

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2021-133

Anonymous Referee #2

Referee comment on "Air pollutants in Xinjiang during the COVID-19 pandemic and glaciochemical records of a Tien-Shan glacier" by Feiteng Wang et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-133-RC2>, 2021

In this study the authors report some observational analyses of the impact of Covid-19 pandemic restriction measures on air pollutants in Xinjiang, China, and ions/particles in Tien-Shan glacier. They found that NO₂ had a large reduction during certain time periods, compared to small variations in SO₂, CO and PM_{2.5}. Soluble ions in Tien-Shan snow samples also decreased by 20-30%, although BC and OC showed no differences from 2018 to 2020. The measurements are new and interesting. However, the paper in its current form reads more like a short measurement report. More in-depth analysis is needed to make the paper more scientifically significant. Please see my specific comments below.

Major comments:

- The authors seem to assume that air pollutants at the surface sites and species in Tian-Shan glacier are from local sources in Xinjiang, so emission changes in surrounding regions are not discussed. This is likely not the case, especially for the long-lived ones such as CO. The authors should review relevant studies in the literature on source attribution and/or run air mass back-trajectories to track the sources of pollutants reaching the measurement sites. This would help better understand the observed changes, spatial variation and their relationship with emissions.
- The observed changes are attributed to mobility and emission changes. How about the roles of atmospheric dynamical, physical and chemical processes? Atmospheric transport, dry/wet deposition and chemical reactions should affect the concentrations of the air pollutants. It could be more complicated for the concentrations of ions, BC and OC in snow that involve precipitation and snow melting processes. The direct year-to-year comparisons may be biased due to large interannual variability in these processes. Comparison of 2020 results to longer-term mean might be helpful. More analyses and discussions in this regard are necessary.
- How accurate is the snow dating for the recent past back to 2018? The different results of 2019 between the two snow pit profiles need more clarification. What are the possible reasons for the differences? Please clarify.

Minor technical comments:

Line 34: has -> have

Line 101: Please check the measurement end date of December 31, 2021.

Line 110: Suggest using present tense for this sentence; Staff should be used as a singular noun here.