

Size distribution and size segregated ionic composition of the aerosol at the continental Antarctic site Kohnen (75°00'S, 00°04'E)

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SUPPLEMENTARY MATERIAL

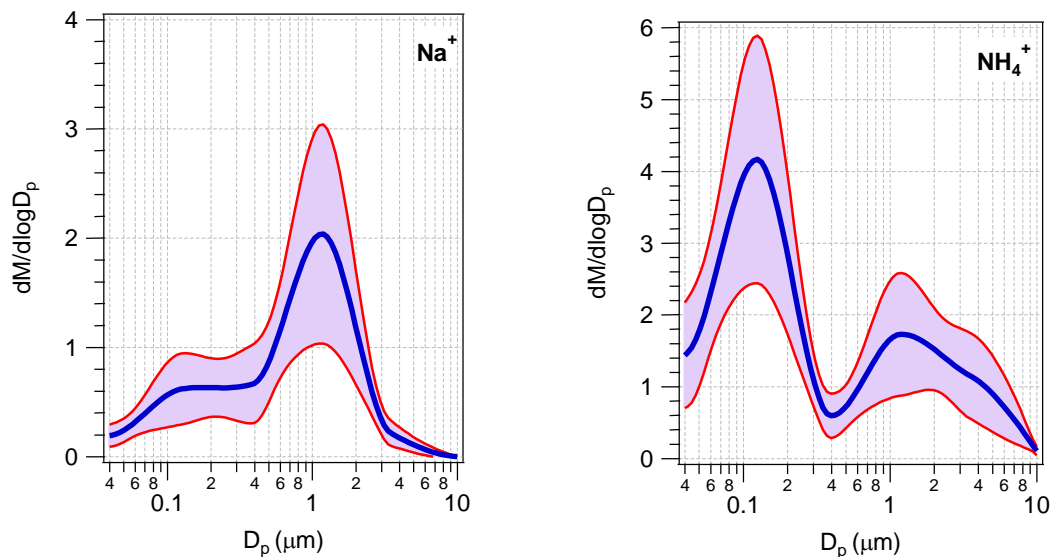


Figure S1. Mean inverted size distributions (blue lines) and the confidence intervals (red lines) determined for the two most critical cases, i.e. NH_4^+ of impactor #1 and Na^+ of impactor #4 from the campaign in 2015. We run a Monte Carlo simulation, with 1000 realization of the inversion, independently varying the concentrations of each impactor stage within two STD of the experimental error (using individual concentration dependent errors derived from the exponential fit in Fig. 2).

AMPS 30-km WRF -- South Atlantic Window
 Fcst: 15 h
 Total precip. in past 3 h
 Sea-level pressure

Init: 12 UTC Sun 18 Jan 15
 Valid: 03 UTC Mon 19 Jan 15

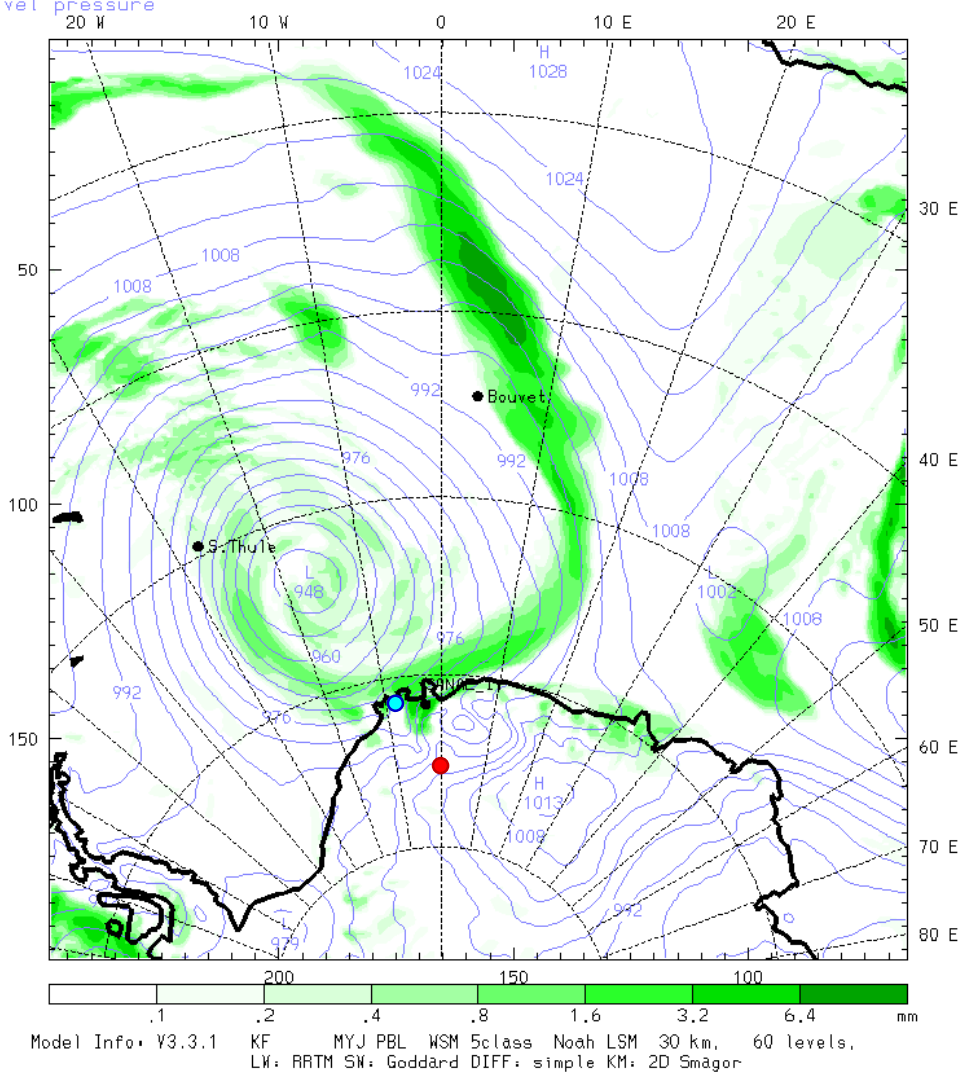


Figure S2. Example of a AMPS weather chart for 19 Jan. 2015, 03:00 am, initialized 18 Jan. 2015, 12:00 am. The locations of Neumayer and Kohnen Station are marked by a blue and a red circle, respectively. The weather chart shows the surface pressure and the total precipitation in the last 3 hours on a 30 km grid for the South Atlantic section. A short animation of the cyclone path (from 17 Jan. 2015 03:00 – 22 Jan. 2015 00:00) is appended (metKo2015.avi).

AMPS 30-km WRF -- South Atlantic Window
 Fcst: 12 h
 Total precip. in past 3 h
 Sea-level pressure

Init: 00 UTC Fri 15 Jan 16
 Valid: 12 UTC Fri 15 Jan 16

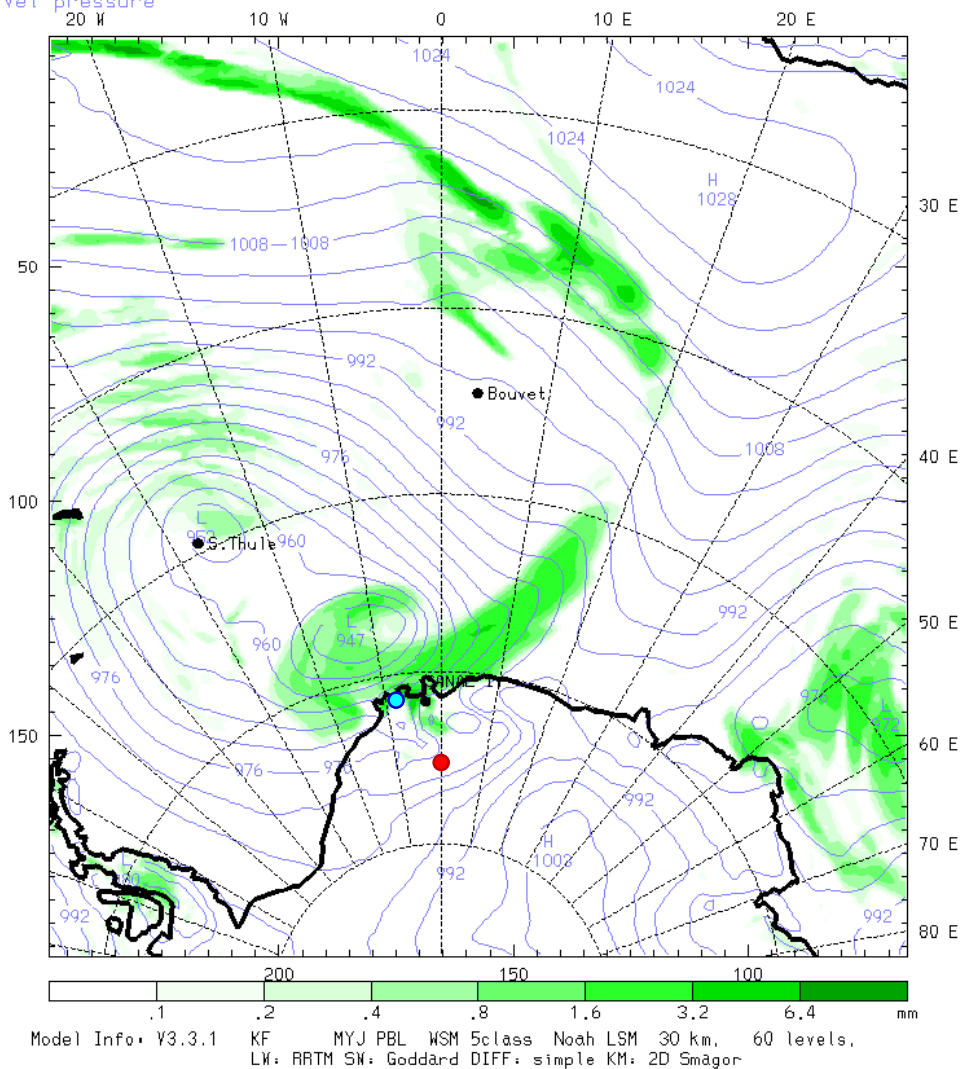


Figure S3. AMPS weather chart for 15 Jan. 2016, 12:00 am, initialized 15 Jan. 2016, 00:00 am, similar to Fig. S.2. A short animation of the cyclone path (from 13 Jan. 2016 03:00 – 18 Jan. 2016 00:00) is appended (metKo2016.avi).

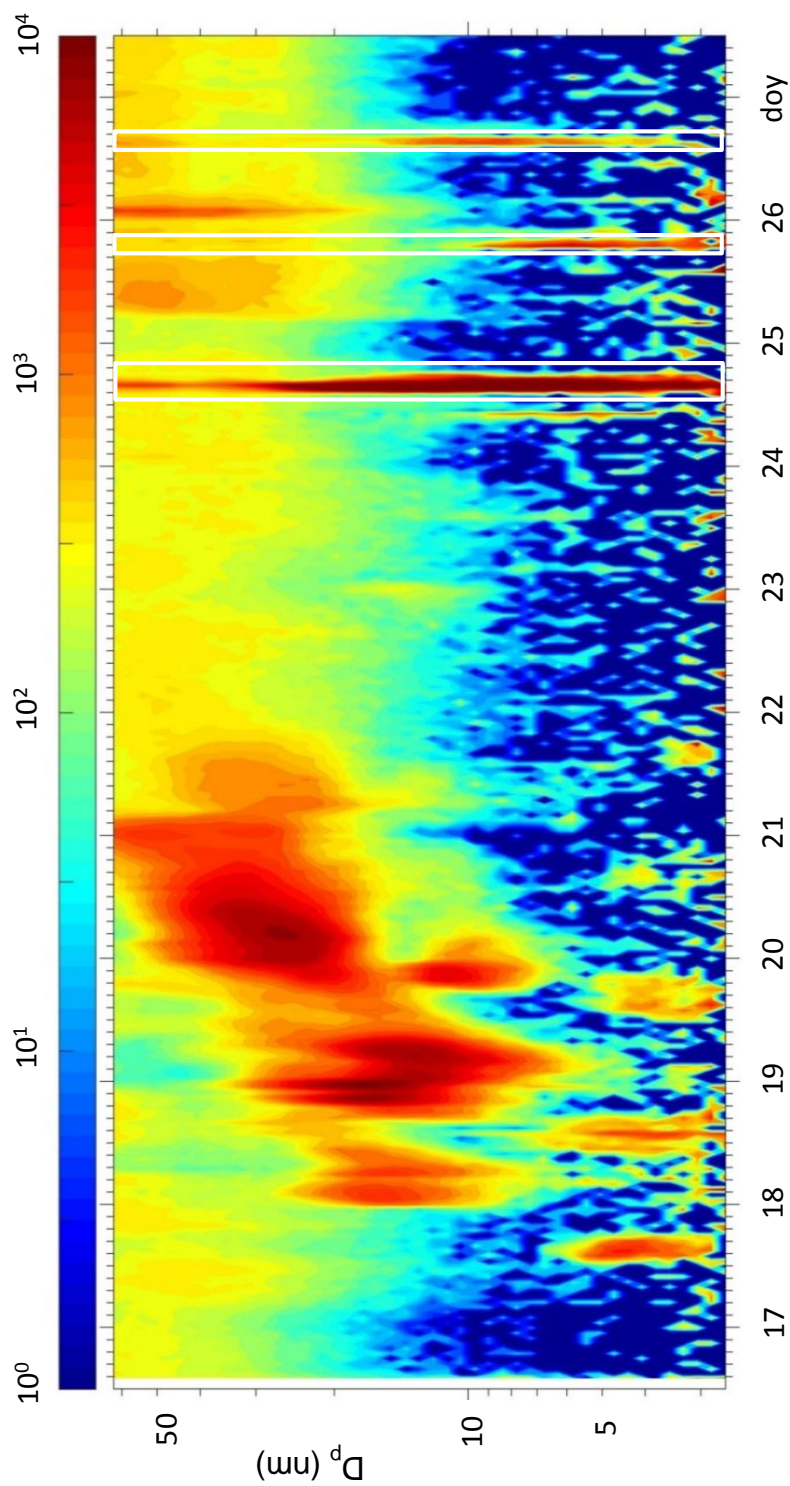


Figure S4. Time series of the particle size distribution $dN/d\log D_p$ (cm^{-3}) on a logarithmic scale (color code at the top of the contour plot) including the NPF event, measured with the nano-DMA 3085. Contamination affected periods are within the white frames (24, 25, and 26 January).

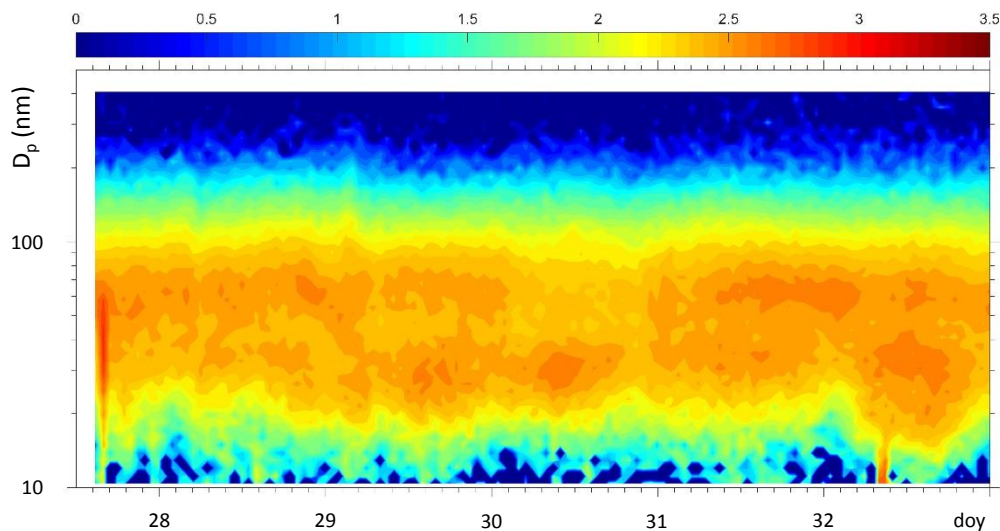


Figure S5. Time series of the measured particle size distribution $dN/d\log D_p$ (cm^{-3}) during summer 2015 measured with the DMA 3081 on a logarithmic scale (color code on top of the contour plot)

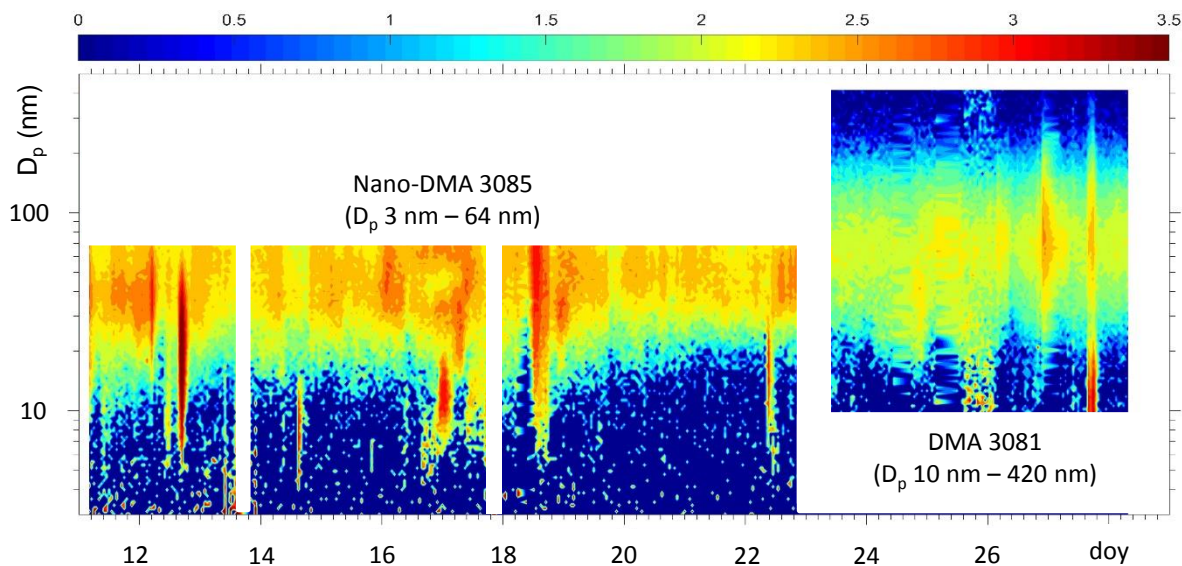


Figure S6. Time series of the measured particle size distribution $dN/d\log D_p$ (cm^{-3}) during summer 2016 on a logarithmic scale (color code on top of the contour plot). The horizontal blanked areas mark the size restriction of the corresponding DMA, while the vertical blanked areas were instrumental failures due to power breakdown.

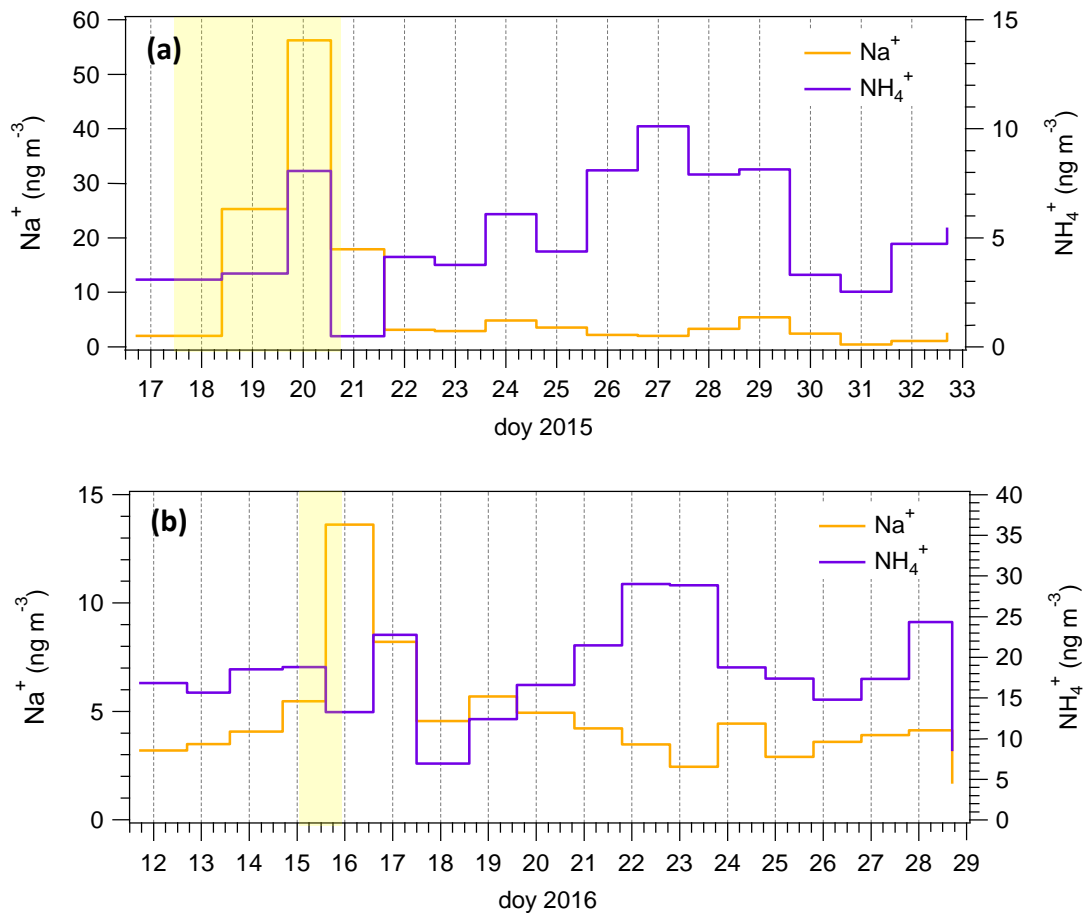


Figure S7. Time series of the measured Na^+ and NH_4^+ concentrations from bulk aerosol (low volume) sampling during the campaign 2015 (a) and 2016 (b). The period of LPS15 and LPS16 are shaded in yellow.

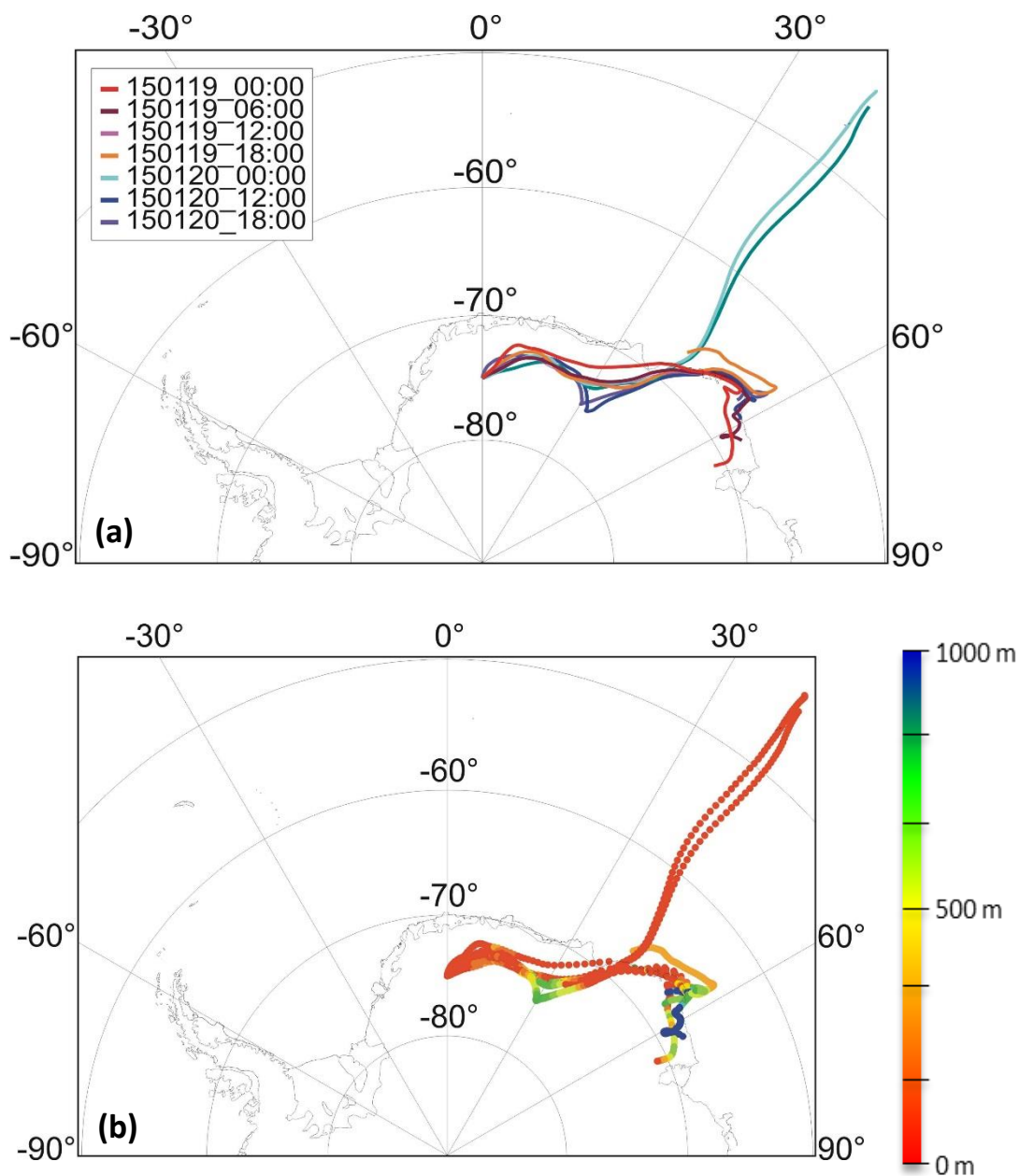


Figure S8. Five day backward trajectories during the NPF event, similar to Fig. 14, but now with trajectory starting height of 10 m above Kohnen (a). Below the travel height above ground (local topography) is illustrated in a color coded scale (point interval 1 hour) (b).

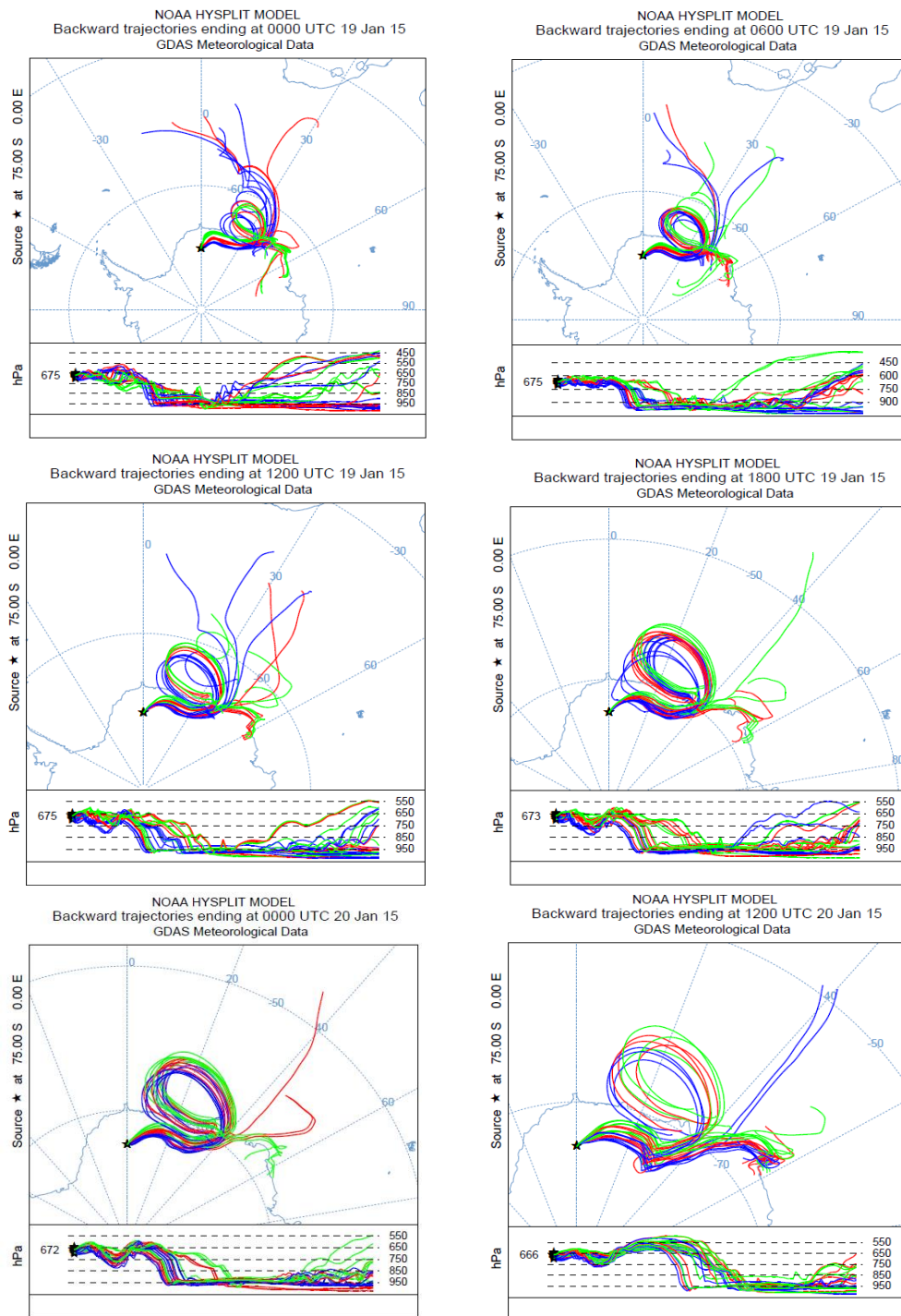


Figure S9. Five day backward trajectories ensembles during the NPF event (3D approach, start date & time noted in the headings). Each ensemble shows 27 individual trajectories whose starting points were varied by $\pm 1^\circ$ longitude and $\pm 1^\circ$ latitude each, while for the height above ground 0 m, 250 m, and 500 m were chosen, respectively.

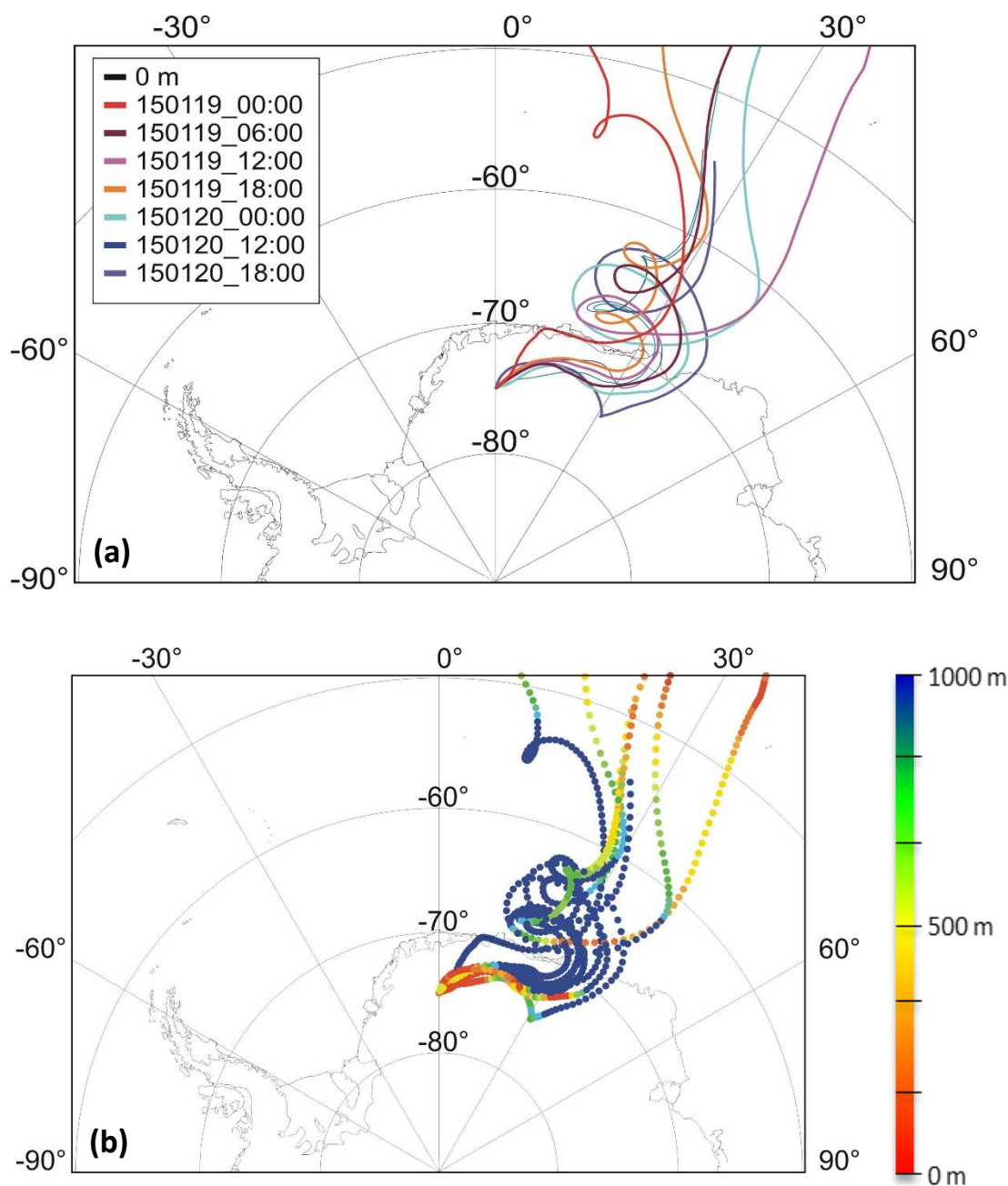


Figure S10. Five day backward trajectories during the NPF event, similar to Fig. 14, but now calculated under isentropic approach, starting height of 100 m above Kohnen (a). Below the travel height above ground (local topography) is illustrated in a color coded scale (point interval 1 hour) (b).

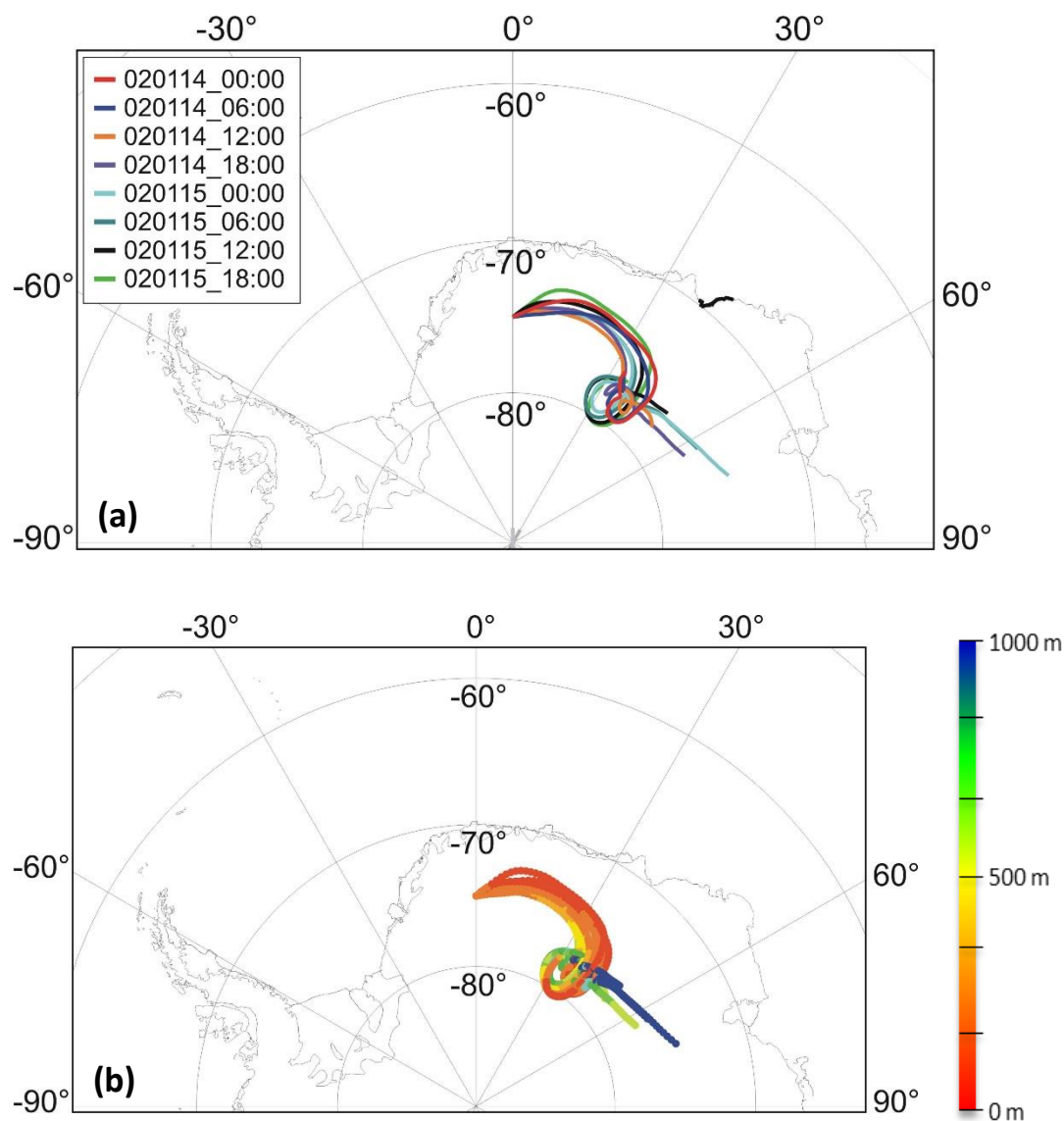


Figure S11. Five day backward trajectories during outstanding biogenic sulfur concentrations observed during 14 and 15 January 2002 (Piel et al., 2006), based on NCEP meteorological data (a). Travel height above ground (local topography) is illustrated in a color coded scale (b).

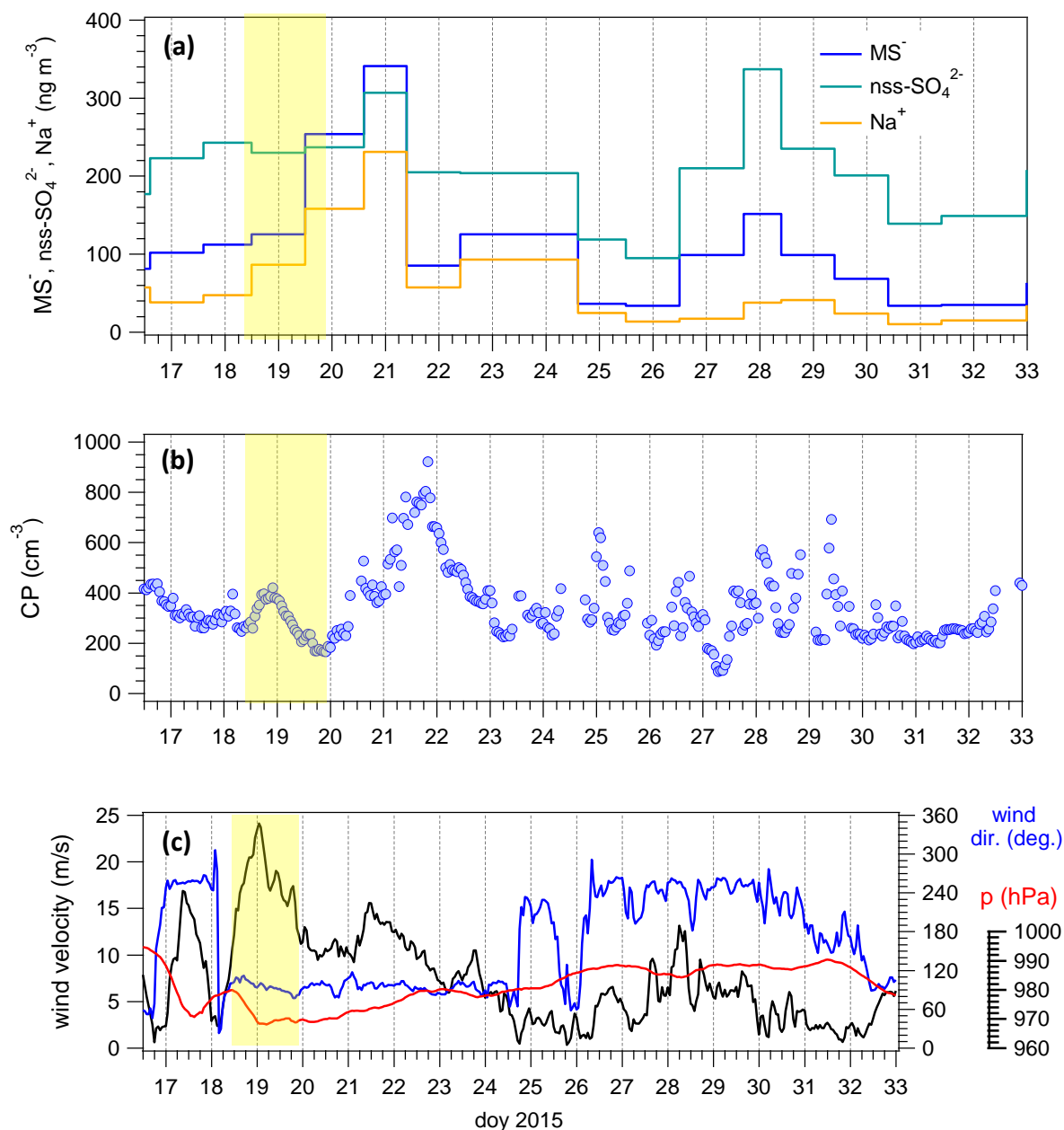


Figure S12. Time series of the measured ionic composition of the aerosol (a), CP concentrations (b) and meteorological data (c) from coastal Neumayer station measured during the sampling period of the Kohnen campaign in 2015. The period of LPS15 is shaded in yellow.

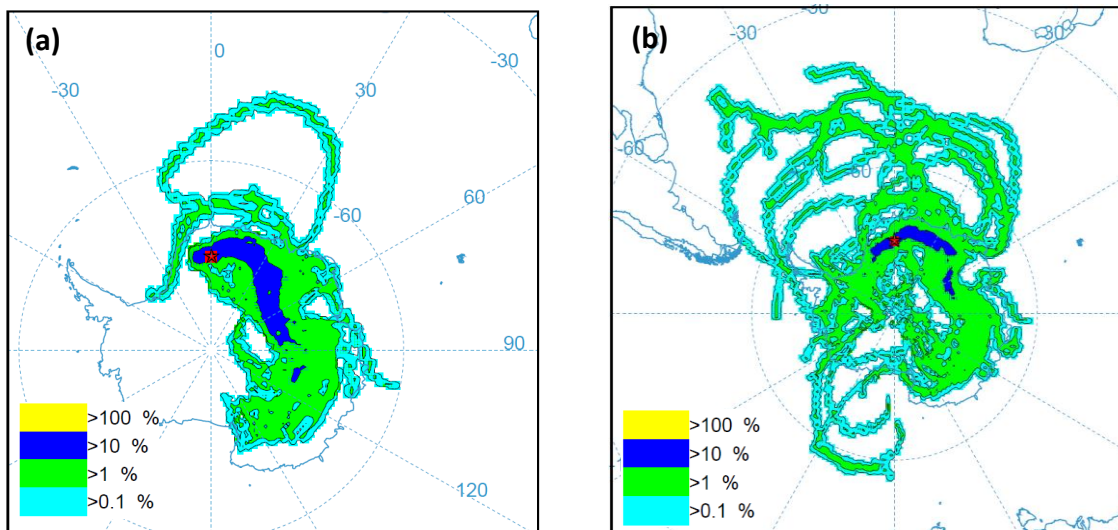


Figure S13. Daily 10-day backward trajectories during clear sky condition in 2016 (doy 12 to doy 31, $N = 80$). Shown is the relative (percentage) number of trajectory intersection on a given grid cell (resolution $1^\circ \times 1^\circ$). The left hand plot (a) presents all 10-day back trajectories for 3D approach, starting height 10 m, while on the right (b) the corresponding 10-days back trajectories for isentropic approach and starting height 10 m are shown.