Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-277-RC3, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "One year of aerosol refractive index measurement from a coastal Antarctic site" *by* Z. Jurányi and R. Weller

Anonymous Referee #3

Received and published: 5 August 2019

GENERAL REMARKS

The study presented in the manuscript investigates the complex index of refraction for aerosol sampled at a coastal Antarctic site. The period covered by this study spans a full annual cycle. The experiment and the analyses are very carefully conducted, given the difficult situation at the sampling site with very limited access to, e.g., reference materials for instrument calibration and aerosol laboratory equipment. Overall, the study is scientifically sound and makes a significant contribution to the research field of aerosol impacts on climate. The manuscript is well organized and fits very well into the scope of the journal.

My main concern is discussed below in the specific comments. Furthermore, before publication the language requires careful inspection. Then, few minor revisions need

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to be considered which are listed below. In my report below I focus on the issues not yet mentioned by the other referees.

SPECIFIC COMMENTS

The authors report on aerosol refractive index observations but never mentioned that the index of refraction is a complex number. Particularly, the imaginary part of the refractive index constitutes the light-absorbing properties of the sampled aerosol. As Weller et al. (2013) reported, there is a small but significant fraction of lights-absorbing material contained in the aerosol in Antarctica. However, the authors never refer to this observation in a quantitative manner, nor they stated the assumption of a zero imaginary part of the refractive index. Furthermore, the scattering cross-section as calculated by Mie or Rayleigh-Debye-Gans theories depends on the square of the complex refractive index which includes the imaginary part.

I request a discussion of the uncertainties in calculating the real part of the refractive index, when neglecting the imaginary part. The effect may be small but it should be mentioned since the imaginary part plays a crucial role in the aerosol radiation interaction.

MINOR ISSUES

Figure 3: I assume that the dashed green line refers to the LAS uncorrected best fit, please add.

Figure 10: I propose to specify LAS original as LAS (m = 1.59); the term “original” suggests that data were modified, which is, however, not the case.

When reporting on the black carbon mass concentration determined by the MAAP, the authors should use the today accepted terminology of “equivalent black carbon” (eBC); see Petzold et al. (2013).

REFEENCES

Petzold, A., Ogren, J. A., Fiebig, M., Laj, P., Li, S.-M., Baltensperger, U., Holzer-Popp, T., Kinne, S., Pappalardo, G., Sugimoto, N., Wehrli, C., Wiedensohler, A., and Zhang, X.-Y.: Recommendations for reporting "black carbon" measurements, Atmos. Chem. Phys., 13, 8365–8379, doi: 10.5194/acp-13-8365-2013, 2013.

Weller, R., Minikin, A., Petzold, A., Wagenbach, D., and König-Langlo, G.: Characterization of long-term and seasonal variations of black carbon (BC) concentrations at Neumayer, Antarctica, Atmos. Chem. Phys., 13, 1579-1590, doi: 10.5194/acp-13-1579-2013, 2013.

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