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Interactive comment on “Effect of ions on the measurement of sulphuric acid in the CLOUD experiment at CERN” by L. Rondo et al.

Anonymous Referee #3

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The manuscript “Effect of ions on the measurement of sulphuric acid in the CLOUD experiment at CERN” explores the role that weakly-bound clusters of sulfuric acid and oxidized organic compounds (OxOrg), which are formed and ionized within in the chamber, may play in biasing the measurement of sulfuric acid monomer in a selected ion chemical ionization mass spectrometer (CIMS). In this manuscript, the authors present evidence that shows an increase in sulfuric acid signal as detected by CIMS could be the result of increased transmission of the OxOrg.HSO₄⁻ clusters in the CIMS inlet, and the breakup of those clusters in the collisional dissociation chamber. Additionally the authors explore whether this enhancement effect has atmospheric implications during a recent field campaign in a forest.

Having read this article several times, I generally feel that the presentation is more con-
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fusing than it needs to be; eventually, and after multiple readings, most of the main details of the manuscript make sense. I have a few questions that I will outline below, but generally I would encourage the authors to review their manuscript and strive to simplify the presentation if possible. Once the issues are addressed I feel this manuscript would be suitable for publication.

questions/comments: 6602/18: this sentence suggests that there are alkene contaminants in CLOUD. If true, please provide a simple sentence that states this (e.g., a summary of the relevant results from the cited study by Schnitzhofer et al.). Typically, sulfuric acid CIMS instruments directly measure OH concentrations using isotopically labelled SO₂ . . . was this not the case in the current study?

6604/25: This is a major observation of the manuscript: the observation that a major part of the bisulphate ions from the chamber, is probably being lost before reaching the ion drift tube due to diffusion or electrostatic forces.” What evidence suggests this to be the case? Or is this just a hypothesis? The subsequent text seems to suggest that this loss mechanism is a fact, as it details the possible locations for the loss.

6606: I am somewhat confused about the results shown in Figure 7. Are these the result of the parameterization? If not, then why are the pinanediol data displayed here?

6607/12: As the authors state, one would expect ambient observations to be similar to chamber GCR data . . . that is, a slight enhancement of the HSO₄⁻ signal due to ambient ions. Could this be due to the fact that the OxOrg produced by CLOUD is not representative of the actual atmosphere? This seems to be the suggestion presented by the authors in this paragraph.

minor points:

6596/4: the phrase following i.e. should correspond to the previous phrase (that is, it should state “i.e., without and with the presence of ions, respectively,”

6598/4: “detectable”

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6602/2: “the” not needed in front of pinanediol

6604/24: reword the awkward phrase: “fragments the ions less strongly pronounced”

6605/2: suggest “possible locations” instead of “possibilities”

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 6595, 2014.

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