Atmos. Chem. Phys. Discuss., 13, C634–C636, 2013
www.atmos-chem-phys-discuss.net/13/C634/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Investigating the influences of SO_2 and NH_3 levels on isoprene-derived secondary organic aerosol formation using conditional sampling approaches" *by* Y.-H. Lin et al.

Anonymous Referee #3

Received and published: 18 March 2013

General comments:

This is a carefully designed and conducted field study aimed at clarifying the effect of acidity by examining the role of ambient SO2 and NH3 concentrations on isoprene SOA formation. The results are of atmospheric relevance suggesting that under ambient conditions the formation of isoprene SOA depends on the atmospheric SO2 concentrations and sulfate aerosol could be a surrogate for surface area in the uptake of IEPOX onto preexisting aerosols. Weak correlations are found between aerosol acidity and the mass of IEPOX-related SOA tracers, which is perhaps a little disappointing but

not so surprising because information is lacking about the acid history of the particles. It is interesting to see that the correlations between the mass of the isoprene SOA tracers under all conditions correlated better with the particle sulfate loadings than with the acidity of the particles. The manuscript is very well structured and written, and reads fluently. I fully concur with the positive appraisal of the first reviewer and only have a few specific comments.

Specific comments:

Part 3.1 – page 3108 – lines 1-4: The authors write "In addition, strong correlations (r = 0.71) were observed between the IEPOX-derived organosulfate (m/z 215) and the MPAN-derived organosulfate (m/z 199), suggesting similar formation behaviors or limiting factors, since these two species are known to form from different NOx-dependant pathways, as shown in Fig. 1." It is not clear what the authors mean by "similar formation behaviors or limiting factors". Isn't "similar formation behavior" in contradiction to "different NOx-dependant pathways"?

Furthermore, it is also possible that the m/z 199 organosulfate is more complex than thought as the chromatographic resolution using the ACQUITY UPLC HSS T3 column is limited and contains other species than the 2-methylglyceric acid-derived (or MPAN-derived) organosulfate. See the paper by Safi Shalamzari et al. which recently appeared in Rapid Communications in Mass Spectrometry (27, 784-794, 2013).

Part 2.2 – lines 5-10: The polar isoprene SOA-related organosulfates were quantified using sodium propyl sulfate as surrogate standard. It is not clear how the actual quantitation was performed: was it done assuming a similar mass response or molar response? This should be mentioned.

Table 2 and 3, and corresponding discussion of the data: To calculate the sum of the IEPOX SOA tracers the sum is made of the 2-methyltetrols determined using GC/MS with prior trimethylsilylation, IEPOX-derived organosulfate (m/z 215) determined using LC/MS, and some other isoprene SOA species. I doubt that this summation procedure

can be followed since part of the 2-methyltetrols measured with the GC/MS procedure will originate from the acid-catalyzed hydrolysis/derivatization of IEPOX-derived organosulfate upon trimethylsilylation. Hence, a correction should be made for the part of the 2-methyltetrols that was counted double. It is not clear from the manuscript whether such a correction was done. The same comment applies to the MPAN SOA tracers. Thus, there could be an overestimation of the mass of IEPOX- and MPAN-related SOA tracers.

Technical corrections:

Page 3102 – line 10: . . ... of the GC/MS procedure . . ...

Page 3103 – line 7: . . ... all isoprene-derived organosulfates . . .. . .

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 3095, 2013.