

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2022-298

Anonymous Referee #1

Referee comment on "Comparison of atmospheric CO, CO₂ and CH₄ measurements at Schneefernerhaus and the mountain ridge at Zugspitze" by Antje Hoheisel et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-298-RC1>, 2022

This study compares two years of highly resolved records of CO, CO₂ and CH₄ measured in two different locations at Zugspitze, which are the Schneefernerhaus and the more remoted Zugspitz mountain ridge (156 m higher in elevation). The study represents important work in the assessment of data quality recorded at the Environmental Research Station Schneefernerhaus, especially as more and more sources of anthropogenic contamination may affect such remote places, which in turn may eventually influence the high precision measurement sporadically. They conclude that the mountain ridge site is almost unaffected by pollution and that the manual flagging procedure allows the successful removal of local pollution events in the Schneefernerhaus record. In addition, small excess in CO₂ could be attributed to anthropogenic sources. The analytical procedure is well described and an advantage of the measuring line is that the air samples are delivered to three different instruments in a simple and straightforward way. Overall, the study is concise and well-structured. I thus recommend its publication in AMT after minor revisions listed afterwards.

Specific comments:

The authors attribute the CO₂ spikes to anthropogenic contamination, namely in the abstract. Is it possible to attribute those spikes only to anthropogenic sources? Or the complex topography and/or wind patterns may also play an important role as mentioned (Lines 259-260). Maybe that the authors should stress the difficulty they encountered when disentangling both processes.

Data flagging: I understand that CO and CH₄ spikes can be easily flagged (essentially due to snow clearing); however, how are the CO₂ spikes manually flagged? Except for scientists working on the terrace, is there any other CO₂ contamination flagged? Is it possible to quantify the influence of scientists working on the terrace?

The paper would benefit in general from a few more appropriate references. As for instance in Section 3.6.

The figure captions could be extended with more detailed information so that we can understand them alone.

Minor comments:

Lines 17-18: Add countries to station's name

Line 37: and tourism

Lines 41-42: Is there a local reference paper? You may want to cite Bukowiecki et al., 2021. **DOI** 10.1088/2515-7620/abe987

Line 144: Isn't it 126 m higher?

Line 61: You mention an elevation of 2669m a.s.l. for the air inlet located at the 5th floor. In the abstract, you mention an elevation of 2666m a.s.l. for the station. Is it correct?

Lines 63-64. A reference is missing here. Or you mean that it is shown in this paper?

Lines 73-74: add ZSF and ZGR. Throughout the text you mostly use "Schneefernerhaus" and only a few times "ZSF" (for instance lines 110, 112, 154). Stick maybe to "Schneefernerhaus". The same with "mountain ridge" and sometimes "ZGR" (lines 110, 111).

Lines 164-166. Can you mention the restriction? Did it lead to the cease of tourism for a while? It could also be interesting to show on Fig. 2 from when to when these restrictions occurred. The covid pandemics could possibly be discussed and used in this study to a greater extent, as it is supposed to have noticeably reduced pollution events.

Line 170: Is it a CH₄ reverse "spike" or more generally a longer excursion?

Line 205: "to the QC datasets reported to national and international databases". Not clear, precise.

Lines 264-265: Shouldn't it then be explained by other mechanisms compared to Jungfrauoch?

Lines 267-268: Are there other possible explanations?