Atmospheric Chemistry and Physics Discussions

Interactive comment on "Secondary Organic Aerosol from biogenic VOCs over West Africa during AMMA" by G. Capes et al.

Anonymous Referee #1

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Review of Secondary Organic Aerosol from biogenic VOCs over West Africa during AMMA by Capes et al.

This manuscript discusses the aircraft based measurement of organic aerosol during the AMMA campaign. The paper is well written, and the results clearly articulated. The general conclusions are that the regional median organic aerosol loading of 1.08 micrograms per m3, is in good agreement with a simple prediction of biogenic secondary organic aerosol from isoprene and monoterpenes. The authors conclude that this result is in contrast to the results obtained in urban environments at higher latitudes. Based on the analysis in this paper this is true, and I agree with the concerns of the Referee #2 which discuss potential problems from the choice of aerosol yields used in the calculation of mass loading from biogenic precursors. A further concern regarding

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this manuscript is with the VOC measurements, and why only a subset of the measurements are used in the calculations. Based on these 2 concerns some reanalysis is required prior to publication in ACP.

Specific Comments:

Yields: In general the concerns raised by Reveiwer number 2 are well stated, and will not be repeated here. One additional comment regarding the numbers used for the yield calculations: Shilling et al. 2008, showed low mass concentrations yields of a-Pinene from continous flow ozonolyis experiments to be 0.09 (organic loading of 0.15 ug/m3). This is lower than the 0.15 used in the calculation, and would decrease the predicted concentrations, but only by 30% or so.

VOC measurements: As the yield calculation for BSOA is described, the Isoprene + Product concentrations measured by PTRMS are used to calculate all of the BSOA. The isoprene + products concentration is used to infer the starting Isoprene concentration. Then emission ratios from Saxon et al. are used to infer the initial monoterpene concentrations. From these initial concentrations and assumed yields, expected BSOA concentrations are calculated. In principle this is okay, however the reader may become confused since the authors describe the measurements of several VOC components not used in the analysis in the Aircraft instrumentation section. In particular the measurements of mono-terpenes were described in the text, but these measurements are apparently not used in the yield calculations, and instead emission ratios of monoterpenes to isoprene from Benin are used in the analysis, assuming that the ratios are the same. Since the sum of a-Pinene and Limonene make up approximately 0.6 of the 0.8 ug/m3 predicted BSOA this is something that should be tested and compared. Table 2 does this to some extent, but it is not well described in detail in the text. At the very least the a-Pinene to Isoprene emission ratio could be checked for consistency between the plane data and the Saxton et al. 2007 data, since the authors state the lifetime is nearly identical, the ratio should remain constant. This comparison needs to be done for the revision, as the current analysis relies heavily on the emission ratios

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measured by Saxton et al.

Other Comments: p 2536 line 19: Noise in the AMS measurments for 30 second averages is stated at 1.7 ug/m3 for organics, however in Figure 3, it looks like there is considerably more noise with some concentrations reaching nearly -10 ug/m3 for organic species. Has the noise calculation for this campaign been calculated, as the Crosier reference is for a separate campaign?

p 2539 line 4 and p 2543 line 20 and caption Table 2: The atmospheric lifetime of isoprene is given as less than one hour, then later as 2.1 hours. First which lifetime is correct, and second what were the conditions (OH, O3, etc) for which this was calculated.

p 2540 line 7: Do isoprene concentrations less than 100 ppt really indicated "highly aged regional air"? For a parcel of air with an initial concentration of 1000pptv, it will take approximately 2-4 hours (depending on lifetime, see previous comment) to reach 100 pptv assuming no further emission into that parcel.

References: de Gouw, J. and C. Warneke (2007). Measurements of volatile organic compounds in the earths atmosphere using proton-transfer-reaction mass spectrometry. Mass Spectrom Rev. 26: 223-257.

Saxton, J. E., A. C. Lewis, et al. (2007). Isoprene and monoterpene measurements in a secondary forest in northern Benin. Atmos. Chem. Phys. 7(15): 4095-4106.

Shilling, J. E., Q. Chen, et al. (2008). Particle mass yield in secondary organic aerosol formed by the dark ozonolysis of alpha-pinene. Atmospheric Chemistry and Physics. 8: 2073-2088.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 2533, 2009.

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