

Interactive comment on “Single Particle Soot Photometer intercomparison at the AIDA chamber” by M. Laborde et al.

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The manuscript describes results from an inter-comparison of several single particle soot photometers (SP2s) at the AIDA chamber facility. The instruments sampled a variety of BC types and the observed properties of BC measured by the SP2 including number and mass concentrations, size distributions, and mixing state/coating properties were compared. The large number of SP2 instruments now active in the research community justifies a comparison of multiple instruments to determine the consistency of their measurements and the topic is clearly in the scope of AMT. The manuscript is well organized and written. I would recommend publication once the following comments have been addressed.

General

One of the main things that seems to be missing from the manuscript is a table summarizing the key statistical parameters describing the overall agreement of the instruments in the major categories (number concentration, mass concentration, size and coating/mixing state). In addition, more description of how the authors decided on the +/- XX % values reported in the manuscript is also needed. It isn't really clear where these values come from (they appear to be the range of minimum and maximum values) but in some cases there are clearly points outside this range (e.g., Fig. 7). Since the comparison of the SP2 outputs is a major focus of the paper, these numbers need to be defined more rigorously and summarized in a table. Right now they seem more like "ball park" estimates of the agreement.

The abstract should state that the comparison values result from an analysis using a single analysis software package. Figure S1 shows good agreement between the results from two different software packages but I think it should be emphasized more strongly somewhere in the manuscript that the agreement seen here does not account to additional variability in output data that could result from differences in the analysis routines as well as potentially subjective choices for particle filtering made by different users. It might be helpful to quantify the lower detection limit of the SP2s tested in this study using a D50 type approach, where the lower detection limit is set to the mass at which 50% of the particles are detected. This is a common metric for specifying size ranges of impactors and would be a good way to quickly summarize the different lower limits as well as their variability from instrument to instrument.

The comparisons to non-SP2 techniques should either be described in more detail or else omitted. Additional information on the size range of aerosol sampled by the optical and OC/EC instruments needs to be given and the discussion expanded. For example, in current form it is difficult to evaluate the large MAC observed for the CAST soot referred to in section 4.3. Some of this difference is likely due to the contributions by particles outside of the SP2 size range. Comparisons of the SP2 to other BC and EC

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measurement methods are needed, but given that the focus of the manuscript is on an inter-comparison of SP2 instruments it may be better to omit the comparisons in this work and hopefully address them in a more detailed manuscript in the future.

Specific

Page 3524, lines 17-21: Is this sentence referring to the SP2 research groups at large or just those involved in the study? If any of the instruments discussed here were modified this should be noted.

Page 3526, 17-21: would be helpful to have specific sizes for the "larger particles" referred to here

Page 3527, 24-26: was there any reason for the lower flow rate of the MPI instrument? Was this to test sensitivity of the instrument response to varying flow rate?

Page 3528, 27: should add that the interference occurs on filters.

page 3532, 24: might as well state the solid angle here as well to be complete

page 3533, 25-28: please state the refractive index values used in this calculation (same as Schwarz et al. 2008?)

page 3536, 22: "almost stable" please be more specific (i.e., percentage of drift from initial value or something similar...)

page 3538, 15: suggest changing "insure" to "ensure"

page 3538, 17-18: "...an uncertainty of 20% in scattering amplitude still provides decently accurate optical sizing." It would be helpful to have some firm numbers here for the typical limits of the scattering size range, such as +/- XX nm for a 150 nm particle at the lower size range and +/- XX nm for a 400 nm particle at the upper limit.

page 3539, 4-7: It would be helpful to expand this section slightly. How much did the filtering thresholds vary from instrument and how sensitive are some of the comparisons

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to the choice of filtering value?

page 3541, line 11-14: please clarify if this refers to CAST soot before or after coating with α -pinene SOA.

Text in some figures (e.g., fig 14) is too small.

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