

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2021-718

Anonymous Referee #2

Referee comment on "Unveiling atmospheric transport and mixing mechanisms of ice-nucleating particles over the Alps" by Jörg Wieder et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-718-RC2>, 2021

This is a careful detailed study of INP from two sites separated vertically over complex terrain. The vertical transport of INP is investigated. Overall, I suggest publication with the following minor revisions.

Abstract Line 3: I would state this phrase more carefully. "INP, which **measurements suggest** are sparsely populated in the troposphere.

Introduction Line 15: Field and Heymsfield, 2015 is not an appropriate or original reference for this statement.

Starting at Line 38. It is important to clarify earlier that an **idealized** PBL is in a well-mixed state with constant potential temperature and aerosol number concentration with height. This is stated later an idealized description, but should instead be clarified initially.

Line 56 – I am confused by term "arbitrary"

Line 115 – more information is needed pertaining to the inlet. What is the efficiency of the inlet at different aerosol sizes?

Line 190 – clarify why locations were omitted, since trajectories passed close to mountain tops? The reasoning here is unclear.

Figure 3 – excellent plot, easy to understand

Line 237 – this can also be caused by a combination of both (down from higher altitude and local sources)

Line 244 – what 3 scenarios are referenced here? soot, biomass burning (with and without dilution), or... This may need to be rephrased.

Figure 5, can you speak to the uncertainty of the measurement (or at least statistics around the medians).

Line 254 – Important point is that global long-range transport events were removed. This should be stated at other times within the paper.

Figure 6 – can you add the % of cases (or number of cases) for each of the 4 wind scenarios?

Figure 7 – the use of “/” rather than (StdL^1) is quite confusing. It appears as a ratio rather than a unit.

Figure 8 – are all 4 panels needed. There is very little science results outside of the NW plot. Could the other 3 panels be moved to supplemental figures?

Figure 9: I found this confusing. The color bar states that orange references 24-48 hours before sampling. Yet the caption states that orange circles indicate locations where a trajectory's ten minute time step was lower than 500 m above ground. Why are these two conditions met at the same time?

Line 370-385 – This is speculative and potentially should be phrased with less certainty.