

# ***Interactive comment on* “From a polar to a marine environment: has the changing Arctic led to a shift in aerosol light scattering properties?” by Dominic Heslin-Rees et al.**

## **Anonymous Referee #2**

Received and published: 7 August 2020

### GENERAL

The paper presents an 18-yr data record of aerosol optical properties measured at the Zeppelin observatory in Svalbard. The optical properties discussed in the paper are total scattering coefficient, backscattering coefficient, their ratio and the wavelength dependency of scattering. The data are analysed especially to find trends and to interpret these. The trends are analysed using statistical methods that yield more or less similar results. For the interpretation also transport analyses were conducted using the HYSPLIT model. The observed trend is obviously towards more marine aerosol. The authors show that changes in air mass circulation patterns are the main

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factor responsible for the trend, not the decrease of Arctic sea ice. This is an important result and should be published.

The only thing that slightly puzzles me is year 2001. Fig 1 shows that both the backscatter fractions and scattering Ångström exponents are clearly higher than before or after it, it looks like an outlier. What is special in 2001? Is there any possibility of a technical explanation? Inlet issue, instrument issue or similar? Or forest fires from Siberia? They emit small particles. If you omitted 2001, how would the trends, their statistical significance, and conclusions look like?

Answering that and the small editing suggestions – not requirements – I present below are enough for publishing the paper in ACP.

#### DETAILED COMMENTS

Lines 57-73 present equations that are somewhat an outlier in the introduction. Those lines would much more logically belong to section 2.4. Think about moving them. I don't require that, though, but the move would make the introduction more fluent.

Table 1. In the caption it is written " All optical values are given for the 550 nm wavelength." But there are only two optical properties, scattering coefficient and Ångström exponent and Ångström exponent is not at 550 nm. Reword.

Tables in the supplement Table S1, in the caption it is written "Decreasing (D) and increasing (I) statistically significant trends are signified." But there are no decreasing trends in the table. Consider rewording. Analogous comment for Tables S2-S4.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-521>, 2020.

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