

Atmos. Chem. Phys. Discuss., referee comment RC3
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Comment on acp-2021-643

Anonymous Referee #3

Referee 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-RC3>, 2021

This study provides interesting insights into the linkage between mineral dusts from the Sahara and ice nucleation activity at low temperature at the Jungfraujoch station. By using a wide array of instruments, techniques, and model data the authors were able to assign Sahara dust events and link it to INP concentrations. Even though many assumptions were necessary for the data curation, the authors clearly stated the limitations of each technique. The authors further hypothesize possible dust transport pathways within the atmosphere. Generally, the article is well written, concise and the results are of general interest for the scientific community. The provided data will improve the knowledge of the field and are important for further model studies on clouds and climate. However, I suggest minor revisions before publication:

General comments:

Introduction:

Can you explain in the introduction in more detail why you have chosen 243 K and Sw of 1.04 as the parameters for your measurements? I assume it is due to general mixed phase conditions. However, why is this particular temperature area so important for ice nucleation including mineral dust and not e.g. 250K? Please elucidate in more detail so a general reader can better follow the content.

Materials and Methods:

Line 116: I think it would improve the manuscript and makes it clearer to the reader if you could explain the Single scattering albedo Angström exponent in more detail.

Line 203: The classification of air masses comes a little bit abrupt. Could you mention that at the of the introduction where you summarize the investigations? (just a suggestion)

Figure 4: The figure gives a good overview of the collected data to assign a dust event and compare it to INP concentrations. The caption reveals much information. However, I miss an explanation of the figure in the continuous text.

Results:

The results point out that further characterizations are necessary in order to estimate the role of mineral dust and other INPs on microphysical processes in the atmosphere. You mentioned in the manuscript in one sentence (line 321) that you cannot draw any conclusions on the influence of biogenic coating. However, I wonder whether this would be an important information? I think the manuscript would benefit if this would be discussed and commented in more detail. In addition, how could you improve future studies to target this issue?

Technical Comments:

Line 82: Jungfraujoch (JFJ) – abbreviation was already introduced above

Line 88: space is missing between the number and the unit (check throughout the whole paper)

Line 89: m/s or $m\ s^{-1}$ – only use one style

Line 119: [...] more 'than' 6 consecutive [...]

Line 119: This is longer than the 'previously' [...] (?)

Line 127: [...] MERRA-2 'with' [...]

Line 135/136: meters were abbreviated before

Line 227: introduce the abbreviations and delete them below (line 231/232); Carbon dioxide (CO) and reactive nitrogen (NOy)

Figure 4 caption: superscript '222'-Radon

Line 253: '85°' is missing a degree sign

Table 1: All INP 'concentrations' missing the letter s in the end

Line 302: Figure or Fig.? chose one style

Line 349: I guess at the end of the sentence it should be 'can'?

