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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Temporal and spatial variations of aerosol physical and chemical properties over West Africa: AMMA aircraft campaign in summer 2006" *by* A. Matsuki et al.

M. Posfai (Referee)

posfaim@almos.vein.hu

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Major comments:

This study describes the results of the physical and chemical characterization of aerosol particles and cloud elements collected before and after the onset of the monsoon period in West Africa. Aerosol particle concentrations, size distributions and their CCN activities were measured, along with the analysis of individual particle compositions and morphologies using transmission electron microscopy. The combination of bulk size and volatility measurements with TEM single-particle analysis is an extremely effective, albeit labor-intensive procedure for obtaining comprehensive information on

the particles. The paper could serve as a good reference for the properties of aerosol particles that dominate in the distinct atmospheric layers that are typical in West Africa. It is a surprising result that particles in the 'monsoon layer', arriving from the ocean, are less CCN-active than particles in the free troposphere and in the Saharan aerosol layer. Another noteworthy result is the identification of a significant fraction of submicron dust particles. The paper deserves to be published in ACP and needs only minor adjustments.

- Volatility measurements. The results of volatility measurements are given for the 20-300 nm fraction. Since volatility data are mentioned to be available for larger sizes, it would be useful to show them.

- Identification of particles from biomass burning (p4478, top paragraph). C and O were not analyzed, and only the K and S contents of the particles were taken as evidence for a biomass burning origin. This procedure may be slightly misleading, since many biomass smoke particles, particularly tar balls, do not contain significant K or S. On the other hand, some non-smoke sulfates can also contain K. The authors mention the volatility of some K/S-bearing particles, which may also indicate that the analyzed particles are primarily sulfates that may not necessarily originate from biomass smoke. (According to my own experience, organic particles from biomass burning are not spectacularly volatile in the TEM – see, for example, Pósfai et al. (2003), JGR 108, D13, 8483.) Thus, the results should be interpreted with caution, and there may be some chance that the number of particles from biomass burning is overestimated.

- Concerning the low volatility of the particles in the monsoon layer, could at least some of the particles come from urban emissions from the large coastal cities in West Africa? Particles from urban pollution are, in general, more hydrophobic than organic particles from savanna or forest fires. Are "biomass burning" particles meant to include those from household emissions, which could be also quite significant in that region? Some discussion on these points would be welcome.

Minor (mostly technical) comments:

Abstract, 3rd line from bottom: ‘after the onset of the monsoon period’

4465, line 22: ’spatial variation in the aerosol..’

4466, line 24: ’to be contrasted with...’

4466, line 26: delete ’the’ after ’aircraft’

4467, line 23: ’descents’

4468, line 8: ’when the monsoon was at its peak’

4468, line 14: ’evaporation’

4469, line 13: ’one CCN spectrum’

4470, top paragraph: ’samples were collected’ instead of ’made’, in two places

4470, line 18/19: ’spectrometer’ instead of ’spectroscopy’

4471, line 20: Gulf of Guinea

4472, line 8: ’in Niamey in 2006’

4472, line 23: distributions

4472, lines 24/28: convoluted sentence, please rewrite

Table 1: Particle sizes should be in nm, not μm

4474, lines 18: ’overlying’ (also in many places elsewhere in the paper), and ’If any different, then..’

4474, last paragraph: It may be useful to state here again that the volatility measurements were performed on particles in the 20 to 300 nm fraction (i.e., most mineral grains were not included), otherwise it is difficult to understand how the volatility of particles in the SAL layer could be larger than in the monsoon layer.

4477, line3/4: ’understand’ or ’study’ instead of ’to confirm or rule out’, and please delete ’supposed’

4477, line 11: ’in a companion paper’

4477, line 15: aerosol

4477, line 18: ’consisting’ instead of ’constituting’

4477, line 23: ’showed characteristic morphology..’

4477, line 24: comma instead of period

4477, line 26: ’...it was difficult to distinguish the mineral species from the...’

4479, lines 14/16: meaning of the sentence unclear

4480, line 25: On the contrary

4481, lines 3/4 and 6/7: meaning unclear

4481, line 10: ’which are believed..’

4481, lines 15/18: Are CCN activity data for the dust fraction available for this study? If yes, it might be worth showing them.

4482, line 5: analyses

4482, line 11: proceeded

4482, line 17: compositions

4482, line 24/25: please reword sentence

4483, line 6: ’hydrophobic’ instead of ’hydrophilic’

4483, line 14: ’how to explain that the particle chemistry..’

4484, line 1: compositions

4484, line 8: delete 'out'

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 4463, 2010.