

Interactive comment on “Observation of neutral sulfuric acid-amine containing clusters in laboratory and ambient measurements” by J. Zhao et al.

Anonymous Referee #2

Received and published: 6 September 2011

General Comments

The manuscript by Zhao et al. describes the detection of neutral sulfuric acid-amine clusters using a technique newly developed by the authors called Semi- Ambient Signal Amplification (SASA) and under ambient conditions without signal amplification. The authors demonstrate that amines appear to play a major role in the growth of sulfuric acid clusters after they have nucleated in the atmosphere at the Boulder, CO measurement site. The early stages of particle growth in the atmosphere are important for human health and climate, but our understanding of these processes remains limited. This paper does an excellent job of presenting the first ambient results to show

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that amine compounds play an important role in early particle growth after nucleation. The paper is well written and the subject matter is very appropriate for publication in ACP. The technique of adding additional sulfuric acid to ambient air (SASA) allows the authors to definitely see signals that have previously been too small to detect. The authors do an excellent job of describing this new approach and of explaining their results. I have no major criticisms of the paper and recommend it for publication in ACP after the minor corrections below have been addressed.

Minor Revisions

Line 28 Page 19730 I suggest changing the wording from “Results from ambient measurements” to “Results from ambient measurements using the CIMS without addition of sulfuric acid”. It is a little confusing the way it is because both types of measurements are with ambient air.

Line 28 Page 19739 It would be good to have a reference for the measurements referred to in the statement, “based on measurements at other locations”

Line 10 Page 19742 It would be good to add errors on these averages, “For the former, the average percentages of sulfuric acid-ammonia and sulfuric acid-amine clusters in the total size 4 clusters are 37 % and 30 % respectively. For the latter, these percentages become 24 % and 53 %.” Without some statistical analysis it is difficult to determine if the authors’ statement that 30 and 37 percent are similar while 24 and 53 percent are very different is legitimate, though the graph is fairly convincing, statistics would be of additional benefit.

Figure 8 It would be clearer if the bottom axis was labeled Normalized signal of N4 instead of just normalized signal

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 19729, 2011.

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