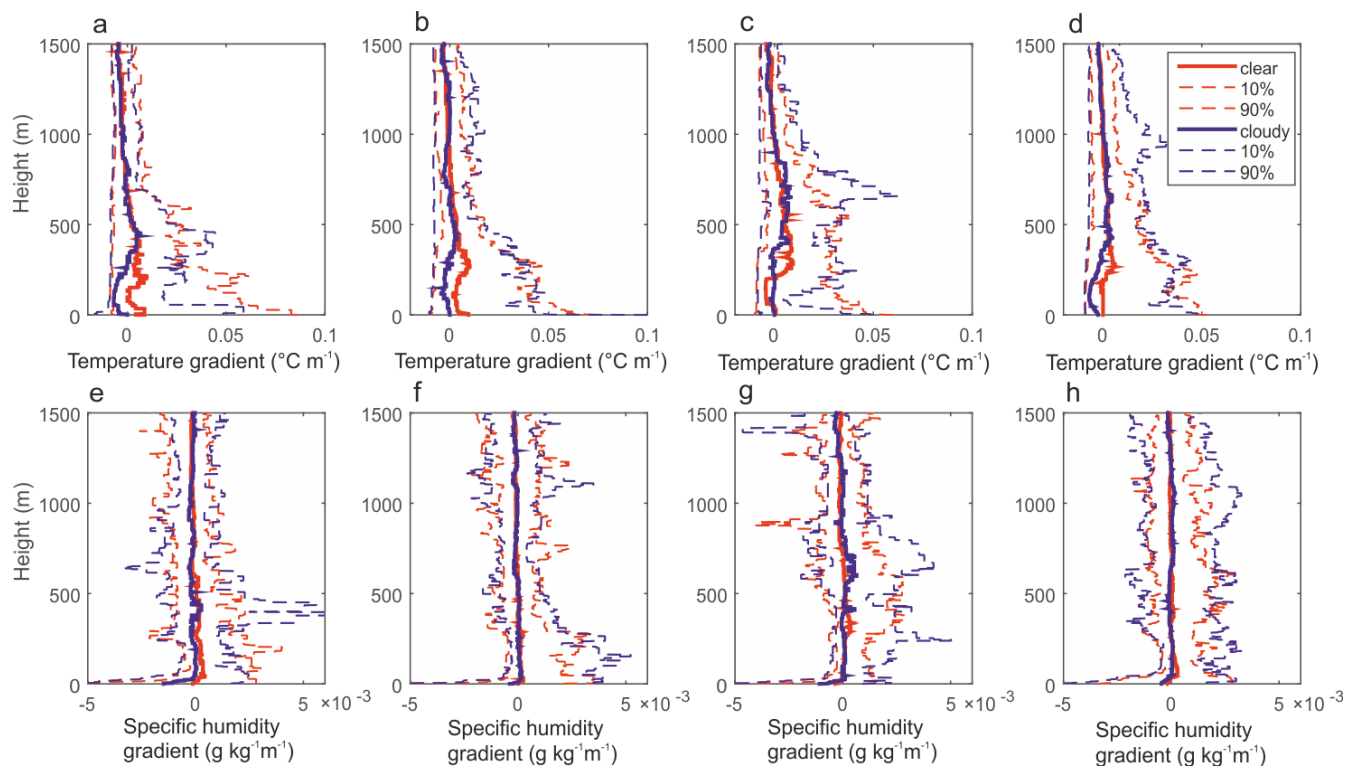
Figure S4: Median (solid lines), 10% percentile (dashed lines), 90% percentile (dashed lines) of vertical temperature gradient profiles (a–d), and vertical specific humidity gradient profiles (e–h) at Utqiaġvik for atmospheric circulation types 1, 3, 9 and 10 (from left to right). The profiles are based on radiosounding observations. Red lines show radiatively clear profiles, blue lines radiatively cloudy profiles. Gradients are defined positive, when the values increase upwards.
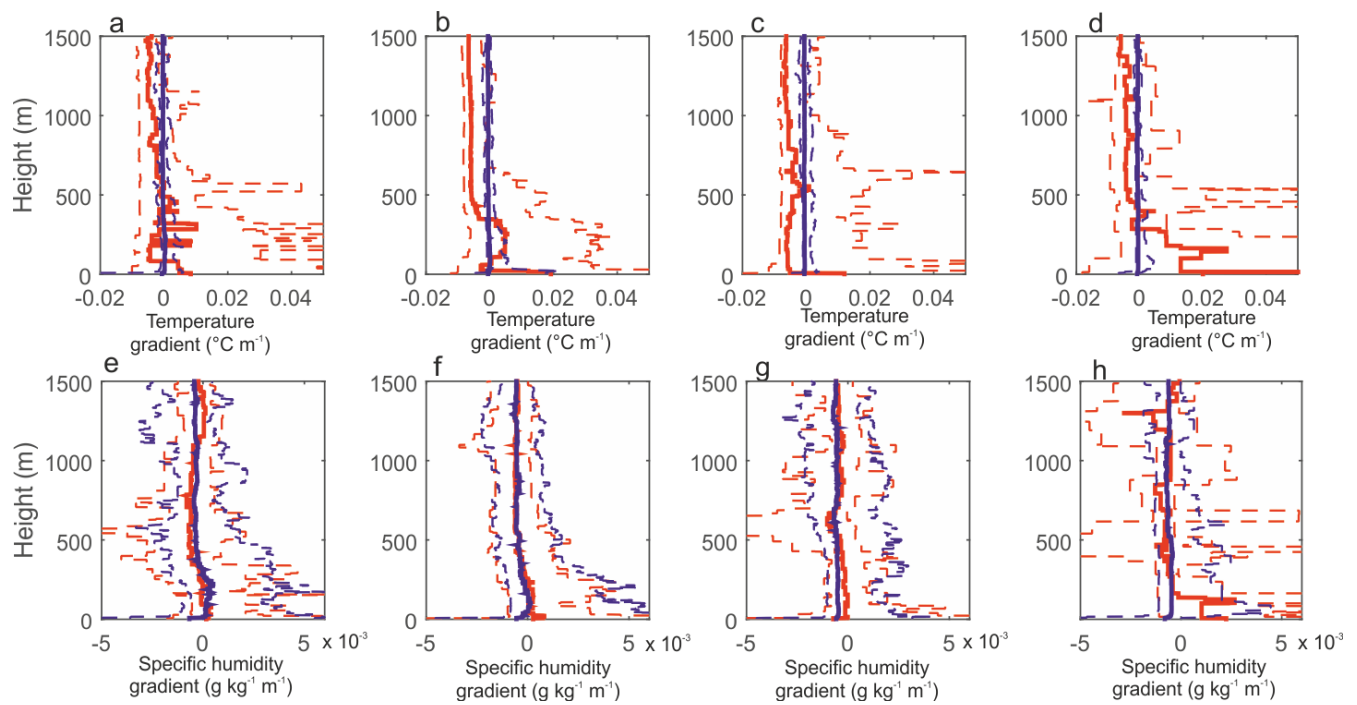
Figure S5: Median (solid lines), 10% percentile (dashed line), 90% percentile (dashed line) of vertical temperature gradient profiles (a–h) and vertical specific humidity gradient profiles (e–h) at Sodankylä for atmospheric circulation types 12, 1, 4 and 5 (from left to right). The profiles are based on radiosounding observations. Red lines show radiatively clear profiles, blue lines radiatively cloudy profiles. Gradients are defined positive, when the values increase upwards.