

Reply to Report #1 of referee #1, Dr. Paul DeMott: Interactive comment on “The contribution of Saharan dust to the ice nucleating particle concentrations at the High Altitude Station Jungfraujoch (3580 m a.s.l.), Switzerland” by Cyril Brunner et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-643-RC1>, 2021.

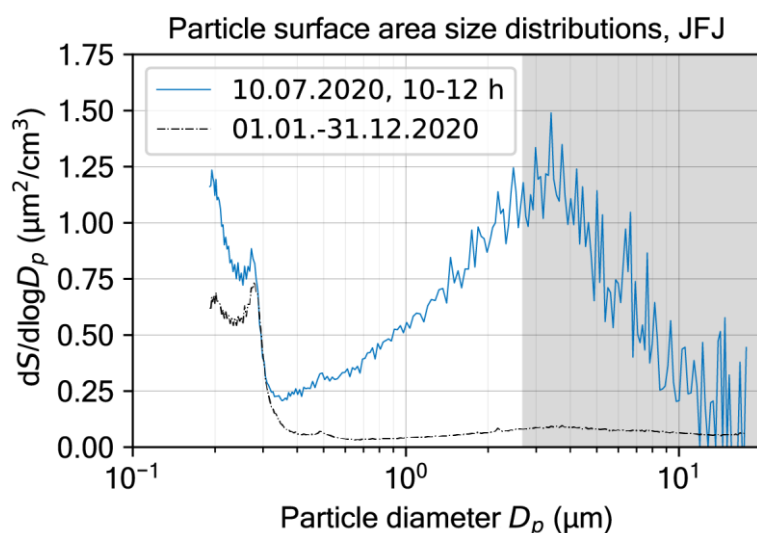
Reviewer comments are reproduced in **bold** and author responses in normal typeface; extracts from the original manuscript are presented in *red italic*, and from the revised manuscript in *blue italic*.

As I was already convinced that the paper was nearly suitable for publication, I have only a few comments in response to the revisions.

We would like to thank Dr. Paul DeMott for reviewing the revised manuscript, for the valuable comments and address the comments individually below.

1. Figure A2: This is counts per bin, dN , or is it $dN/d\log D_p$? And should you not be plotting $dS/d\log D_p$ (surface area rather than number)? The statement that 35% of the overall surface area is being contributed in the gray shaded area is not directly clear when showing only counts. Plotting in surface area space would best support the stated results about INPs missed by the HINC due to surface area.

We agree with the reviewer, and changed Figure A2 (revised manuscript) as follows:



Mean particle surface area size distributions at the JFJ during a SDE at 10:00-12:00 UTC on July 10, 2020 (blue line) and between January 1, and December 31, 2020 (black dashed line), both measured with an OAS. Only particles with diameters $< 2.5 \mu\text{m}$ are sampled by HINC-Auto due to the sampling line geometry and flow rates used. All particle $> 2.5 \mu\text{m}$ (gray shading) between February 7 and December 31, 2020 contribute during all SDE periods to 35 % to the overall particle surface area. Surface area calculations assumed perfectly spherical particles.

2. Regarding new discussion about including arable soil dusts by altering the term to simply “dust” versus “mineral dust”, I am not sure about the term “biological surface features”. I understand that this is difficult to generalize, but perhaps biogenic material content? It is not only proteinaceous material being referred to, which I why I might suggest biogenic versus purely biological.

We agree with the reviewer, and changed lines 364-370 (revised manuscript) as proposed:

Whether this is because of the ice nucleation activity of the mineral dust or because of biogenic material content, as proposed by other studies (e.g., see O’Sullivan et al., 2016; Augustin-Bauditz et al., 2016), is

outside of the scope of this study. Biogenic material on the dust particles as the predominant cause of the ice nucleation activity of the particles would have two main implications.

Furthermore, we changed lines 372-374 (revised manuscript) as proposed:

Secondly, it would raise the question of the source of the dust particles containing ice-active biogenic material to be potentially from dried lake beds in desert regions or agricultural regions that are not differentiated in this work.

In addition, we changed lines 401-403 (revised manuscript) as proposed:

To validate the stated contribution in future studies or investigate the presence of biogenic material causing the ice-activity, we propose to separate INPs from the bulk aerosol population to analyze the chemical composition of the INPs as well as study the surface using scanning electron microscopy.