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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.

Anonymous Referee #1

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The paper discusses the filter sample analysis by SEM-EDX of single particles collected by aircraft over the Amazonian tropical rain forest. Based on composition and morphology, particles are divided into seven categories for sub- and super-micron aerosol. Samples were further separated depending on the location and altitude where the samples were taken.

Overall comments: Determination of the chemical composition of aerosol particles is very important in order to understand aerosol sources, various aerosol processes as well as studying the influence of aerosols on clouds and climate. Very few aircraft observations exist for the continental tropics - and especially single particle analysis is rare. Therefore such an analysis is of high value for the atmospheric chemistry

community.

Unfortunately the analysis presented here is limited to chemical elements with Z>11 and solely to non-volatile particles >0.2 μm. A large portion of the aerosol probably consists of compounds containing carbon, hydrogen, nitrogen and oxygen (organics, soot, ammonium nitrate?). Additionally, Krejci et al., 2003, shows that by far the most particles encountered during their measurements were smaller than 0.2 μm. Therefore the vast majority of atmospheric particles cannot be accessed with the presented technique. Nevertheless, their findings are still interesting because mineral dust particles for example - although constituting just a very small fraction of the total aerosol - might be important ice nuclei in the upper troposphere. An explicit caveat should be stated in the abstract about the grave limitations of the analysis.

A point that should be discussed in detail is, why no pure sulfate or sulphuric acid particles were detected, and why the fraction of sulfur containing particles is so small. Are these particles too volatile to be analysed? Especially in the free troposphere a large fraction of the particles should be sulfate particles (e.g. Sheridan et al., GRL, 1994, Murphy et al., Science, 1998, Curtius et al., JGR, 2001, Papaspiropoulos et al., JGR, 2002, etc). The results presented in the manuscript should be discussed in the light of these findings. Krejci et al., 2003, themselves model the evolution of free tropospheric aerosol including uptake of H2SO4 as the only condensing gas-phase species!

The largest fraction of analysed particles fall into the "not-determined" category. Arguments are presented that these particles are mostly of organic origin. Although this conclusion is likely to be correct (at least if there are really no sulfates), it should be stated in the text (especially in the abstract and in the conclusions) that the largest fraction of particles was not-determined particles that are possibly organic particles.

At several places in the manuscript a conclusion is drawn on the absolute concentration of the observed aerosol class (e.g. statements in the abstract like 20% - 90 % of the

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particles are organic, or section 4.3. "The mineral dust number density in the MBL range from 13 to 22 cm-3." ? "The N_200 particle number density in the MBL was 20-40 cm-3. With respect to the fraction of sea salt particles in the MBL this corresponds to 4-10 cm-3). The calculation of absolute concentrations for an aerosol category, as well as statements like 90% are organic cannot be made from the presented analysis, because it is not known which fraction of the atmospheric particles volatilises in the vacuum environment. Such statements would only be correct if formulated as "90% of the non-volatile particles $>$ 0.2 μm are likely to be organics". Statements like "4-10 cm-3 are sea salt particles" cannot be made at all. Therefore the ms should be rephrased or cut accordingly throughout.

The paper is presented in a clear and concise way. The major points presented above have to be addressed in detail before publication can be considered.

Technical comments: p.3, l.7, "Artaxo et al., 1998, reported results from a..." (omit brackets),

p. 5, "near-isokinetic inlet", please explain, for which altitudes and velocities is the sampling isokinetic, in how far is it anisokinetic at other altitudes?

p.6, l. 11, ...along the way that introduce uncertainties...

p.6, l. 15, "live time" please explain; also, life time?

p. 7, l. 8, "...convective systems then transported..."

p. 14, l. 3 in Section 5: "...particles larger than 1 μm represented less than 1 % of the aerosol..."

p.16, l. 4 "...marine conditions than typical..."

p.17, l. 8, "...from the source region, requires a more..."

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