

## ***Interactive comment on “How frequent is natural cloud seeding over Switzerland?” by Ulrike Proske et al.***

### **Anonymous Referee #1**

Received and published: 14 January 2021

In their paper "How frequent is natural cloud seeding over Switzerland", the authors quantify the occurrence of an ice cloud layer above other clouds from CALIOP/CloudSat (DARDAR) data. In addition, the possibility of ice crystals sedimenting into the lower layers is calculated from temperature and relative humidity profiles based on ERA5.

The paper is well written, the method is sound, the analysis is careful and the results are very interesting. I recommend the manuscript for publication after minor revisions.

Main comments:

- I don't understand the "filtering" or smoothing of the data. Line 121 mentions a 7x7x7 points cube, but what are these three dimensions? Why is the median used? How

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sensitive are the results to this filtering?

- Line 131 says that reff is also filtered “for consistency”, but the smoothing applied here is very different. What impact does this have on the results?

- The temperature in the DARDAR dataset is also not a retrieved parameter, but is obtained from interpolated NWP data, if I’m not mistaken. How different is this from the ERA5 temperature? Is the discrepancy in the sublimation calculations only due to a discrepancy in relative humidity or also in temperature? How is this affected by the smoothing?

- Sometimes the terminology is a little unconventional. The term “seeder-feeder” is also used for cases in which ice crystals fall into pure ice clouds. I don’t think the term is appropriate in this case. Further, the ice cloud layer below  $-35^{\circ}\text{C}$  is termed “cirrus”, even if it is the upper part of a mixed phase cloud – e. g. a frontal cloud or a convective cloud. I would reserve “cirrus” for isolated ice clouds.

Other minor comments:

- Table 2 gives coefficients “for cloud droplets”, shouldn’t this be ice particles?

- Fig. 3(b): Why does the cumulative occurrence frequency for the situation with a cirrus cloud does not reach 1 minus the cirrus cloud frequency (i.e. a little less than 0.6) at 10km?

- What is the sensitivity to the time step of the sublimation calculations?

- Line 140: “mean values” of what?

- Line 416: I suggest to include the reference to the companion paper only if it is already available (at least as preprint) when the revised version of this manuscript is published. Otherwise, this is more confusing than helpful for the readers.

Technical comments:

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- Caption of Fig. 3: typo “atmosphere”
- Line 352: “for spheres”: blanks missing.
- Table A2: typo “Earh”

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-1145>, 2020.

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