

Interactive comment on “Aerosol size distributions during the Atmospheric Tomography (ATom) mission: methods, uncertainties, and data products” by Charles A. Brock et al.

Anonymous Referee #2

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GENERAL COMMENT

The manuscript describes with large richness of detail the methods applied for obtaining particle size distributions from the aerosol instrumentation deployed during ATom 1 to 4 on the DC-8, including the uncertainties associated to the parameters and derived data products, such as the aerosol scattering coefficient or the aerosol mass concentration. The applied methods and associated uncertainties are described very carefully, whereas in-depth intercomparisons between different instruments and, wherever appropriate, between instrument parameters and data products demonstrate the

C1

high data quality of the ATom data set. The manuscript will serve as the reference document for any scientific analysis based on the ATom aerosol data set. It is therefore of high relevance for the scientific community and will set a standard for future research campaigns using instrument combinations.

The manuscript fits perfectly into the scope of AMT. It is clearly structured, well organized and very well written. Only technical corrections are required before the manuscript is acceptable for publication in AMT.

MINOR COMMENTS

1. Page 2, line 6: the authors refer sometimes to “the paper”, sometimes to “the manuscript”. I suggest using “the manuscript” throughout the text.
2. In the abstract, the authors specify the range of particle measurements from 2.7 nm to 4.8 diameter (page 1, line 18), whereas in the instrumentation section they specify the range as from 3 nm to 930 μm diameter (page 2, line 17). These different ranges are caused by instrument specificities, but later in the manuscript the authors never used the range from 4.8 μm and larger. It might be worthwhile to state this in the abstract.
3. On page 3, line 9, the authors may add “this refractive index range ‘of the atmospheric aerosol’ ”.
4. On page 4, line 26, there is a typo “located ‘aft’ of the UH/LARGE inlet.” Please correct.
5. On page 5, line 5, the authors introduce filter samples collected during the flight which were used for post-flight chemical analyses. Please state the sampling time and the resulting spatial resolution.
6. On page 6, line 15ff, the authors mention briefly the flow through the CAPS instrument and refer to Spanu et al. (2019) for the flow-induced errors in aerosol. Compared to the detailed discussion of the other instruments’ uncertainties, a few more details

C2

would be good. In particular, how does the analysis of corrections published by Spanu et al. (2019) compare to the recently published detailed study on the thermodynamic correction of particle concentrations measured by underwing probes on fast-flying aircraft (Weigel et al., 2016)?

7. On page 11, line 32, there is an erroneous line break inserted.

8. In Fig. 1, neither the track for Atom-4 is shown nor is an explanation given why this is not the case. Please specify.

9. In Fig. 7, the y-axis title is missing for the left panel.

10. In Fig. 10, the title of the y-axis is too close to the axis labels for both panels.

REFERENCES

Spanu, A., Dollner, M., Gasteiger, J., Bui, T. P., and Weinzierl, B.: Flow-induced errors in airborne in-situ measurements of aerosols and clouds, 2019, 1-46, doi: 10.5194/amt-2019-27, 2019.

Weigel, R., Spichtinger, P., Mahnke, C., Klingebiel, M., Afchine, A., Petzold, A., Krämer, M., Costa, A., Molleker, S., Reutter, P., Szakall, M., Port, M., Grulich, L., Jurkat, T., Minikin, A., and Borrmann, S.: Thermodynamic correction of particle concentrations measured by underwing probes on fast-flying aircraft, *Atmos. Meas. Tech.*, 9, 5135-5162, doi: 10.5194/amt-9-5135-2016, 2016.

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2019-44, 2019.