

Interactive comment on “Chemical characterization of atmospheric ions at the High Altitude Research Station Jungfraujoch (Switzerland)” by Carla Frege et al.

Anonymous Referee #3

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This paper reports field measurements of atmospheric ions over a nine month period in the free troposphere at Jungfraujoch, Switzerland. The study focused primarily on negative ions, i.e., producing seven categories of ions, relevant to two important topics (halogen chemistry and new particle formation, NPF) that the authors spent their efforts to elaborate. Atmospheric ions are of great interest to atmospheric chemistry, especially their composition, distribution, and roles in new particle formation and other ion chemistry. Issues and comments on this manuscript are listed below:

1. All the discussion in this paper is based on the results from negative ion measurements. The presentation of positive ions seems distractive rather than helpful to the overall conclusion of the study. It is suggested that only a few sentences would be

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enough to illustrate characteristics of positive ions.

2. Figure 1 (a, b) is an average spectrum over the whole campaign period and detailed information on seasonal variation might be lost. The authors should provide at least some comparisons of the spectra among different seasons to demonstrate little variation among seasons so that this average method is validated.

3. The authors proposed several plausible mechanisms for night time production of sulfuric acid. However, those mechanisms are for sulfuric acid molecules and the measurements are for ions only, not for molecules or clusters (no chemical ionization is applied). How this representation of molecule or cluster formation related to measured ions needs to be further illustrated.

4. Figure 10b show higher signal intensities for m/z higher than 300, but it doesn't mean this higher portion is responsible for NPF, since there are still significant “residue” for m/z below 300 Th that may also possibly contribute to NPF. 5. Page 7, L21-22, Ehn et al. (2010) is not the first to report this ion of SO_5^- . In fact, Eisele et al., (JGR, 111, D04305, 2006) mentioned how this ion was produced in the atmosphere.

6. Page 12, L1, please correct typos; L9, correct typos in “5 had an RH between 38-62% and 16 a RH between 72-99%”; the last paragraph obviously present contradictive conclusions for the nature of SO_5^- and the authors need to provide some clarification.

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