

***Interactive comment on* “Characterization of light-absorbing carbon particles at three altitudes in East Asian outflow by transmission electron microscopy” by J. Zhu et al.**

Anonymous Referee #1

Received and published: 7 February 2013

Title: Characterisation of light-absorbing carbon particles at three altitudes in East Asian outflow by transmission electron microscopy

Authors: J.Zhu, P.A. Crozier, and J.R.Anderson

This paper describes the characterisation of carbon particles collected at three different altitudes during one research flight as part the ACE-Asia project. Single aerosol particles are analysed using transmission electron microscopy imaging. Particle chemical composition is determined using electron dispersion spectrometry.

The authors showed that aerosol particle sizes and morphologies can vary greatly at different altitudes. In addition to soot particles a high percentage of brown carbon par-

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ticles were measured. These carbon particles contributed the most to aerosol volume (relative to the soot fraction). The authors highlight that the physical and chemical properties of LAC can vary greatly with altitude and that care should be taken when interpreting measurements from ground based stations. This paper is well written and I think that it is suitable for publication in atmospheric chemistry and physics. However, I have some minor comments below.

Comments:

Experimental:

Please include a short description of the main aerosol inlet on the aircraft? Flow rates, inlet diameters. Was the flow isokinetic? What was the measured RH in the sampling line? What was the sampling time? Did the sampling time change depending on different altitudes (to account for different aerosol concentrations?)

Are there other published results from measurements taken alongside the impactors (aerosol chemistry, BC) that can be used to give a more global description of this flight. The authors mention how LAC can affect CCN concentrations and light scattering measurements. Were CCN measurements operating alongside the impactors and do CCN properties vary with altitude.

Samples are representative on one day of sampling. How do the authors think these measurements represent longer time periods or certain air mass sources?

Results and Discussion:

Since the focus of this manuscript is describing the physical and chemical properties of organic particles, a discussion of their contribution to the overall aerosol particle population should be included in order to provide a better idea of their importance in the atmosphere.

What was the fraction of aerosol particles that contained soot compared to the total aerosol concentration measured, how did this fraction change as a function of altitude?

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Is the relative abundance shown in Figure 5 for the total aerosol composition or just aerosol particles containing soot?

P32955, Line 9: In section 3.3 the authors suggest different sources of the organic carbon. However, they do not discuss other types of aerosol particles collected on the grids. A short description of the other types of aerosol particles on the grid and the overall contribution of LAC particles would allow better source apportionment.

Figure 5 and elsewhere in the manuscript, how is the aerosol particle diameter defined?

Figure 6, please describe line profiles a bit better.

P32953, line 19: Is it possible that the silicon is coming from the window in the EDS detection system?

P32953, line 21: What is the fractal dimension of a sphere using your method, and how does your fractal dimensions compare with other studies (Adachi et al., 2010, Xue et al., 2009).

P32954, line 12: Has the EDS been calibrated so to be able to make quantitative conclusions on the measurements?

P32956, Line 15: “ in different operating conditions”..

P32960, Line 1: “ ..are from tens of particles”. If Figure 9a is representative of more than 11 points, how are the 11 points calculated? Are they averaged over a range of particle thickness? If so can you include error bars? (Figure 9a and b).

P32964, Line2: what was the composition, size, and morphology of aerosol particles that the soot was internally mixed with?

Minor comments

P32951,Line 6: insert comma, “..for stage 3, 0.05 to 0.3 microns”

P32951, Line 10: Reword sentence and define SEM.

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P32951, Line 14: "...equipped with a thin window light elemental..."

P32952, Line 23: For altitudes.

P32959, Line 16: "Was used to investigate"

P32959, Line 27: "...and has a linear relationship"

P32960, Line 20: Sometimes "to" is used to define a range and other times "-" is used. Please be consistent and use the same terminology.

P32960, Line 25: "The small quantity of large spheres above 500 nm contributes about 18

Alot of percentages are used to describe the aerosol particle population in this section. However, no errors are reported. The authors mentions that "about 70

P32961, Line 16: 120 m

P32962, Line 26: These larger particles will have much more important consequences on aerosol light scattering and CCN. Why do you not discuss them further?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 32945, 2012.

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