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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Importance of the organic aerosol fraction for modeling aerosol hygroscopic growth and activation: a case study in the Amazon Basin" *by* M. Mircea et al.

M. Mircea et al.

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Answers to Referee 1:

We would like to thank the Referee for her/his careful reading of the paper and for her/his suggestions that we have considered in the revised version of the manuscript.

1) Lines 10-14 page 5256: The message we convey in this paragraph is that the same approach (the approach of Zhou et al. (2002) and Rissler et al. (2004)) led to different results for different field campaigns/sets of data: a good agreement between predictions and measurements in the studies of Zhou et al. (2002) and Rissler et al. (2004) and little agreement in the study of Vestin et al. (2005). The study of Vestin et al.

(2005) will be submitted to ACPD this month.

2) We agree with the referee that calling the Raoult term “modified” can be too much as long as it only accounts for the additional number of moles from WSOC. On the other hand, it gives a hint to the reader who wants to know if the presence of WSOC was taken into account. Therefore, we would prefer to keep the word “modified” in the article.

3) The lines 11-13 on the page 5260 will be changed as the Referee suggested.

“The concentration of inorganic ions (NH4+, Na+, K+, Ca2+, Mg2+„Cl-, NO3-, SO4-2) was determined, besides real-time measurements of ammonia, acidic trace gases and water-soluble inorganic aerosol species (Trebs et al., 2004), by ion chromatography (IC) as described in Falkovich et al (2005) and in Fuzzi et al. (2005).”

4) The main content of this comment is already acknowledged in the MS on page 5276, lines-8-11. We only expressed in other words (page 5261, lines 16-19) the interdependency of saturation, size and chemical composition of the aerosol particles through the Kohler theory. We prefer to keep our formulation because it points out the dependency of equilibrium water saturation ratio on chemical composition of the aerosol particles. The Referee suggests reformulating the sentence on page 5261, lines 16-19 because “identical Kohler curves can be obtained for different chemical compositions”. We like to indicate to the Referee that identical Kohler curves can be also obtained for different sizes of the aerosol particles but appropriate numbers of moles and surface tensions given by the chemical composition. The surface tension depends on the chemical identity of the organic species, especially on the solubility of the organic species.

5) Eq. 1 will be changed as the Referee suggested. On page 5262, the lines 16-18 will be modified accordingly. “i, mi, Mi are the number of dissociated ions, soluble mass and molecular mass, respectively, of inorganic and organic components of aerosol particles.”

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6) As written in the MS, we averaged the aerosol number size distribution measured with DMPS, the diameter growth factor at 90%RH measured with HTDMA and CCN number concentration measured with CCN counter over the time of aerosol sampling with the impactor. The DMPS operated in dry conditions; therefore the averages are not dependent on saturation relative humidities. The HTDMA and CCN data were averaged at fixed relative humidity/superaturation. More details about DMPS and HTDMA instruments and data can be found in the accompanying study of Rissler et al (2005).

7) The inorganic salt compositions used in our simulations are based on the results of ion chromatographic analysis performed on impactor samples collected during the campaign. A good agreement was found between the analyses performed on the different impactors (namely 5-stage Berner, MOUDI, Dekati LPI and SDI, Fuzzi et al., 2005). The overall impactor samples analyses indicate that sulphate was by far the major inorganic anion during the entire campaign, with the exception of the samples collected during the night in the dry period when nitrate was equally important. Therefore, by introducing K salts of anions different from sulphate might be of importance only in the case of KNO3 during the night in the dry period. By the way, we have excluded this option since nitrate was found to form in the aerosol phase during the night mainly by condensation with ammonia (Trebs et al., 2004; Fuzzi et al. 2005), therefore nitrate was considered to occur only as NH4NO3 in our model.

8) Please see the answer 2 to Referee 2.

9) Please see the answer 2 to Referee 2.

10) The missing citation are Fuzzi et al. (2005) and Cabada et al. (2004). They will be added in the article. Cabada, J. C., Rees, S., Takahama, S., Khlystov, A., Pandis, S. N., Davidson, C. I., and Robinson, A. L.: Mass size distributions and size resolved chemical composition of fine particulate matter at the Pittsburgh supersite, Atmos. Environ., 38, 3127-3141, 2004.

11) We are sorry; we do not understand the Referee's comment. The CCN counter

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performs measurements at fixed supersaturations. We calculated the CCN number concentrations at those supersaturations for which the CCN counter made measurements.

13) The aim of the CCN parameterizations is to produce reliable numbers of particles at supersaturations where the clouds form because these will further influence cloud structure and evolution. We agree with the Referee that more parameters are needed for Eq. 3 in order to describe the various regions and conditions, but that it will be achieved in the future experimental and theoretical studies. However, the present parameterizations allow studying the sensitivity of large scale models to the CCN predictions in environments influenced by biomass burning aerosol and this will help in designing more complex models based on detailed thermodynamics.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 5253, 2005.