Supplementary material

Drivers controlling black carbon temporal variability in the Arctic lower troposphere.

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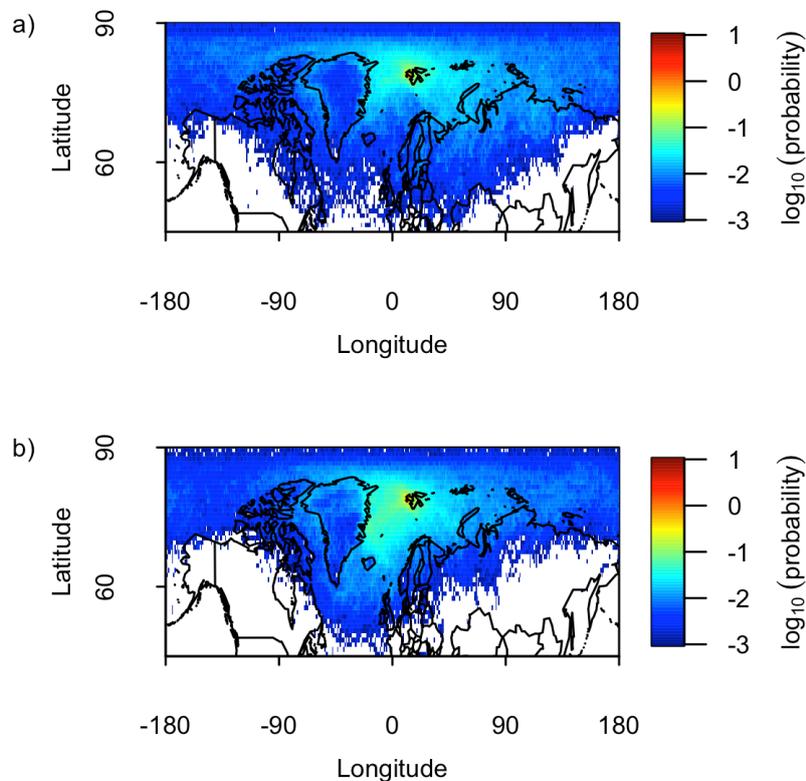
Figure S1. Probability residence time map of the cold (panel a) and warm (panel b) season from 7-day LAGRANTO back trajectories.
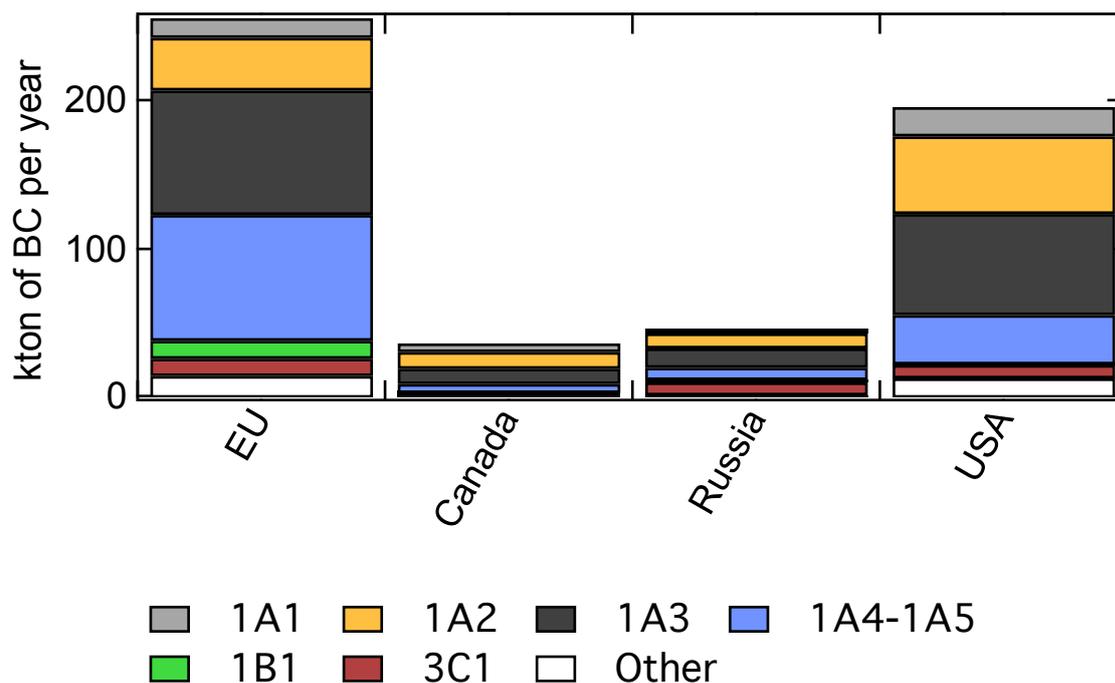
Figure S2. Share of 2018 BC emissions from Europe (EU), Canada, Russia, and United States of America (USA), corresponding to power industry and oil refinery and transformation industry (1A1), combustion for manufacturing (1A2), transportation (1A3), energy for buildings (1A4-1A5), fuel exploitation (1B1), agricultural waste burning (3C1), and other sectors. BC emissions are derived from EDGARv6.1 emission database (https://edgar.jrc.ec.europa.eu).

Figure S3. Pearson correlation matrix of eBC concentration, meteorological variables, and general circulation indexes for the cold (November – April) and the warm period (May -October).
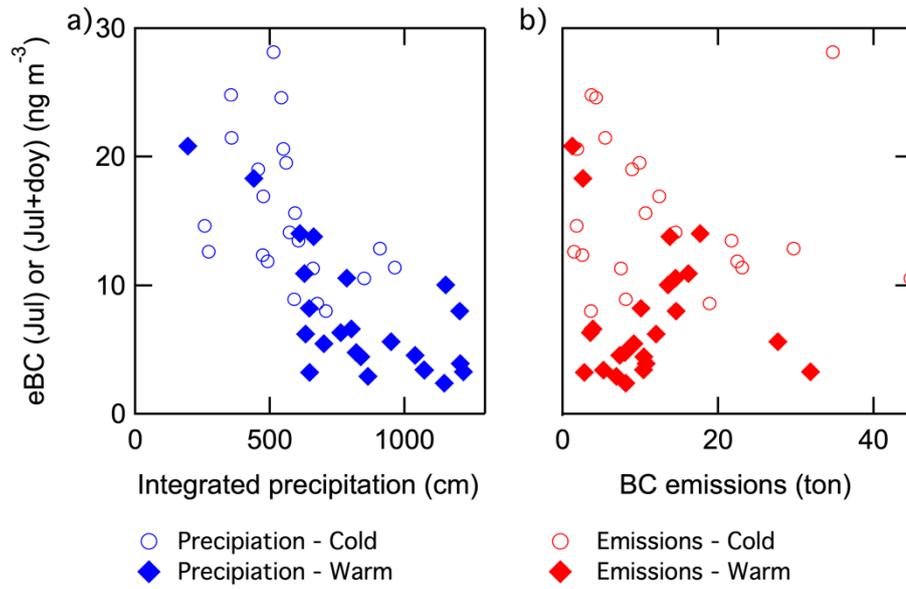
Figure S4. eBC monthly averages modeled by GAM, based on Julian day in the cold season and Julian day and day of the year in the warm season, as a function of precipitation (a) and BC emissions (b), integrated along back-trajectories.
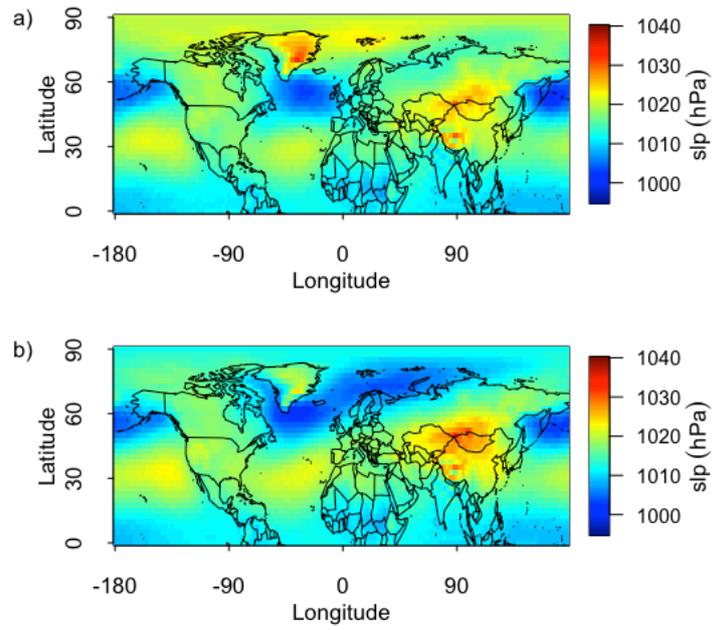
Figure S5. Average sea level pressure maps when atmospheric pressure at GAL was higher than 1010 hPa in the cold season (panel a) and during the entire cold season (panel b).
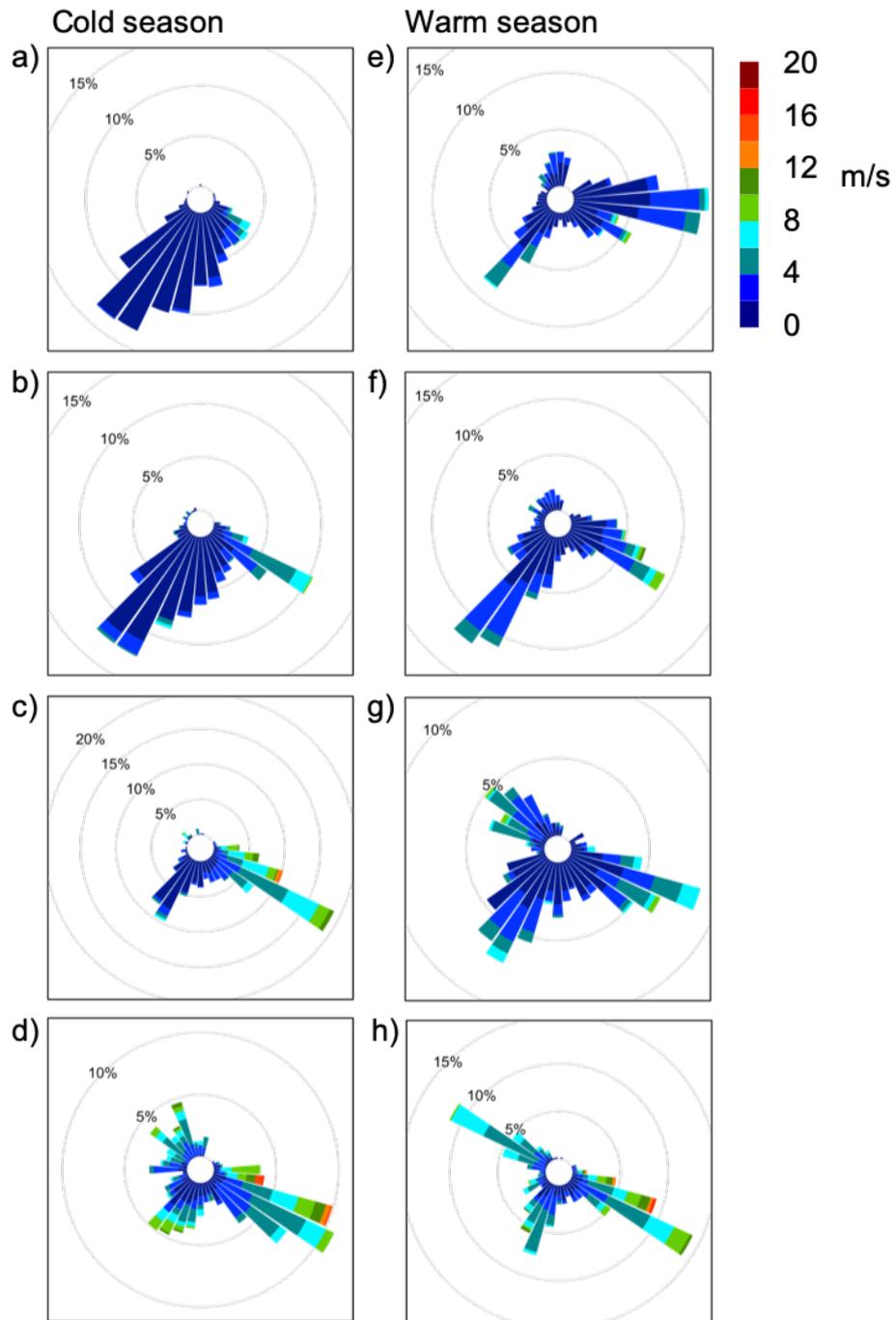
Figure S6. Wind roses describing main wind pattern at GAL during the cold (a-d) and the warm season(e-h) when blh was below 100 m (a and e), between 100 and 200 m (b and f), between 200 and 400 m (c and g), and between 400 and 600 m (d and h).
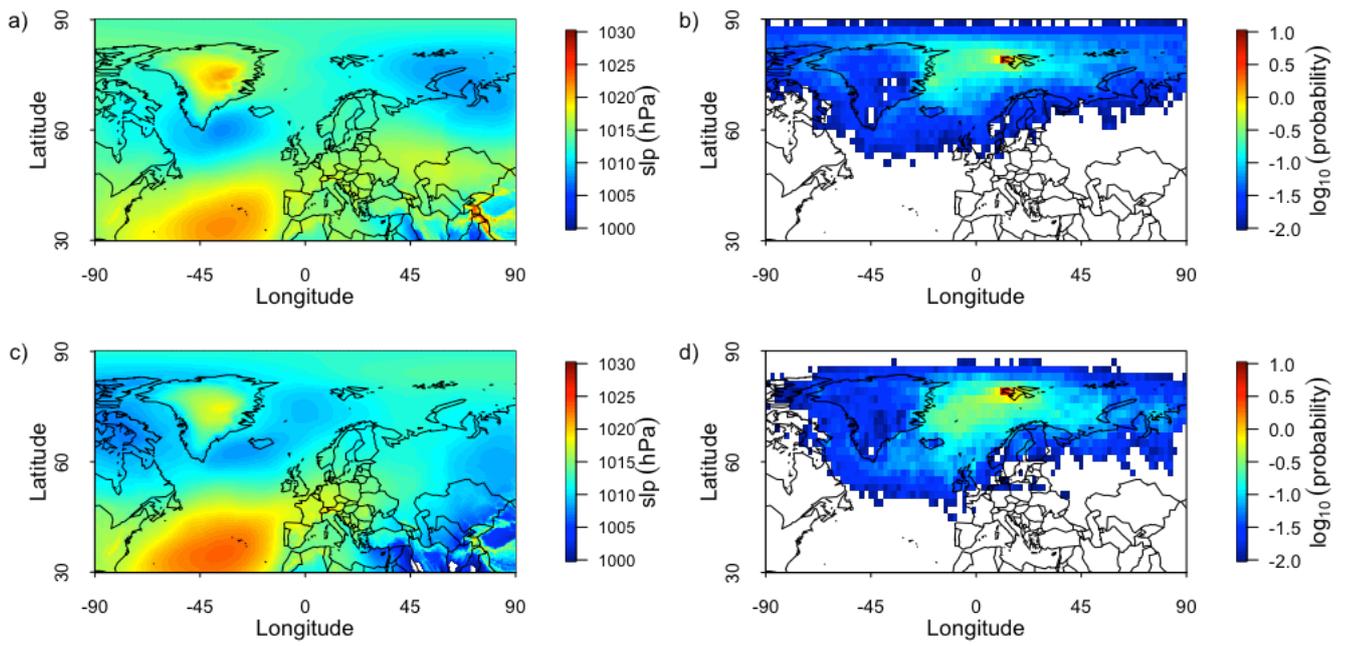
Figure S7. Residence time probability maps when the temperature at GAL was lower (panel a) and higher (panel b) than 278 K during the warm season. Residence time probability maps are based on 7-day back-trajectories. The threshold of 278 K was defined based on the temperature impact on eBC concentration reported in Fig. 7c.
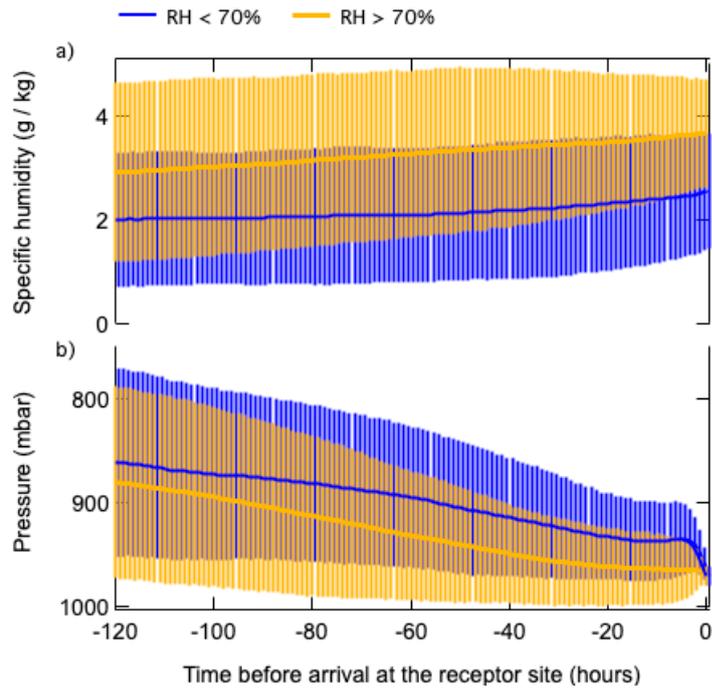
Figure S8. Change of specific humidity (panel a) and pressure (panel b) along back-trajectories, for air masses arriving at GAL when RH was higher (orange) and lower (blue) than 70%.
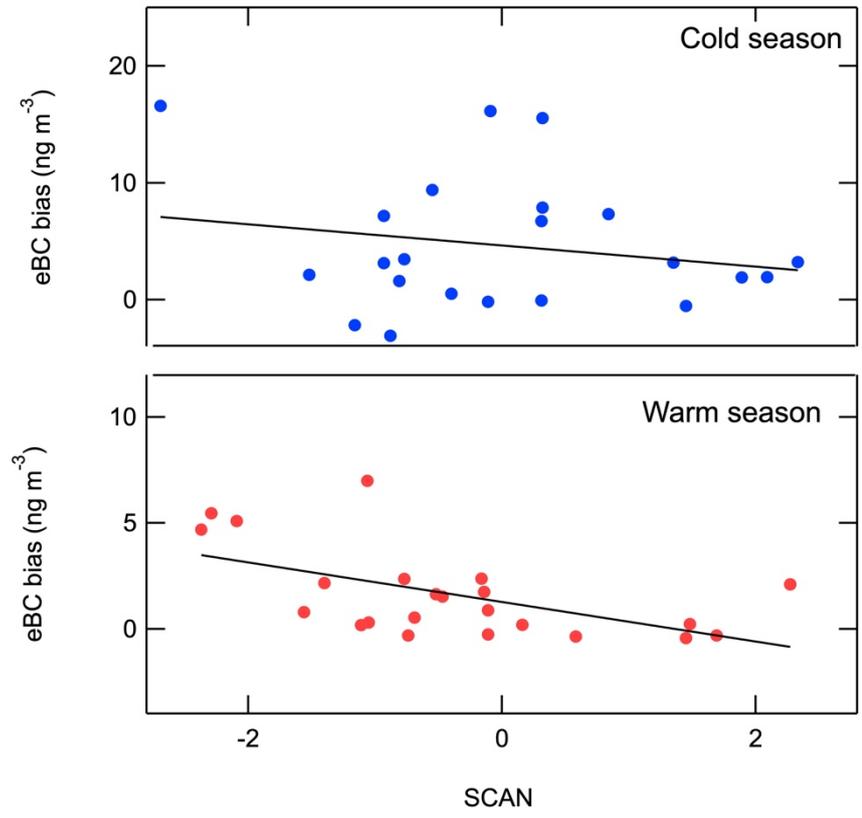
Figure S9. Relationship between GAM monthly biases and SCAN index.