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Supplement of

The vertical structure of the troposphere and its connection to the surface mass balance of Flade Isblink in northeast Greenland

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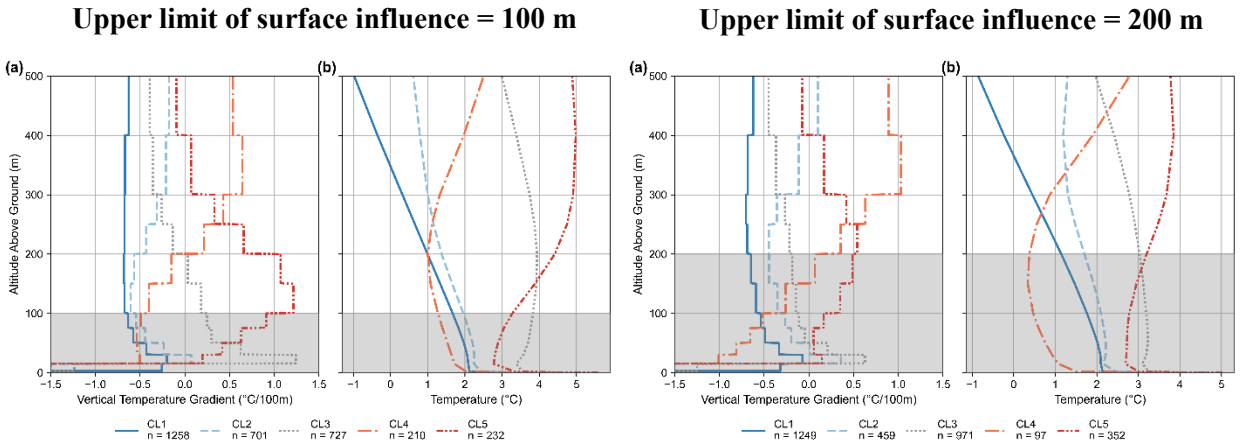

Figure S1: Mean vertical temperature gradients and temperatures for clusters derived from K-means clustering of daily CARRA temperature gradient profiles above tundra between 1991 and 2024. The left panels show results for excluding the lowest 100 (upper limit of surface influence) from clustering, while the right panels show the corresponding results for an upper limit of surface influence of 200 m. In both cases: (a) Vertical temperature gradient and (b) air temperature for each cluster mean in JJA between 1991 and 2024. The shaded grey area indicates the atmospheric layer excluded from clustering due to its strong sensitivity to the properties of the surface cover.

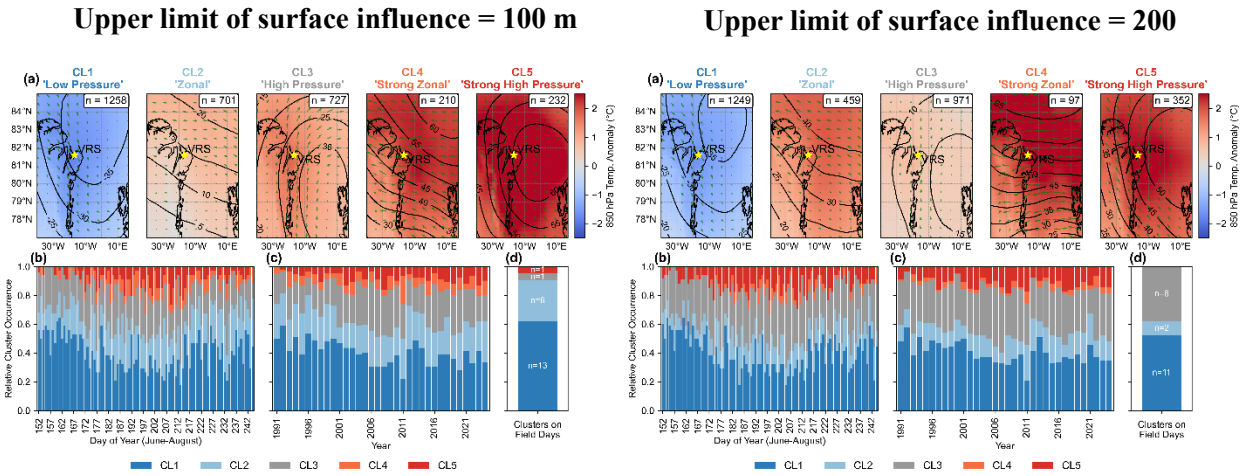

Figure S2: Synoptic conditions and temporal characteristics of cluster occurrence derived from K-means clustering of daily CARRA temperature gradient profiles above tundra between 1991 and 2024. The left panels show results for excluding the lowest 100 (upper limit of surface influence) from clustering, while the right panels show the corresponding results for an upper limit of surface influence of 200 m. In both cases: (a) synoptic conditions represented by the cluster means, their descriptive naming, and absolute occurrence, with temperature anomaly (colour), wind anomaly (green vectors) and 500 hPa geopotential height anomaly (m) from ERA5 reanalysis; (b) relative cluster occurrences by day of year (1991–2024); (c) changes in relative cluster occurrence between 1991 and 2024; and (d) number of clusters corresponding to days of UAV field measurements ("Field Days").

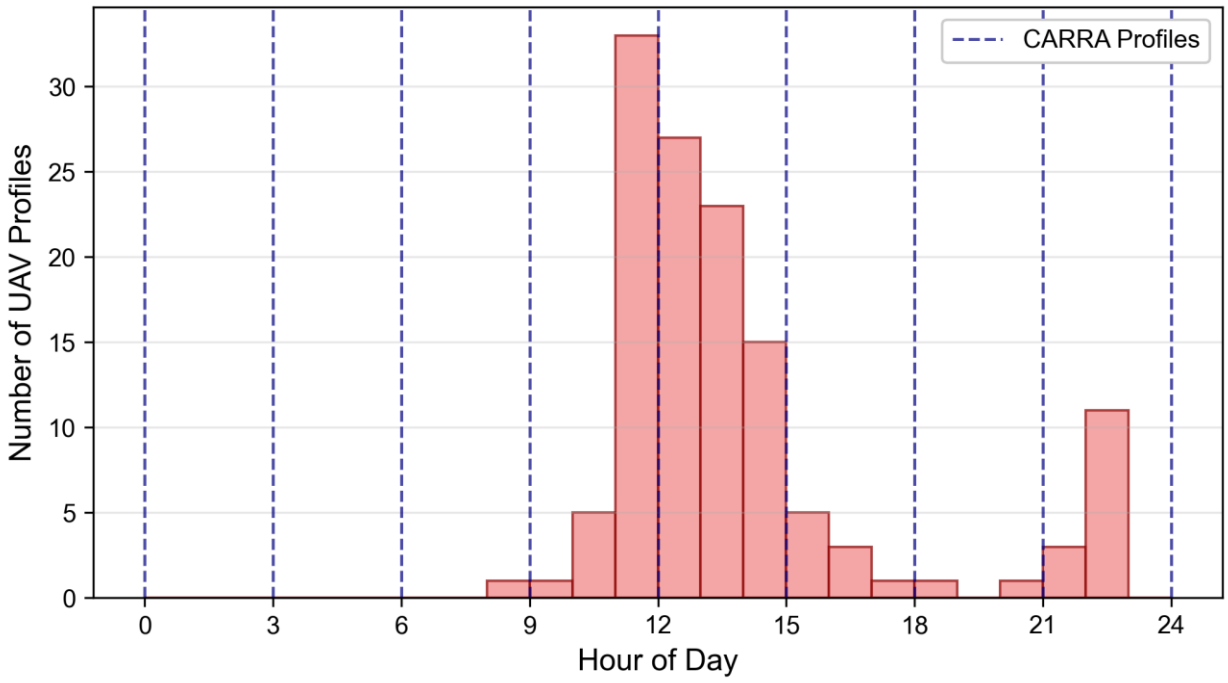

Figure S3: Hourly distribution of all UAV sounding times (red bars). Blue dashed lines mark the 3-hourly timestamps of CARRA profiles.