

Interactive comment on “Identifying a regional aerosol baseline in the Eastern North Atlantic using collocated measurements and a mathematical algorithm to mask high submicron number concentration aerosol events” by Francesca Gallo et al.

Anonymous Referee #2

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This manuscript developed an algorithm (ENA aerosol mask) to identify local emissions in two remote sites with high time resolution particle number concentration data. This algorithm can be useful for other measurements in remote locations but it is not easy for other studies to apply it due to the lack of parameterization tests in the current manuscript. Since the aerosol mask the key point of this manuscript, I recommend the authors to re-organize it so that it can be easier for other researchers to follow and thus achieve a higher impact.

The goal of this study is to filter high-frequency, high-intensity signals statistically. It is only reachable when natural sources are significantly less variable and lower in intensity. Even when that is true, all algorithms will inevitably balance the trade-off between losing real natural variability and including more local anthropogenic influences. The discussion about this trade-off in this manuscript is not very systematic or vigorous. It seems that this method is working well with the dataset but I am not very convinced that the final parameterizations are optimal in this study. See specific comments below:

1. It did not try to compare to other pre-existing methods for this problem, for example, the smoothing methods that can remove the spikes? (Liu et. al. 2018, Velle 1977 and Goring 2002)

Liu, Jun, et al. "High summertime aerosol organic functional group concentrations from marine and seabird sources at Ross Island, Antarctica, during AWARE." *Atmospheric Chemistry & Physics* 18 (2018): 8571-8587.

Goring, D. G. and Nikora, V. I.: Despiking acoustic Doppler velocimeter data, *J. Hydraul. Eng.-ASCE*, 128, 117–126, [https://doi.org/10.1061/\(asce\)0733-9429\(2002\)128:1\(117\),2002](https://doi.org/10.1061/(asce)0733-9429(2002)128:1(117),2002).

Velleman, P. F.: Robust nonlinear data smoothers – definitions and recommendations, *P. Natl. Acad. Sci. USA*, 74, 434–436, <https://doi.org/10.1073/pnas.74.2.434, 1977>

2. Parameterizations of σ_b and alpha need to be improved. Page 7, Line 6: "We determined the standard deviation of the data below the median (σ_b) of N_{tot} for each of the two one-month periods." This sounds arbitrary and needs explanation. Is two months the result of a sensitivity check? Is it related to the time resolution of N_{tot} ? I suppose the moving medians are used here for all the data points? Why below-median, not another percentile?

The authors only tested four scenarios in Table 1. Can the authors do a sensitivity test with more data points?

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3. The wind direction, wind speed, and size distribution sections are long and not necessarily related to the aerosol mask. Consider shorten them or move part of them to the supplement.

I will support its publication if the authors can address my comments.

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