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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical ionization of clusters formed from sulfuric acid and dimethylamine or diamines" *by* Coty N. Jen et al.

Anonymous Referee #3

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Review of Jen et al., Chemical ionization of clusters formed from sulfuric acid and dimethylamine or diamines

Summary and General Comments: The authors present a series of experiments designed to assess the utility of nitrate ion CIMS techniques for the detection of H2SO4-base clusters that lead to the formation of new particles in the atmosphere. Nitrate ion CIMS has been used for detection of low vapor pressure trace gases previously, and is well known to be a highly sensitive, but very specific reagent ion. The authors extend this logic to the detection of clusters, under the premise that nitrate ions may be selection in ionization of neutral (or less acidic) clusters. To demonstrate the effect, they contrast the nitrate CIMS technique with acetate CIMS techniques, demonstrating that nitrate ion chemistry does not ionize all of the clusters generated in the flow reactor. The authors combine both experiment and simple models to describe the results.

The manuscript is well written, and should be accepted following the authors attention to the following minor comments:

Specific Comments:

I was surprised there was not a reference to the use of acetate ions for gas-phase acid measurements (e.g., Veres et al. 2008 (Int. J. Mass Spectrom., doi:10.1016/j.ijms.2008.04.032, 2008)

I found the notations S160 / S125 (and similar) that are used throughout the figures to be confusing to the non-expert. I suggest defining these relationships in each figure caption. For example in Fig. 5, "Measured and modeled sulfuric acid-to-nitrate ion ratio (S160 / S125)" This helps keep the reader engaged and not flipping back to the definition in the manuscript. The same is true for S195 / S160 or S160 / S97.

Line 123-124: Are the reagent ion cluster distributions those observed in the mass spectrometer or those calculated to be in the source region. I would expect there to be a considerable difference between the reagent ions in the ion-molecule reaction region and those detected by the mass spectrometer following collisional dissociation. How might the reagent ion cluster size impact its ability to undergo proton transfer?

Line 126: What is the nominal cluster size used to calculate the assumed collision rate? Is there reason to suspect that the cluster size is different in nitrate and acetate mode?

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