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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "The Pagami Creek smoke plume after long-range transport to the upper troposphere over Europe – aerosol properties and black carbon mixing state" *by* F. Dahlkötter et al.

**Anonymous Referee #2**

Received and published: 30 December 2013

Dahlkoetter et al. present in their manuscript a detailed case study on a pyro-convective forest fire with a long-range transported smoke plume detected over Germany. The plume was analyzed using airborne in-situ (mainly using the Single Particle Soot Photometer, SP2) and a ground based lidar measurement. In addition, a HYSPLIT dispersion simulation was used showing that the detected elevated smoke plume originated from a forest fire in Minnesota, USA.

The presented content and methods appear sound and proof; however, the manuscript is largely excessive with many repetitions, unneeded information and literature discussions that have to be bundled. The authors should consequently shorten their

manuscript and really focus on their key findings. This also includes the number of tables and figures and the unusual high number of used footnotes, which should in general only be used sparsely in scientific articles. The structure (and length) of the article can e.g. be improved by combining the section on the results (Sect. 3) with the discussion part (Sect. 5), which would also avoid many repetitions and ease the reading.

The finding of the disintegrating rBC particles is appealing, however, I miss a real quantification. An additional figure could be added here.

A detailed error analysis and description of the main error sources of the different used instrumentation and inlet infrastructure (of the research aircraft) is currently missing and should be added.

Therefore, I recommend the article to be published in ACP, if the manuscript is consequently being shortened and the comments have been satisfactorily answered and included in the revised manuscript (major revisions).

Comments:

Page 28753, 28754, 28764: All footnotes should be part of the main text (in a shortened form).

Page 28754, Line 11: Is this estimate valid for all seasons or an annual average? Please clarify.

Page 28754, Line 12: Please add “particle diameter” in the parenthesis.

Page 28754, Line 16: Please add “surface albedo” or something similar in this sentence.

Page 28756, Sect 2.1.: Please focus on the main instrumentation and flights used in this study (e.g. HONO, HCl, etc. are not being discussed here).

Page 28757, Line 10: Were all five CPC’s being used for the analysis? If not, describe



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only the ones being used (incl. manufacturer, model, cut-off).

Page 28759, Line 24: What is the assumed uncertainty on this assumption (refractive index) and how does it influences the corresponding particle diameter?

Page 28760, Line 5: I would suggest adding a variable sign after the delta, e.g. deltaD_coat.

Page 28760, Line 7: Please use the same notation of the refractive index as before (plus sign between real and imaginary part, see also Page 28761, Line 7).

Page 28760, Line 22: I doubt that the assumption (15% uncertainty on rBC mass) is really justified if all uncertainties (incl. the aircraft sampling system) are thoroughly included. Please clarify on the aerosol sampling and SP2 losses and its combination to a total uncertainty assumption.

Page 28763, Line 7: Table 2 is not really needed, since only two flights detected the smoke plume and also Fig 3. shows the same message. The table could therefore be removed (or moved to an additional supplement).

Page 28764, Line 21: Figure 5 could be moved to the supplement.

Page 28766, Line 2: Please add that CALIPSO is a space borne lidar.

Page 28766, Line 8: Why was the section between segment 12 and 13 not used (especially the second half of this intermediate segment looks like a clear signal to me)?

Page 28766, Line 13: Please precise that Fig. 9 only shows the lognorm-fits of the measured size distributions (besides the median of all the distributions; red points). Error bars for the FT background are missing as well.

Sect. 3: It would ease the reading and improve the structure of the paper, if the discussions follow the description of the individual results. For example, add the discussion of the other measured size distribution from the literature shown in Fig. 10 right after the paragraph of Sect. 3.3.2. (same for all the other subsections).



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Sect. 4: It looks to me that the HYSPLIT model results miss the lidar observation in Leipzig (Fig. 11g). Please clarify and precise the sentence on page 28770, line 14.

Page 28771, Line 20: Are these values measured for plumes with a comparable age?

Page 28777, Line 14: Please add the DrBC-value.

Figure 13 and within text: Please give the time unit in pure seconds and not increments of 0.2ms.

Page 28785, Line 19: Please replace “height” by “thickness” or “depth”.

Page 28805: Figure 1 could be removed (shown already elsewhere), moved to the supplement or combined with Fig. 2.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 28751, 2013.