



EGUsphere, referee comment RC1
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Comment on egusphere-2022-1182

Anonymous Referee #1

Referee comment on "Measurement report: Molecular-level investigation of atmospheric cluster ions at the tropical high-altitude research station Chacaltaya (5240 m a.s.l.) in the Bolivian Andes" by Qiaozhi Zha et al., EGU Sphere,
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This manuscript presents a large dataset of atmospheric cluster ions at a high-altitude station in the Southern Hemisphere over a 5-month campaign, which is important. This work is one of the few existing studies reporting cluster ion composition at high altitudes, and probably the only one in the Southern Hemisphere. The chemical composition of the cluster ions was determined by using state-of-the-art instrumentation. The authors show interesting seasonal variations of the observed ions and attribute them to the properties of parent neutral molecules and different source origins by combining the results from the FLEXPART model. The potential link between the observed cluster ions and aerosol nucleation is also discussed. The manuscript is well-written and within the scope of ACP as a measurement report. I recommend it be accepted after the authors address several (minor) comments listed below:

- While the authors attributed the variations of some cluster ions (e.g., NO₃⁻ and HSO₄⁻) to the abundance and properties of their parent neutral molecules in a convincing way, it would be better to show the observed concentrations of, e.g., NO_x and SO₂.
- This reviewer understands that the seasonality of positively charged ions could not be determined because they were only measured in wet season. A significant fraction of the discussion in the manuscript is thus based on measurements of negatively charged cluster ions. However, as mentioned in line 554, the increase of large positive ions was found concurrently with NPF events. It would be better if the authors could specify the chemical composition of the NPF-related positive ions instead of the sum of the signals over a certain mass range.

- It is odd to see the fraction of SA-NH₃ and SA cluster ions started increasing before the onset of nucleation (line 530), and an explanation for this may be needed. The reviewer suggests the authors make sure the aerosol data in Fig. 10 are synchronized with cluster ion data.

