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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sources of carbonaceous aerosol in the Amazon Basin" *by* S. Gilardoni et al.

Anonymous Referee #2

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This paper deals with measurements of fine and coarse aerosol chemical composition at a background station in the central Amazon basin, providing an overall good mass closure on the identified chemical species during the wet and dry seasons in 2008. A comparison between the concentrations of 'soot' determined by thermal-optical methods and by light attenuation techniques was carried out and a first measure of the mass absorption coefficient was provided. Beside that, the main observations on the fine and coarse aerosol chemical composition and principal sources reflect the results already published in the review by Martin et al. (Rev. Geophys., 2010) and in the paper by Poeschl et al. (Science, 2010). The Authors are encouraged to emphasise the real progress in understanding the chemical nature of Amazonian aerosol with respect to the above studies. Clearly, one original result is the source apportionment of OC based on thermogram analysis. I have some worries about the validity of this approach:

- The identification of thermograms is based on the comparison with standards. One problem is that the thermo-optical analysis proceeds step-wise, therefore a substantial degree of covariance between samples and between samples and standards is given by the fact that they will all show peaks in the same positions in the thermogram (OC1, OC2, etc.). If the information in each thermogram can be essentially reduced to the intensity of the seven peaks, corresponding to the steps in the analysis, thus the correlation between factors and standards for n = 7 is not significant at a significance level of 95% even for r2 > 0.90, that means the resolution of your technique is not good enough.

- Even when correlation is significant, the Authors must acknowledge that their reference standards cannot be considered fully representative for the conditions and sources of the central Amazonian basin, and that therefore the similarity between the thermograms of the samples and those of best-fitting standards can be incidental, due to the low specificity of the analytical technique employed. Ancillary information, like the correlation of F2 occurrence with EBC concentrations and with fire counts, are essential for a more robust attribution of ambient thermogram types to reference materials.

In this reviewer's opinion, a more prudent conclusion from section 4.2 is that F2f can actually trace biomass burning products but that both F1f and F3f are compatible with the volatility features observed for standard SOA. For coarse particles, certainly the standard of pollen is the best fitting. But what about calcium carbonate?

Minor comments:

- Page 29926, lines 9 – 12. Indeed, deep convection lifts polluted boundary layer air to high altitudes, but in the process aerosol particles are efficiently scavenged, therefore the transport is observable mainly for the insoluble gaseous compounds.

- Page 29928, line 21: "filters were not pre-treated prior to analysis" means that they were not baked before sampling, or that after sampling they were analyzed without

extraction or acid addition?

- Page 29932, lines 8 – 11. The Q values are lower than the theoretical Q, meaning that the uncertainty is somewhat overestimated.

- Page 29932, line 14. By increasing the absolute value of Fpeak normally increases Q, therefore it is obvious that for minimizing Q Fpeak must be set to zero. Normally, Fpeak is applied to obtain solutions which are more easy to interpret or that looks "more reasonable" than the one with minimized Q.

- Page 29934, line 9. The factor of 1.4 for fresh organic particles applies to combustion aerosol or to freshly produced SOA, not to PBAP, for which a more representative value should be provided.

- Page 29939, line 16. "N+3" is evidently a typo.

- Section 4.3. The main outcome of the comparison with the model is that the interannual variations in biomass burning activities leads to significant discrepancies in calculated vs. observed concentrations of aerosol OC and EC. However, what if we scale down the emissions based on observed proxies for biomass burning (e.g., fire counts) and their deviation in 2008 respect to the reference years for the emission inventory?

- Table 2 at page 29960: 'BC' should be 'EBC', according to the text.

- Caption of Fig. 8. Please, indicate the variables referred to the left and right vertical axes.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 29923, 2010.