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Atmospheric Chemistry and Physics Discussions

Interactive comment on "African biomass burning plumes over the Atlantic: aircraft based measurements and implications for H_2SO_4 and HNO_3 mediated smoke particle activation" *by* V. Fiedler et al.

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Authors response, acp-2010-130, Ref#2

We also thank referee #2 for the really instructive comments, which we all considered. All Figures have been revised, combined or changed (see comment to referee#1), as well as major revisions were made to the text (for e.g. the new order of the text see

also author response to ref#1). We hope, that the entire paper is now compelling and conclusive.

We moreover noticed that the method section of the manuscript did not include at least a brief explanation of the aerosol instruments onboard the DLR Falcon aircraft. Data of these instruments are shown and discussed later in the paper. Although the reviewer haven't made a comment on this, we felt it's necessary to add a new paragraph at the end of Section 2, which very briefly explains the aerosol measurement methods (including two new references).

Furthermore, we added one author, Thomas Hamburger, who contributed to the aerosol measurements and data analysis and who was accidently omitted in the first version of the manuscript.

Following the changes according to the comments of reviewer #2 in detail:

Major changes:

- Most plots have been either combined or changed, for the changes in figures see author comment to Ref#1.
- page 3:
  a) We mention the second plume already in chapter 2 of the paper and we checked the paper for correct heights.
  b) We added a reference and correct values concerning HNO3 here.
- page 4:
  a) We removed the figures, see also author comment #1.
  b) We analyzed forward trajectories from the smelting area. They do not affect our measurements, the air masses were either transported from the smelting area directly to the North or even to the East. We will mention this in the revised

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version.
c) We combined the figures, see author comment #1

- page 5:
  a) We introduced the plume by using SO2, because our own measurements focused on SO2. We analyze and interpret the SO2 measurement data in the light of all other data, especially regarding SO2 as the main preliminary gas for particle formation etc. But we will mention the meaning of CO2 in the biomass burning context more clearly.
  b) This offset is not due to instrument response. A sampling line effect would result in higher values during the reascent, not during decent. In our opinion, this offset reflects spatial and temporal inhomogeneity of the plume. This is also supported by the OMI satellite aerosol index (former Fig. 2), which shows the inhomogeneous aerosol distribution in the plume.
  c) Figure changes see author comment #1
  d) We added further references here e.g. DeReus et al. 2001, Brock et al., 2004

- page 6:
  a) This is due to a combination of two effects, a sampling line storage effect and real differences in the plume air mass. We try to make this more clear in the new paper version and we will also point out the difference to CO.
  b) The reviewer is correct in pointing this out. The original plot is not correct because PCASP raw data were erroneously used, which were not flow corrected during the ascend and descend sequences. We now present corrected data and for clarity a single profile averaged for both descend and ascend together. The same is done for other aerosol parameters presented in the vertical profiles of Figure 6. In the original version, the scatter of data points was too high simply because raw data in too high temporal resolution were used. We did now average the data for altitude intervals of 100 m and obtain therefore smoother and therefore more meaningful aerosol vertical profiles.

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c) This refers directly to the problem pointed out before and has been corrected. There is in fact no significant difference in particle concentrations between the descend and ascend profile.

- page 8: As already mentioned in the author response to referee #1, we especially changed and revised the former chapter 5 of the first paper version. These points will now be thoroughly addressed in the new chapter 6.

Minor changes:

We also thank for the stylistic and grammatical comments, which we grateful applied.

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