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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Single particle analysis of the accumulation mode aerosol over the northeast Amazonian tropical rain forest, Surinam, South America" *by* R. Krejci et al.

R. Krejci et al.

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Authors reply to comments from Anonymous referee #2

We thank referee for comments and suggestions and below present our answers. First the original comment from reviewer is presented in Italic, followed by author's reaction.

1) A major drawback of the paper is the fact that due to the deployed methods of SEM filter sample analysis, only larger particles were detectable. Furthermore, particularly for samples from the upper free troposphere, more than 90% of sampled particles were not identified. Since the analytical method is not able to detect C and lighter atomic elements, the authors draw the reasonable conclusion that the particles of the

NON DTERMINED (ND) category are composed of organic material. However, this is still an assumption which is not justifiable. The authors should keep this limitation in mind when interpreting their observations. To give an example from the Discussion section: more than 90% of the particles observed at altitudes between 4 and 12 km ARE ASSUMED TO BE composed of organic matter, instead of ARE COMPOSED OF!!. This holds also for the abstract. In particular the entire Discussion section is built on the assumption that the ND particles are composed of organic matter. I recommend to soften the conclusions and to focus the paper on the presentation of the important results.

The reviewer is correct that with SEM-EDX method using polycarbonate filter and carbon coating we cannot directly determine C (present in both) as well as O and N (present in filter substrate). Through the paper we focused on description why we assume that our ND (Not Determined) group contains on our opinion organic aerosol particles. We believe that in the paper we clearly excluded all other possibilities, which can explain ND group besides organic aerosol. The only compound common in atmospheric aerosol, which can be of importance and was not detectable, is ammonium nitrate. We are not aware of any measurements, especially in the free troposphere where ammonium nitrate was reported to represent significant fraction of the atmospheric aerosol

2) A further limitation of the presented results is the fact that the authors first state that for particle sampling a near-isokinteic inlet was used. Nevertheless, the authors attempt to give absolute numbers for the atmospheric concentration of different particle classes. This approach can only be applied when the authors demonstrate, that the sampling efficiency of their instrumentation including the inlet characteristics is close to 100% for the relevant size range. Otherwise, they cannot link the number of analysed particles to observed particle size distributions. A very valuable information would be the comparison of size distributions measured by the deployed optical particle counter and the respective size distributions obtained from the filter sample analysis. The re-

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quired material should be available because the authors determined the size of analysed particles and measured size distributions in situ.

The sample air for filter samples was sampled through the same near-isokinetic inlet as the sample air for the Optical Particle Counter (OPC), which was used to obtain aerosol size distribution between 0.12 and 3.5 μm. Therefore from this point of view we can link particles to observed particle size distribution.

It is not clear, where the reviewer sees a contradiction between using near-isokinetic inlet and attempt to give absolute numbers for the atmospheric concentration of different particle groups (*A further limitation of the presented results is the fact that the authors first state that for particle sampling a near-isokinteic inlet was used. Nevertheless, the authors attempt to give absolute numbers for the atmospheric concentration of different particle classes).*

The reasons why we used the term near-isokinetic instead of isokinetic are following: Every inlet is truly isokinetic only for a certain air speed, but airplane does not fly the same speed all the time, so it is why we use term near-isokinetic instead. The inlet used on board of the Cessna Citation airplane was designed for most common and usual air speed 150 m s^{-1}. We did not perform special tests, in wind tunnel for example, to check the inlet performance. However, identical OPC and inlet was deployed during ACE-2 experiment on board of the same aircraft and comparison between our OPC and FSSP showed good agreement (de Reus et al., 2000).

In our paper we did not link observed size distribution derived from OPC to the size distribution derived from analyzed particles by SEM technique. We took integral number of all particles larger than 0.2 μm measured by the OPC (N_{200}) as the size limit of the electron microscope was around 0.2 μm. It would be too ambitious try to link size distribution measured by OPC with size resolved composition based on simple Martin's diameter (Hinds, 1999). Both techniques are based on completely different size detection principle. Moreover, with the electron microscope the size was determined using

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only 2 dimensions and the third dimension (height or thickness of the particle) was not determined and has to also account for quite large counting uncertainty in upper OPC bins due to a low number density. Also we cannot exclude possibility that some particles could have also changed their shape after impaction on the filter. Being aware of these differences we used link between N_{200} only in cases where we observed striking difference in aerosol composition among different parts of the troposphere showing the maximum range of the values derived this way.

On a figure below are presented combined size distributions derived from OPC and SEM for a lowermost troposphere over the rain forest. The bins are chosen based on the OPC size bins. With respect to the differences mentioned above the differences are not surprising.

References

de Reus, M., F. Dentener, A. Thomas, S. Borrmann, J. Strom, and J. Lelieveld: Airborne observations of dust aerosol over the North Atlantic Ocean during ACE 2: Indications for heterogeneous ozone destruction, Journal of Geophysical Research-Atmospheres, 105 (D12), 15 263–15 275, 2000.

Hinds, W.C.: Aerosol technology – Properties, behavior and measurement of airborne particles. John Wiley & Sons, New York, 483 pp., 1999.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 533, 2004.

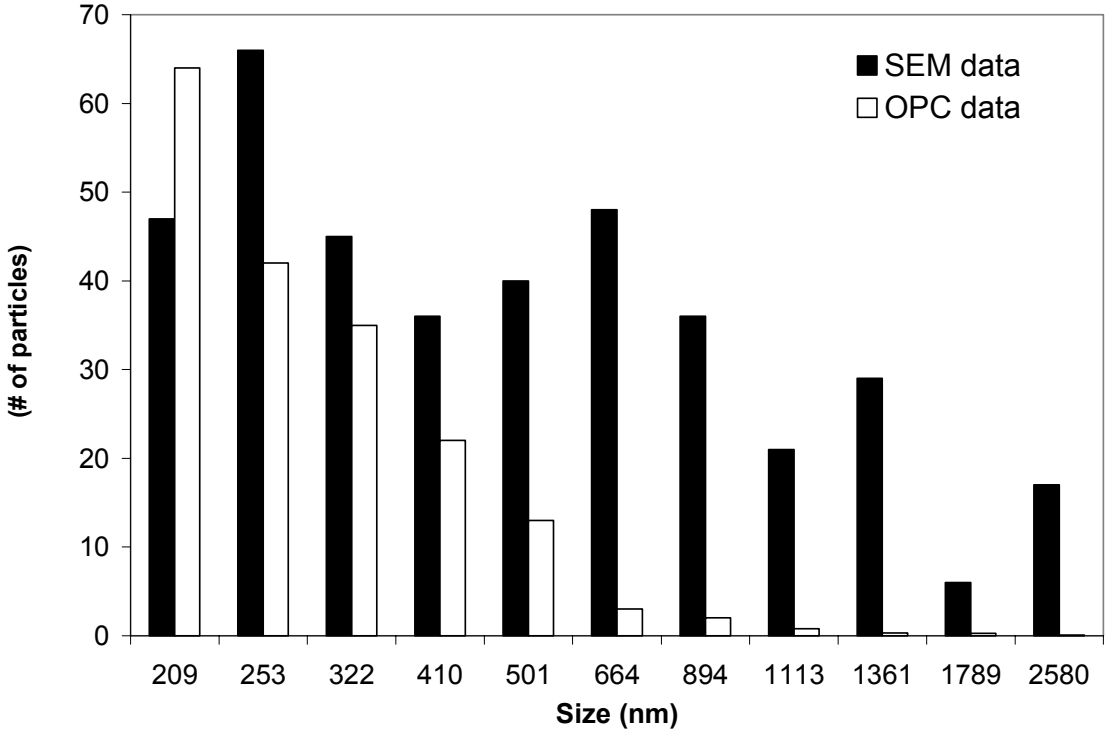

Figure 1:

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