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Supplement of

Aerosol and dynamical contributions to cloud droplet formation in Arctic low-level clouds

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Supplement

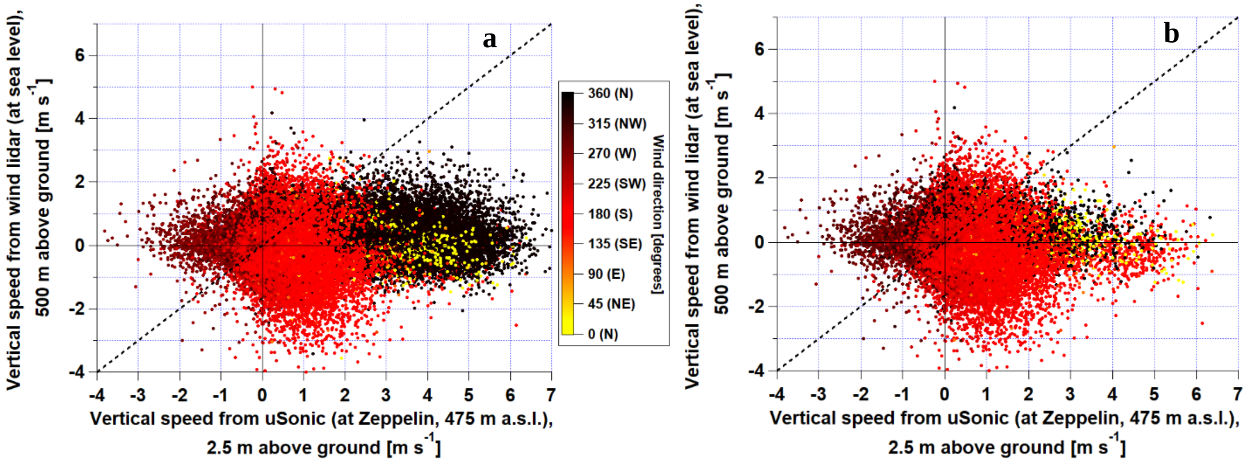


Figure S1. Comparison of updraft velocity measured over the whole campaign by the wind LiDAR and the uSonic. Panel a) includes all data between October 1st, 2019 and May 1, 2020. The same data are shown in Panel b) but data points corresponding to wind directions between 335 and 15 degrees were removed. The location of the two instruments is separated by a horizontal distance of approximately two kilometers, and a vertical distance close to 475 m. To account for the vertical difference, 500 m-altitude wind LiDAR data are selected.

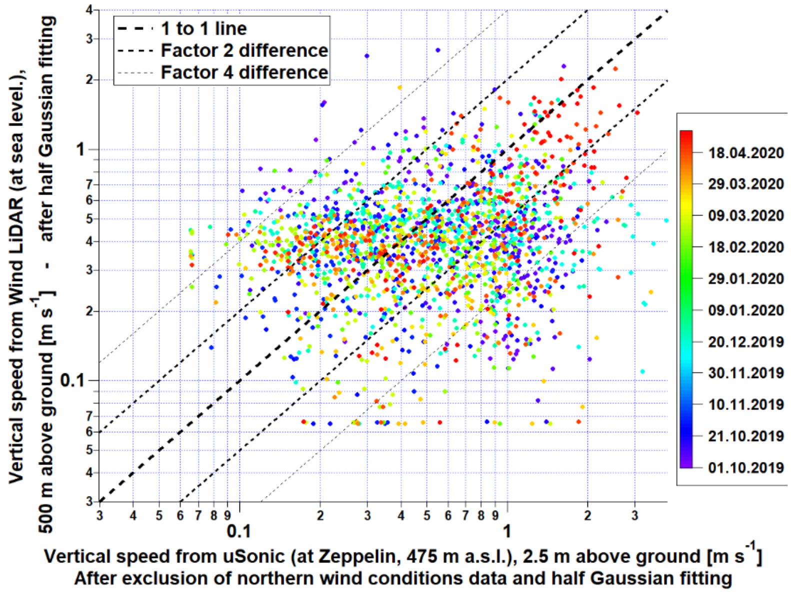


Figure S2. Comparison between wind LiDAR and uSonic 1-hour grouped data over all simultaneous measurement periods.

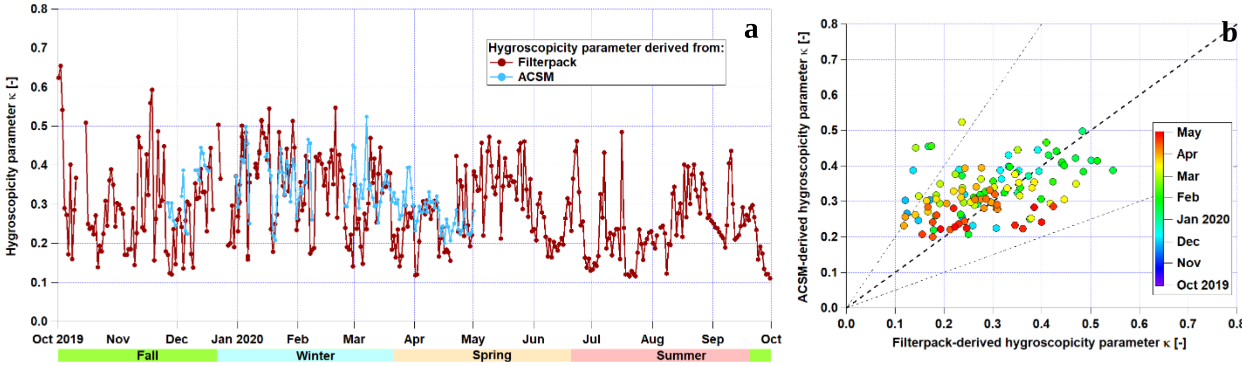
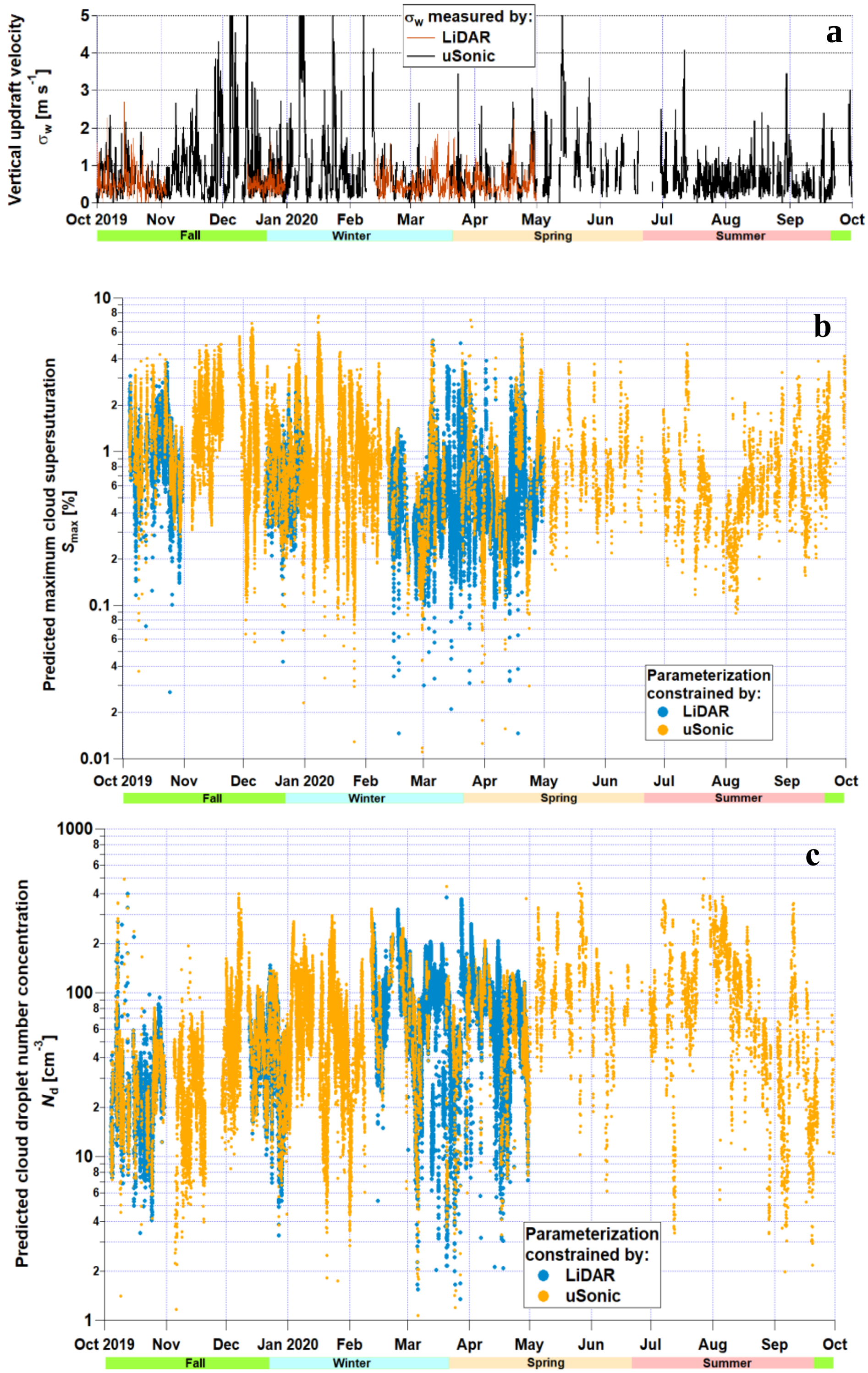


Figure S3. a): Time series of daily-averaged hygroscopicity parameter κ as derived from filterpack, high-volume sampler and aethalometer data (in dark red) and from ACSM (PM_1) and aethalometer data (in blue). b): Scatterplot of daily-averaged ACSM-derived versus filterpack-derived particle hygroscopicity value κ over the whole campaign, coloured by date.


a
Vertical updraft velocity
σw [m s-1]
σw measured by:
LiDAR
uSonic
Oct 2019
Nov
Dec
Jan 2020
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Fall
Winter
Spring
Summer
b
Predicted maximum cloud supersuturation
Smax [%]
Parameterization
constrained by:
LiDAR
uSonic
c
Predicted cloud droplet number concentration
Nd [cm-3]
Parameterization
constrained by:
LiDAR
uSonic

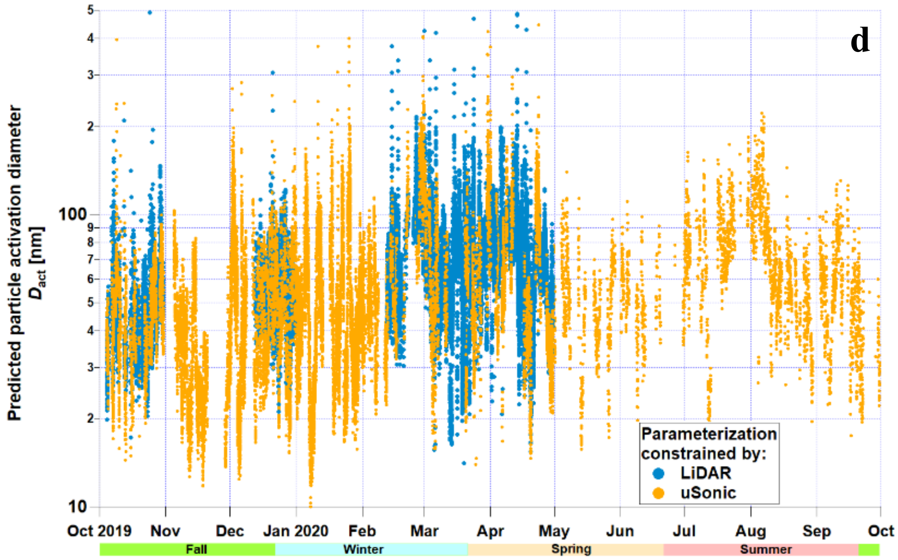


Figure S4. Time series of a) measured updraft velocity σ_w, predicted potential b) maximum cloud supersaturation S_{max}, c) cloud droplet number concentration N_d and d) particle activation diameter D_{act} at the Zeppelin station over the whole NASCENT campaign. N_d, S_{max} and D_{act} are constrained by measurements of σ_w, whose values (after analysis as described in Sect 3.2) are shown at the top of both panels. These results are direct outputs of the cloud droplet formation parameterization presented in Sect. 3.2.

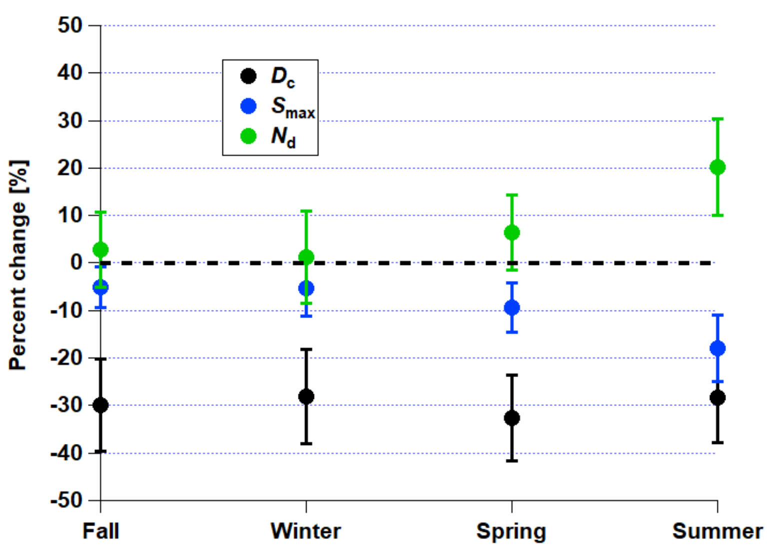


Figure S5. Sensitivity analysis showing the mean seasonal percent change of predicted potential maximum cloud supersaturation S_{max}, cloud droplet number concentration N_d and particle activation diameter D_{act} assuming that half of the aerosol mass consists of sea salt. Error bars represent the standard deviation around the seasonal mean.