We thank Referee#1 for the positive comment. These comments helped to substantially improve the manuscript. Below we give detailed answers to the individual reviewer comments in blue.

RC#1: In the introduction you should write something of PAS's problems, too, it is not a perfect method either.

Answer: Regarding the limitations of the PA technique we added to the introduction on P3,L43:

"However, despite these advantages of a direct absorption measurement, during field applications the presence of ambient trace gases, like NO2, ozone or water vapor can influence the photoacoustic measurement (Arnott et al. 1999). Especially the impact of high relative humidities on the photoacoustic measurement has to be considered (Arnott et al. 2003, Raspet et al. 2003)."

There is one piece of information that would add the value of the results: the sizeof the rBC core, the mass fraction of rBC, and the thickness of the coating. These affect the MAC and can be obtained from the SP-2 data. If it is not too much work, I would recommend you add this information to your tables and figs and discuss it a bit. Consider it, but it is ok also if you don't add it, after all this is an AMT paper showing methodological development.

We considered it, but we decide against it.

DETAILED COMMENTS

P4,L2: "...in the near-UV ..." 445 nm is visible blue light, not UV by any definition.
Changed into: " in the visible spectral range"

P5, L12: "... aerosol flow of 1std. liter per minute.." How is this maintained? Mass flow controller or what? Is accurate flow actually important? It does not appear in Eq. (1) at all. How does the flow rate affect particle losses? Did you measure size-dependent particle detection efficiency? If you did, please report the main results.
Section 2. Is there a relative humidity sensor somewhere in the instrument? I did not find an info on such. Considering the sensitivity to RH, it should be measured.

Answer:The aerosol flow is maintained by a mass flow controller. An accurate flow rate is not important for the photoacoustic measurement, but it was given with respect to the exchange time of the cell volume. We did not explicitly measure the size-dependent particle detection efficiency, but estimated the size-segregated aerosol transmission.

We inserted in P5, L12:
"A continuous aerosol flow of 1 std. liter per minute through the cell is maintained by a mass flow controller (Mykrolis, Tylon 2900 series). At this flow rate the calculated cell volume of about 265 cm3 is exchanged around 3 to 4 times a minute. The calculated aerosol transmission efficiency through the cell including the acoustic notch filters is 97% for particles with a size of 1 µm and a density of 1.8 g/cm3."

During chamber experiments the chamber was filled with dry synthetic air. During field measurements we used a drier upstream the PAS and nephelometer. The RH values recorded by the nephelometer varied between 40-60% RH during the campaign period.

We inserted:*"During the laboratory chamber studies the RH was always below 30 %. During field measurements there was a silica gel drier installed upstream the PA and nephelometer sampling line, which confined the RH to below 60 % throughout the campaign."*

P7,L38 " ... The TC, EC, and OC contents of the aerosol samples were determined from quartz fiber filters.." Describe the sampling method, now there is nothing. At least sampler, size range it is sampling, flow rate, filter type.

Changed to: "
"The TC, EC, and OC concentrations of the aerosol samples were determined from thermal analyses of particle laden quartz fiber filters. For the filter sampling, 47 mm diameter quartz fiber filters (Munktell MK360) were inserted into a stainless steel filter holder (Satorius) and connected directly to the aerosol chamber. With the aim of a mass flow controller with a set flow of 10 std. L min-1 a defined volume of aerosol was sampled from the chamber through the filter. TC, EC and OC analysis of the particle laden filters were performed using a Sunset OC/EC thermal analyzer (Sunset Laboratory Inc., USA) by applying the EUSAAR-2 temperature protocol (Cavalli et al. 2010)."

P8,L20-21 "... At the beginning and the end of each experiment, filter samples were taken for off-line OC/EC analysis". How stable were the concentrations according to the other instruments' data? This is relevant, since you only sampled at the beginning and end of the experiment. In the results show also time series plots of the chamber experiments and note there the times when the filter samples were taken.

We added another plot of the chamber measurements during the SOOT11 campaign, which shows SP2 and EC mass concentrations as well as PAS mass concentrations calculated from EC-specific MAC.

P9, L36-37 "In order to avoid perturbation of the aerosol sampling during the optical measurements, no filter sampling was possible in parallel with the experiments." Why would filter sampling disturb the experiment?

The SOOT11 campaign took place at the AIDA chamber with pressure control, while the SOOT15 campaign was performed in the much smaller NAUA chamber. At the time of the SOOT15 campaign, the NAUA chamber was not equipped with an automated pressure control to balance additional differential pressures as they are induced during filter sampling.

P10, L35-36 " A reliable SP-2 incandescence measurement at these high C/O ratios was found to be impossible..." Is this due to concentration below SP-2 detection limit or what?

"*Yes, concentrations below the SP-2 detection limit"*

P11,L17-29 " The rBC mass measured by the SP-2 incandescence method was compared to the off-line elemental carbon (EC) and total carbon (TC) analysis results that were obtained by the thermo-optical method." I don't find the results of this comparison. A scatter plot or the EC&OC concentrations in Table 1 would do it.

P10, L17-29:
"The explanation in this part was confusing, so we inserted another table which gives an overview of the different comparisons we have done".

P11,L31-32 " ... due to the increase in the OC mass, the MAC of TC (MAC-TC) decreases with increasing C/O ratio ..." Where is this shown?

This relates to the results of Schnaiter et al. (2006)

P14,L12 " The trend of the nephelometer data ... " The concept of "trend" is something else. Trend is when something increases or decreases over a longer period of time, here you only show 24 hours of data. Rephrase the sentence.

Changed into:„The temporal evolution of the nephelometer data…".

P14,L14 "...while there is no correlation with the number concentration of rBC-free scattering particles..." This is not quite true. The correlation coefficient sure is lower but when I look at the time series in Fig 8, after about 10:00 the light blue line varies actually fairly nicely the variations of the scattering coefficients. How about adding also the total number concentrations measured with the CPC in the figure? Now you don't use the CPC data anywhere.

"We changed figure 8 and added the CPC concentration"