

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-637

Anonymous Referee #2

Referee comment on "Long-range transported continental aerosol in the eastern North Atlantic: three multiday event regimes influence cloud condensation nuclei" by Francesca Gallo et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-637-RC2>, 2022

Gallo et al. studied the influence of aerosol transport events on routine aerosol properties at the ENA marine background site. Using the data collected in 2017, nine multi-day events were identified and grouped according to their air origin and aerosol physical/optical properties. These events had a profound influence on the cloud condensation nuclei properties by increasing their concentration. The manuscript is well written and most of the analysis are sound and solid. However, the manuscript reads more like an ACP measurement report as not much new is brought to the table. The authors could try making a stronger case e.g. by adding more statistics (maybe even further data/years) and/or by adding a more detailed discussion on the difference to previous studies and this data can be used (e.g. for model improvements or validation exercises). Furthermore, some important technical details are currently missing and should be added to the revised version. I recommend major revisions.

Detailed comments are given below.

Page 2, line 4-8: The last two sentences in the abstract should be revised since they are difficult to understand. Maybe add the percentages to the different transport types. What do you mean by the last sentence? How will this be possible without detailed knowledge of the chemical composition?

Page 3, End of Sect 1: One way to improve the manuscript could be to specifically state the research questions here. What are you trying to find out? And how does this lead to an advancement? Why is it important?

Section 2: Although many studies have been published using the aerosol data from ENA, it

is still needed to describe a few technical details on the sampling and your 2017 data:

- What kind of inlet was used (with or w/o size cut)?
- Was the inlet heated?
- What was the average RH before the aerosol instrumentation?
- What was the average RH for the dry diameter (first DMA in the HTDMA)?
- How and how often were the CCNC and HTDMA calibrated?
- Where the scattering coefficients corrected for truncation and illumination errors?
- Are the values given at ambient pressure or corrected to STP?
- How much data was removed and how complete is the entire 2017 dataset? Maybe add a table to the SI.

Page 4, line 8: I would remove the word "optical". Although the CPC detects optically the individual particles, the lower cut-off diameter is determined by the settings and technical details of the CPC (e.g. reached supersaturation).

Page 5, line 29: GDSA -> GDAS

Page 7, line 18: Since the phytoplankton activity is low, are the oxygenated gas-phase organic compounds of marine or transported origin?

Page 7, line 35: The last value should be at 0.2% SS, correct?

Page 7, line 37: Strictly spoken you did not observe a "reduced biological activity" but rather lower number concentration. Suggest to re-phrase this sentence.

Page 8, line 21 (and also later in the text and table): Artic -> Arctic

Page 9, line 9: Suggest to round all kappa-values to 2 digits after the comma.

Page 12, line 6: Please add a reference or toolkit used for Tukey-Kramer test.

Page 12, line 17: Besides gravitational settling, it is probably also due to wet scavenging that coarse mode particles are removed.

Table 2: Why aren't the kappa-values included here? This would be very useful as well.

Table 3: burining -> burning

Sect. 4, last sentence: Why is that algorithm needed (if the site continuously measured CCN concentrations)? The reader is left a bit alone on why this is needed and could be important.

The conclusions and abstract read both more like a summary and could be shortened.

The font size of the axis of Figure 2, 3 and 8 are too small. Please increase (to match the caption font size). Especially Figure 7 is really hard to read.

Figure 2: Add "technical limitations of the" before "UHSAS"

Figure 3: It is a bit difficult to see the activated fraction. Could you maybe change the color and connect the open circles with a line?

Figure 4 to 6: It is really difficult to see any details of the CALIPSO trajectory (especially in Fig 4). What do you actually like to show with these images? Maybe move them to the SI?