

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-94

Anonymous Referee #1

Referee comment on "Differentiation of coarse-mode anthropogenic, marine and dust particles in the High Arctic islands of Svalbard" by Congbo Song et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-94-RC1>, 2021

Comments:

This manuscript describes a cluster analysis of approximately five years (from 2015 to 2019) aerodynamic volume size distribution with diameter ranging from 0.5 to 20 μm at the Gruebadet Observatory in the High Arctic Islands of Svalbard. Furthermore, the aerosol size distributions are complemented by aerosol chemical composition data. This work clearly distinguished the Arctic coarse-mode aerosols originated from anthropogenic sources (related to Arctic Haze) and from natural sources (related to open ocean and mineral dust). This result is an important and really interesting conclusions that has not been made in the past, because most of the previous studies have been only focused on investigating number size distributions of particles smaller than 1 μm , which measured by SMPS system. Overall, this manuscript is well written, and presents the main conclusion obviously. I support publication in ACP once the following issues can be addressed.

Minor comments:

Page 10 and Line 261: The present study suggests that the size distribution of C3 is associated with sea aerosol coming from the ocean. Typically, sea spray aerosol is generated *via* bubble-bursting processes under sufficient wind speed conditions. At wind speeds greater than approximately 5 m s^{-1} , breaking waves are formed on ocean surface. In this study, Fig. A4 shows density distribution of the wind speeds for the C3. However, it seems that wind speeds for C3 is not enough to produce the sea spray aerosol.

Please also note the supplement to this comment:

<https://acp.copernicus.org/preprints/acp-2021-94/acp-2021-94-RC1-supplement.pdf>