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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Effects of mixing state on optical and radiative properties of black carbon in the European Arctic" *by* Marco Zanatta et al.

Anonymous Referee #1

Received and published: 18 June 2018

Zanatta et al. present measurements and analysis of aerosol optical properties from a ground site on Svalbard Island during the springtime arctic haze period. The measurements and analysis presented focus on the black carbon component of the aerosol, but also include scattering and AOD measurements. Agreement between the SP2 and COSMOS black carbon mass concentration measurements is demonstrated. The MACs observed are higher than expected for bare BC, but the authors show that is can be explained by coating enhancement of BC absorption which is modeled with Mie theory. It is advantageous that the BC is heavily coated which allows the assumption of a spherical core/shell morphology.

The measured optical properties are extrapolated to 1 km height and used along with the AOD in a radiative transfer calculation to determine the radiative forcing of the arctic

haze. The radiative transfer calculation show the sensitivity to the MAC and coating enhancement of the absorbing aerosol.

The topic is appropriate for ACP, and the manuscript is well written and clearly structured. I recommend it for publication.

Technical Issues:

Page 4, line 43: Could you state or summarize the uncertainties in coating thickness.

Page 5, line 44: replace '90 degrees angle' with 'a 90 degree angle'

Page 6, line 29: PMOD/WRC is not defined in the text.

Page 7, line 21: Why is the RI used for the BC core not consistent with the RI used in the analysis of the SP2 data?

Page 8, line 36: replace 'coherent with' with 'consistent with' or 'similar to'

Page 12, line 20: Please give references for the range of BC AAE.

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