Answer to referee #1

The paper „Drivers controlling black carbon temporal variability in the Arctic lower troposphere“ addresses seasonal differences in the eBC concentration during different atmospheric conditions. During this analysis the authors use compare in-situ measurements with model data to find out the history of advected BC. Substantial conclusions are reached and the outline is clear.

The authors would like to thank the referee for the constructive comments and suggestions. We have addressed all the comments as best as we could. Also, we added additional information to the manuscript and adjusted some of the figures to make them more easily legible for the readers. For clarity, comments from the referees are reported in blue, answers from the authors are in black, while changes in the original text are in red.

Since only in-situ measurements at Gruvebadet (Boundary layer) are taken, the title is a bit misleading, that only one measurement site is taken into account.

This study presents a detailed data analysis of observations collected at a single site in the Arctic. Nevertheless, the results here reported show that the largest fraction of time variability of eBC concentration at Gruvebadet is controlled by synoptic scale processes, including wet scavenging during transport from emission regions, as well as synoptic-scale meteorological processes that promotes effective transport from lower latitudes, such as diabatic cooling of air masses moving over snow-covered ground, intrusion of warm air from lower latitudes, and specific sea level pressure patterns. Conversely, local meteorology (wind pattern and boundary layer dynamics) have a less significant impact on eBC time variability. For these reasons, we believe that the observations collected at Gruvebadet are representative of the European Arctic lower troposphere, and we modified the title as follows:

“Drivers controlling black carbon temporal variability in the lower troposphere of the European Arctic”

Language:

line 94: one comma too much

Comma was removed

106: Ångström

Thanks for highlighting the typo. We corrected throughout the entire manuscript.

118 "The NAO a a measure..."

The sentence was modified as follows:

“The NAO is a measure…”

208: „per [For?] each grid cell…“

The sentence was reformulated as:

“For each grid cell…”

250: Ångström

Thanks for highlighting the typo. We corrected throughout the entire manuscript.

316: pressure

We corrected it

339: Ny-Ålesund

We corrected the name of the village

409: Brøggerbreen

The name of the glacier was corrected

412: check units of speed

Wind speed unit was corrected with "-1" as superscript

440-442: «North», «West»

We thank the referee for the suggestion, but we hold to the AP Style and CMOS general rule of using lower case for compass directions

460-461: close bracket

We closed the bracket at the end of the sentence.

Mathematical formulae,...:

line 96: what does «Tr» mean?

Tr stays for transmittance, nevertheless we did not use this abbreviation in any other part of the manuscript and we decided to remove it from this line.

Eq 1: sum over index i is missing

The index i refers to the i-th observation. For clarity the formula was modified as follows:

$$\ln(eBC) = \sum_{j=1}^{p} s_j(x_j) + \sum_{j=p+1}^{q} \beta_j x_j + a + \varepsilon$$

line 161: x_(ij)

The formula was modified and the index i was removed, so the actual text that reports x_j is now correct.

Eq 2: What is «R»?

R in formula 2 is the Pearson's correlation coefficient. We agree with the referee that meaning of VIF was not clearly explained. The text after formula (2) was modified to better explain how VIF is calculated and its meaning.

> "r is the Pearson's correlation coefficient that defines the correlation of the last added variable against all the other variables already included in the multivariate GAM. As a general rule, VIF equal to 1 corresponds to no correlation, while VIF between 1 and 5 indicate a weak correlation. In this study, if VIF exceeded 2.5, the variable was not added to the model and the covariate with the second highest deviance explained was tested. A VIF equal to 2.5 was chosen because it corresponds to a coefficient of determination of 0.6, which is the maximum ~~allowed~~ collinearity among covariates that was considered acceptable."

We also noticed that in the text we often used both R (capital letter) and r (lower case) to indicate the Pearson's correlation coefficient. We modified the manuscript to improve consistency and used the lower case indication.

3056, 306,...: What is «R»? What does the value mean?

The text reports the Pearson's correlation coefficient between the monthly averages of eBC derived from Julian day (treated as dependent variable) and the precipitation rate along back trajectories (treated as independent variable).To specify the meaning of r, the text was modified as follows:

> Monthly averages of eBC derived from Julian day weakly anticorrelated with the precipitation rate along back trajectories (r = -0.43), whilst the predicted eBC showed no link with BC emission variability (r = -0.11) (Fig. S4), indicating that scavenging efficiency had a stronger impact on eBC seasonality than emission variability. The anticorrelation (negative r value) indicate that an increase in precipitation rate was associated with a decrease in surface eBC concentration, as expected due to wet scavenging.

Tab 1 and 2: p-values printed but not explained in text -> interpretation needed

p-values indicate the ability of each explanatory variable to describe the time variability of the eBC concentration. At line 285, the manuscript was modified in order to explain the meaning of this parameter:

> "Table 1 reports the covariates selected for the cold season GAM, together with the deviance explained by the model after the addition of each variable, and the corresponding p-values. Low p-values indicate high significance of the relationship between ln(eBC) and the explanatory variable."

line 441-442: what is «r»? and what does it mean?

r is the Pearson's correlation coefficient between the model residual time series and the time series of the SLP anomalies over the investigated regions. To clarify the link of this paragraph with the previous one, we merged the two paragraphs and we modified the manuscript.

> "The ~~highest~~ ~~anticorrelation~~ lowest Pearson's correlation coefficient (r) between residual time series and SLP anomalies was observed in the region between 55° and 65° north and between 42° and 50° east (r=-0.21), while the ~~higher~~ highest correlation was reported for the region between 30° and 45° north and 10° and 22° west (r =0.19)."

Figures:

Fig 1b, c, 4, 5a, 6, 7, 9a, S3, S5 - S9: not refereed to in text

Reference to figure 1b and c was added to the main text in line 79:

> "Figure 1a shows the location of GAL, Ny-Ålesund village, and the CCT, while Fig. 1b and c report the wind rose during the cold and warm season, respectively".

Figure 4 and 5a are already introduced in section 3.3.1, in line 287 and 292, respectively. Reference to Figure 6 is in line 326 and 332, figure 7 in line 352, figure 9a in line 437, figure S3 in line 277, figure S5 in line 312, and figure S9 in line 430 and 433.

Fig: 1a: include Zeppelin Station on map, scale is missing, Maybe you can include a map of entire Svalbard (and maybe even Europe) to clarify the location of the sight?

We replaced figure 1a with the following figure that includes a map showing Svalbard location in the northern hemisphere, as well as a reference scale.

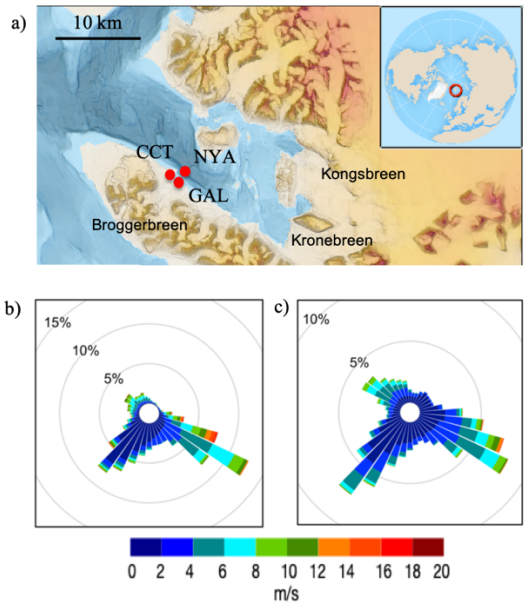


Fig 5b + Fig 6: move to section 3.3.2, where you talk about it.

Figure 6 is correctly located in section 3.3.1. The reviewer likely refer to Table 2, which has now been moved into section 3.3.2. Concerning Figure 5b, we prefer to keep it together with Figure 5a to better highlight the differences between the cold and the warm season. Nevertheless, to avoid misinterpretation of the two panels, we wrote on top of each panel the season it refers to.

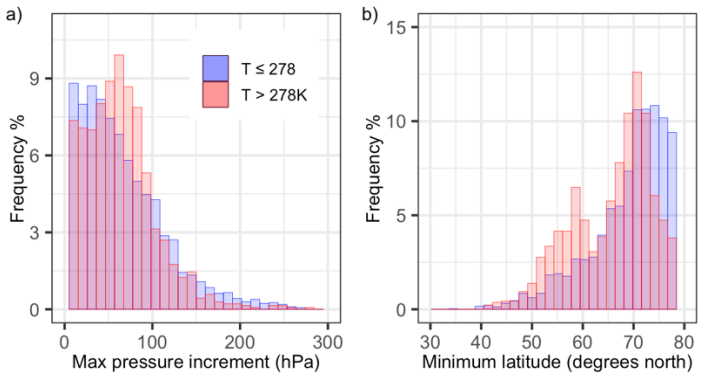
Figure 8: How many histograms are plotted? Is it 2 or 3?

Figure 8 reports two histograms. We added colored lines to the bars to make the plot clearer, and modified the figure's caption as follows:

> "Histograms reporting the frequency of back-trajectory maximum pressure increase during the last 48 hour before reaching GAL (panel a) and minimum latitude reached during the seven

days before reaching the observatory (panel b). Back-trajectory data of colder days are reported in blue, warmer days in red, while purple area corresponds to the overlapping region of the two histograms."

The revised figure is here reported.



The interpretation of many of the figures is too/very short

We agree with the referee that some of the figures were not appropriately described and explained in the main text. We modified the description of figures 8 to 10 as follows:

Figure 8.
"Higher temperature in the Arctic could be due to diabatic warming, adiabatic warming due to subsidence, or intrusion of air masses form lower latitudes (Papritz et al. 2020. The analysis of meteorological parameters during transport shows that only a limited number of back trajectories arriving at GAL during warmer days (average temperature higher than 278 K) experienced diabatic warming before arriving at the observatory (10%). Furthermore, we investigated adiabatic warming due to subsidence based on the maximum pressure increase experienced by the back trajectories during the last 2 days before reaching GAL (Binder et al., 2017). The frequency distribution of maximum pressure increment in Fig. 8a shows ~~We observed~~ a slightly higher ~~number~~ frequency of back trajectories undergoing a pressure increment between 50 and 100 hPa in warmer days compared to colder days ~~(Figure 8a).~~. The pressure change indicates the subsidence ~~indicating~~ ~~transport~~ from the lower free troposphere just before reaching the observatory. Finally, to study the intrusion of air masses from lower latitudes ~~lower than 70 degrees~~, the histograms in Fig. 8b reports the frequency distribution of the minimum latitudes reached by the back trajectories up to 7 days before arriving at GAL, as a function of the average daily temperature. The histogram comparison indicates that it was more likely that air masses originated from regions south of the 70th parallel ~~occurred more often~~ during warmer 62% of the time) than colder days (40% of the time) ~~(Figure 8b)~~. To further validate these results, Fig. S7a…"

Figure 9.
"To test the impact of potential unaccounted synoptic-scale circulation pattern in the cold period, we calculated the average cold season SLP map from 30 to 90 degrees north, we calculated the SLP anomalies (the difference between each daily map and the cold period average map), and finally we investigated the correlation between the anomaly time series in each cell and the time series of the GAM model residuals (the differences between the measured eBC concentration and the eBC simulated by the cold season model). Figure 9 reports the map of the Pearsons' correlation coefficients and shows that ~~calculated the correlation of the SLP anomalies during the cold season with the residuals GAM model (Fig. 9a).~~ higher residuals

were associated with low pressure anomalies over Scandinavia and western Russia and ~~a~~ high pressure anomalies over the Atlantic Ocean, between Spain and the Azores."

Figure 10.
"To investigate GAM model performance, Fig. ~~Figures~~ 10a and b report the scatter plots of modelled versus observed concentration during the two seasons. Most of the points were close to the 1-to-1 line and the fraction of data with a modelled to observed eBC ratio between 0.5 and 2 (Chang et al. 2004) was equal to 72% and 71% in the cold and the warm period, respectively. GAM models underpredicted eBC ~~concentration~~ during both seasons for concentrations larger than 50 ng m^{-3}, likely due to the difficulties the model has to describe the behaviour of an under-represented eBC concentration range. In fact, eBC daily average was larger than 50 ng m^{-3} only during 9% and 1% of the time in the cold and warm season, respectively. Figure 10c shows that overall, the model reproduces well the observed seasonal and interannual variability of the monthly eBC averages ~~(Fig. 10c)~~."

Text:

Julian date is a clear defined date and counts all dates after 1.1.4713 BC. Please use other name for time of your measurement period to avoid miss-understandings.

We would like to thank the referee for pointing out this inconsistency. We decided to use the truncated Julian Date convention introduced by NASA in 1979, which uses as reference time May 24, 1968. We updated the definition of the Jul variable in the "Generalized Additive Model" as follows, and we updated the x-axis range in panels a of figure 4 and 7.

"In addition, we included day of the year (DOY) and Truncated Julian Day (Jul or continuous day count from May 24, 1968) among the investigated variables to take into account all processes that could not be explained by local meteorological variables or circulation indices, such as seasonal and annual variability of emissions and removal processes during transport. DOY ranged between 1 and 366, while Jul varied between 18178 and 19579. In the following section, for simplicity, Truncated Julian Day will be indicate as Julian Day."

line 80f: In which height was the wind measurements performed?

Wind height measurement is now specified in Figure 1 caption:

"Map of the Kongsfjorden area (a) indicating the position of the Gruvebadet Atmospheric Laboratory (GAL), the Climate Change Tower (CCT), and Ny- Ålesund village (NYA); wind rose for the cold (b) (November - April) and warm (c) (May - October) season derived from the CCT wind measurements performed at 2 m from the ground.
Map from https://toposvalbard.npolar.no,courtesyoftheNorskPolarinstitutt."

Does Fig. 1C already show the selected wind data?

Figure 1c reports all the available data, to clarify that only a limited number of hours were characterized by wind direction from the village.

For some URLs the term «last visited» is missing

The time of more recent visit of the websites had been added, where missing.

l. 219: You write about DOY, but it is not shown in table 1 or fig. 4

DOY is not reported in Table 1 nor Figure 4 because it was not selected during the definition of the GAM multivariate model, according to the criteria described in section 2.6. To avid misunderstanding, lines 290-292 were modified as follows:

> "Although DOY was the second variable with the highest deviance explained in the univariate models (16%), it was not ~~added to the GAM in following selection steps~~ selected as explanatory variable during the multivariate model definition (section 2.6), indicating that Julian day already accounted for the seasonal variability that would have been described by the DOY."

Section 3.3 is quite hard to read, because it is not all the time clear, to which figure you refer. When you talk about a new variable, could you please also mention which sub-figure you now analyze?

To improve figure 4 and 6 readability, a reference to the panels is now reported at the beginning of each paragraph describing the behavior of the explanatory variables.

410: See https://doi.org/10.3390/rs14153771 : There is a downward mixing due to a turbulent wind shear zone in Kongsfjorde

We would like to thank the referee for pointing out this publication, that shows how East-southeast wind direction is associated with downward mixing of air masses in the Kongsfjord. We added a reference to this study in line 410.

Answer to referee #2

The manuscript titled "Drivers controlling black carbon temporal variability in the Arctic lower troposphere" by Gilardoni et al. investigates the seasonality and meteorological influences on black carbon (BC) concentration in the Svalbard region through a combination of modeling and observational measurements. It is found that wet scavenging plays a large role in modulating seasonal variability and that circulation, from a boundary layer to synoptic scale, impacts the shorter-term BC variability. The paper has significant potential to increase understanding on Arctic BC concentration and its controlling factors.

Overall, the manuscript is well-written, with the knowledge gap and scientific objective of the manuscript clearly laid out. The paper flows well and is organized in a way that distinctly addresses each objective. However, there are several areas throughout the paper that are unclear or lack necessary supporting information. These issues should be addressed to improve the clarity and strengthen the claims of the manuscript. Following minor revisions, I recommend publication.

The authors would like to thank the referee for the appreciation of the manuscript and for the constructive suggestions. We updated the figures and tables, as suggested, and we modified the text to add supporting information that better clarify the methodology we adopted and the result interpretation. We also moved one paragraph of the manuscript (result section) into the supplementary section to improve text readability, as suggested. For clarity, comments from the referees are reported in blue, answers from the authors are in black, while changes in the original text are reported in red.

General Comments

The manuscript is strongly based on the idea that there are two periods (cold and warm seasons) with different responses in each period. The data were separated into these two chosen periods, November- April and May-October, before any analysis or underlying trends were observed. What is the basis for the selection of the month range for each period? There is little discussion in the manuscript that gives support and explanation for the reason why the data were separated in this way. Is this cold season of November-April and warm season of May-October similarly used to subset data in this region in previous publications? If so, please include references and brief discussion in the introduction or methods. If not, was this based on analysis of measurements? For example, if it is based on average temperature (or some other variable) and there are clear differences between the two periods, then it would be useful to include a discussion (perhaps in the methods or supplement) on how and why these two periods are distinguished. I understand that the goal is to investigate seasonal variability, but why was it chosen to separate the data into two periods rather than say four? The manuscript would benefit from further clarification and support on this subject.

We would like to thank the referee for this comments and we agree that the separation of the study period in two seasons is explained with limited details in the original manuscript. The identification of a warm and a cold period is based on previously published analysis of eBC variability at Zeppelin (Eleftheriadis et al., 2009, Stathopoulos et al. 2021), at about 1 km from the Gruvebadet Atmospheric Laboratory (GAL). eBC showed significantly different source regions during the two periods, defined as cold season from November to April and warm season from May to October. Furthermore, Stathopoulos et al. (2021), showed that large scale circulation patterns that impact the pollutant transport from lower latitudes (NAO, OA, and SCAN) are characterized by opposite behaviors during this two periods of the year.

Although eBC during transition months might not be well captured using a simplified seasonality composed by only two periods, introducing a larger number of seasons would have led to smaller seasonal datasets with limited representativeness.

The "Generalized additive Model" paragraph in the section method was modified as follows:

> "We built two different GAMs to describe eBC concentration observed during the cold (November - April) and the warm (May - October) periods, assuming that different mechanisms might control pollution variability. This assumption is corroborated by the fact that eBC observed at Zeppelin (at about 1 km from GAL) is characterized by significantly different source regions during the warm and cold season, as defined above (Eleftheriadis et al. 2009; Stathopoulos et al. 2021). Furthermore, Stathopoulos et al. (2021), highlights that large scale circulation patterns that impact the pollutant transport from lower latitudes (NAO, OA, and SCAN) shows opposite behaviors during these two periods of the year."

Specific Comments

Line 37: This paragraph appears to be contradictory and the key point is unclear. The first sentence states that overestimation of BC scavenging may cause BC model underestimation. The following two sentences agree with this first statement. However, the last statement suggests the opposite by stating that models tended to underestimate rather than overestimate BC scavenging. Is this sentence supposed to say that models underestimate *BC* in agreement with the first sentence or underestimate *BC scavenging* which opposes the first sentence? If this last sentence is supposed to contradict the previous sentences, then it should be placed in another paragraph with further discussion on the opposing point. Alternatively, with more emphasis that there are contrasting results in the literature they can be placed in the same paragraph. Please clarify on the key point of this paragraph.

We thank the referee for pointing out the ambiguity of this section and we removed the last sentence, which is misleading in this context. We also added a reference specific to BC scavenging modeling parametrization at global scale and in the Arctic, citing the paper from Lund et al., 2018 and Lund et al., 2017.

> "The overestimation of BC scavenging in polar regions, where ice-clouds are dominating, has been proposed as one of the factors responsible for BC model underestimation. Browse et al. (2012) enhanced the model ability to describe BC Arctic seasonality optimising the in-cloud and below cloud scavenging scheme. Zhou et al. (2012) improved the agreement between modelled and observed BC deposition by reducing scavenging in ice and in mixed-phase clouds, but still failed in reproducing the atmospheric concentrations. ~~Furthermore, recent studies indicate that BC atmospheric lifetime is shorter than previously expected (Samset et al. 2014, Lund et al. 2018, Wang et al. 2014, Matsui et al. 2018), indicating that models tended to underestimate rather than overestimate BC scavenging (Lund et al. 2018).~~ Lund et al. (2018) observed that reducing the ice-cloud scavenging significantly increased the BC surface concentration in the Arctic, but declined model performance at lower latitudes, highlighting the need of a deeper understanding of processes and properties controlling BC scavenging (Lund et al., 2017)."

Line 236: The second paragraph of Section 3.2 on the BC MAC reported in literature and the determination of the value used in this paper does not seem vital to this section or the main manuscript. By moving this discussion to the supplement, it would aid in flow and readability of the manuscript and better highlight only the necessary key points of the results. Additionally, there are

several literature values listed throughout this paragraph which makes it hard remember each in order to place the 10.2 m^2g^{-1} in context of the literature. It could be beneficial to summarize all values in a figure. This way, it would be easier to visualize where the 10.2 m^2g^{-1} used in this manuscript falls in comparison to previous literature.

We thank the referee for the suggestion. Accordingly, we modified the first paragraph of section 3.2 as follows:

> "eBC was then derived from the absorption coefficient time series at 660 nm, assuming a constant Mass Absorption Cross section (MAC) equal to 10.2 m^2g^{-1}, in agreement with the MAC calculated by Ohata et al. (2021) with instrument techniques similar the to ones employed in this study (See section S1 and Table S1)."

We then moved the comparison of MAC values reported in the second paragraph to the supplementary material, where we summarized the MAC values in a Table (Table S1).

Table S1. MAC values reported from previous studies in the Arctic region.

MAC at 550nm	Notes	Reference
7.5 m^2g^{-1}	Freshly emitted BC	Bond and Bengstrom, 2006
8.8 – 10.5 m^2g^{-1}	Arctic	Zanatta et al. 2016
9.8 m^2g^{-1}	Svalbard (spring)	Zanatta et al. 2018
5 – 9 m^2g^{-1}	Alert (3 year data)	Sharma et al., 2017
10.8 – 15.1 m^2g^{-1}	Arctic	Ohata et al. 2021

References have been added to the supplementary material.

Line 272: "the largest difference was observed in July 2020, when eBC concentration was...". It is unclear whether "eBC concentration" here is referring to the mean or median value. I assume it is the mean value, but it would be useful to specify.

The sentence has been rephrased as follows:

> "During the warm period, the largest difference was observed in July 2020, when the mean eBC concentration was higher compared to the same months of the remaining analyzed years."

Table 2: Do none of the variables in the table have statistical significance greater than 99%? In the caption it is stated that this is marked with two asterisks (**), but (**) never appears in the table. Please remove this description if it is unused, and/or verify that none of the variables mistakenly have one (*) or three (***) asterisks instead of two (**).

We thanks the referee for pointing out this inconsistency. We modified the Table and Table caption as reported below:

Table 2. As in Table 1, but for the warm season. The p-values are indicative of each variable statistical significance (** corresponds to significance larger than 99.9% and * larger than 95%).

Warm season	Dev. Explained	p-value
Julian Day (Jul)	0.13	$<2\ 10^{-16}$ **
Day of the Year (DOY)	0.22	$<2\ 10^{-16}$ **
Temperature (Temp)	0.32	$<2\ 10^{-16}$ **
Relative Humidity (RH)	0.36	$7.21\ 10^{-5}$ **
Radiation (Rad)	0.40	$4.59\ 10^{-2}$ *
BLH	0.43	$3.45\ 10^{-5}$ **
AO	0.46	$1.38\ 10^{-2}$ *

Line 380: It is hard to tell from Figure S7 that colder temperatures corresponded to airmasses that spend more time over the Arctic Ocean and Greenland coasts. There is hardly noticeable difference between Figure S7b and S7d. I suggest reproducing this figure by plotting a contour map of the difference of Figures S7b and S7d. This would clearly show the locations of greatest difference and perhaps more strongly support this claim. Otherwise, I suggest removing this statement.

We agree with the referee that the difference between panel b and d is difficult to capture. We modified Figure S7 adding an additional panel showing the difference between the residence probability maps to support the statement that colder temperatures corresponded to airmasses that spend more time over the Arctic Ocean and Greenland coasts.

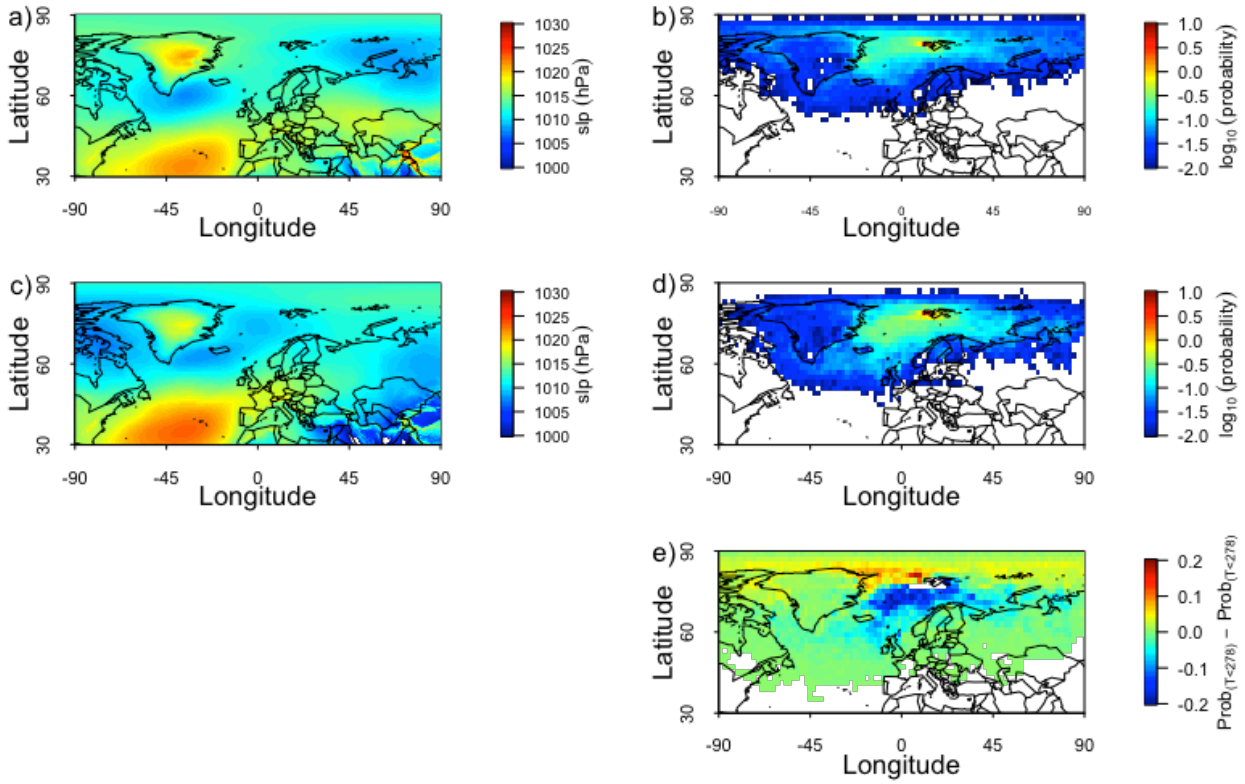


Figure S7. Average sea level pressure maps and residence time probability maps when the temperature at GAL was lower (panel a and c) and higher (panel b and d) than 278 K during the warm season; panel e shows the probability difference map between colder and warmer days (panel b – panel d). Residence 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.

Line 395: This paragraph is lacking support for the reason why eBC increases with increasing radiation. Is the statement "Low-level clouds are usually associated with rain and drizzle, with the later [sic] one not well captured by cumulative daily precipitation measurements" based on previous literature or based on measurements analyzed in this study? Please include supporting references for this statement and/or add further discussion of the analysis that led to this statement.

Cumulative precipitation daily data were derived from hourly precipitation values. Hourly precipitation measurements are usually affected by large error when drizzle and light-precipitation dominates, due to the small precipitation rates (<0.5 mm h^{-1}) (Nystuen et al., 1999). This references were added to the manuscript and the sentence was corrected as follows:

> "Low-level clouds are usually associated with rain and drizzle, with the latter one not well captured by cumulative hourly ~~daily~~ precipitation measurements (Nystuen et al. 1999)."

Figure S6: It is hard to visualize how the winds are changing (which is a relevant point discussed in the manuscript) with a different axis range in each plot. Please use the same fixed axis range for all plots to be able to compare and contrast the plots with each other more easily.

We modified the scale of the wind rose plot in order to use the same range for all the panels.

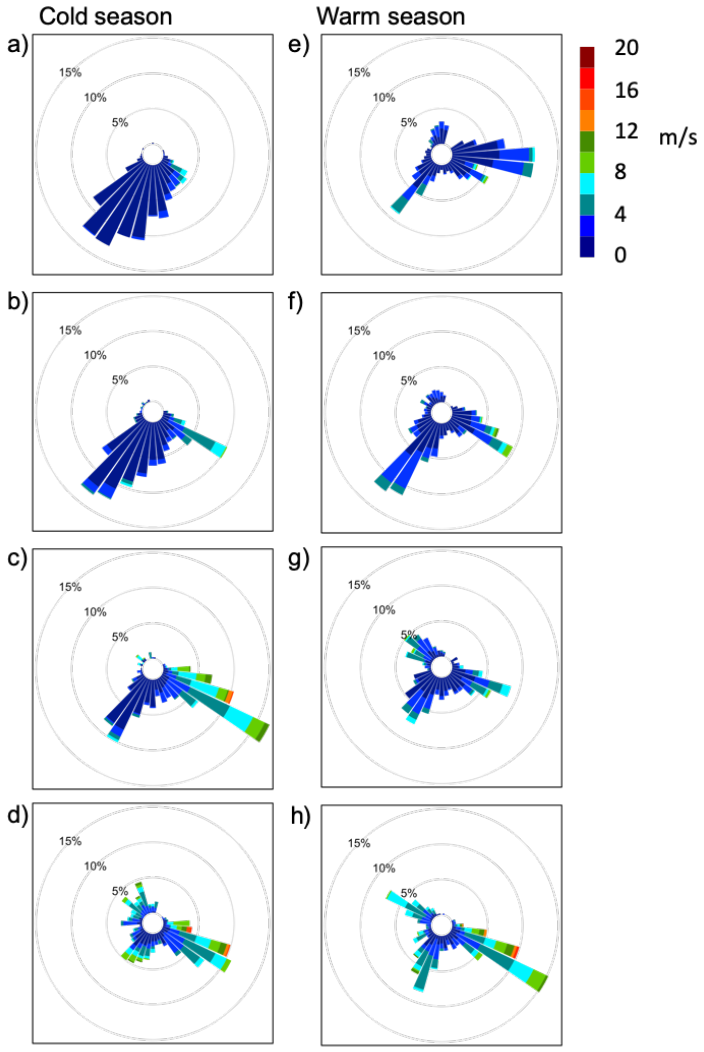


Figure S6. Wind roses describing main wind pattern at GAL during the cold (a-d) and the warm season(e-h) when blh was below 100 m (a and e), between 100 and 200 m (b and f), between 200 and 400 m (c and g), and between 400 and 600 m (d and h).

Figure S8: Are the vertical lines extending to the 25th and 75th percentiles or standard deviation? Is the thick line the median or mean? Please clarify in the caption/description.

Figure S8 caption was modified to specify the meaning of the continuous lines and the vertical lines:

> "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%. Continuous lines indicate mean values, while vertical lines correspond to standard deviation."

Several small grammatical issues are listed below, please address them for clarity and ease of reading:

- Line 38: Add "the" so that it reads "optimizing the in-cloud and..."

Corrected

- Line 52: The word "challenging" appears in the wrong place in the sentence. It should read "Both these factors make the quantification of biomass burning impact on the Arctic lower troposphere challenging" or "Both these factors make it challenging to quantify the biomass burning impact on the Arctic lower troposphere".

The sentence was modified according to the suggestion

- Line 119: Replace "to" with "with".

"To" was replaced.

- Line 296: Change "increased" to "increase" (or remove "of").

The sentence was corrected

- Line 298: "investigates" should be "investigate".

The verb was corrected

- Line 316: "pressire" should be "pressure".

The word pressure was corrected

- Line 325: This sentence is unclear. It seems it should read as "air masses reaching Svalbard spent most of the time over the ocean", or "air masses reached Svalbard after spending most of the time over the ocean".

The sentence was corrected adding the word "after"

- Line 339: Missing "Å". Should be "Ny- Ålesund".

The name of the village was corrected

- Line 357: This sentence should be either plural or singular (not both). It should read as either "indicates a larger interannual difference" or "indicates larger interannual differences".

The sentence was corrected in the plural form

- Line 374: Change "increased" to "increase".

The word was changed

- Line 396: Add "than" so that it reads "to more than 100...".

The word "than" was added

- Line 400: Change "later" to "latter".

The spelling was corrected.