Ice nucleating particles and ice multiplication at moderate supercooling

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1. Project description

In 2018 we had analysed on Jungfraujoch single snow crystals (dendrites) for the presence of ice nucleating particles that may have initiated their formation. We found that only about 1 in 8 crystals contained such a particle, while the remainder of the crystals were probably of secondary origin, i.e. had formed from ice splinters generated through ice-ice collision or through other processes (Mignani et al., 2019). In February and March 2019, we had the opportunity to repeat these measurements at Weissfluhjoch (2693 m a.s.l.), near Davos, during the RACLETS campaign organised by the *Atmospheric Physics* group at ETH Zürich (https://www.envidat.ch/group/about/raclets-field-campaign).

Although analysis of the data is still ongoing, we can already say that the fraction of secondary crystals was several times larger at Weissfluhjoch as compared to what we had seen at Jungfraujoch. An explanation may be the different topography in the main wind sector at both sites. While Jungfraujoch has a more open field-of-view, with consistently lower mountains upwind, Weissfluhjoch is more enclosed by mountains of similar elevation (Figure 1). Therefore, secondary ice particles ingested into clouds from snow-covered surfaces upwind, and growing into dendrites within several tens of minutes, might be able to reach the observatory on Weissfluhjoch, but not at Jungfraujoch, where ice emitted at a similar elevation does not travel for long enough to grow into dendrites before arrival.

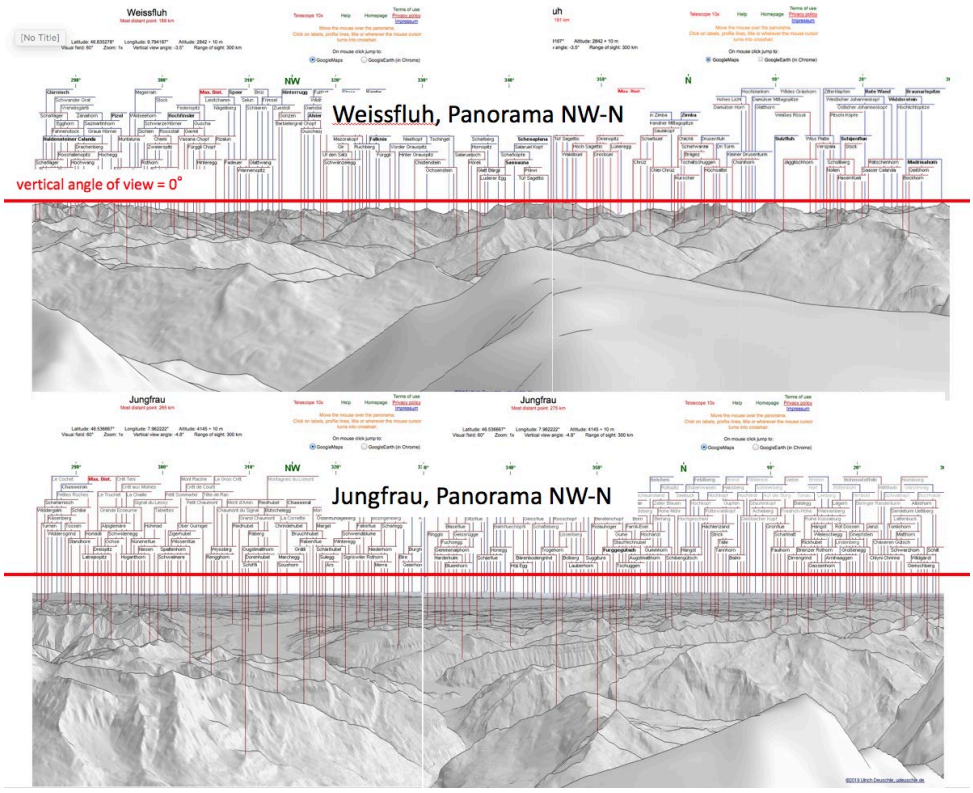

Figure 1. Comparison of panoramas seen from Weissfluh and from Jungfrau, covering the sector from 285° to 30°. Red lines indicate the astronomical horizon (vertical angle of view = 0°).

The panoramas were obtained from: http://www.udeuschle.selfhost.pro/panoramas/makepanoramas_en.htm

Collaborating partners / networks

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Scientific publications and public outreach 2019

Refereed journal articles and their internet access

Mignani, C., J.M. Creamean, L. Zimmermann, C. Alewell, and F. Conen, New type of evidence for secondary ice formation at around -15 °C in mixed-phase clouds, Atmos. Chem. Phys., **19**, 877-886, doi: 10.5194/acp-19-877-2019, 2019. https://doi.org/10.5194/acp-19-877-2019

Creamean, J.M., C. Mignani, N. Bukowiecki, and F. Conen, Using freezing spectra characteristics to identify ice-nucleating particle populations during the winter in the Alps, Atmos. Chem. Phys., **19**, 8123-8140, doi: 10.5194/acp-19-8123-2019, 2019.
https://doi.org/10.5194/acp-19-8123-2019

Conference Papers

Mignani, C., J.M. Creamean, L. Zimmermann, C. Alewell, and F. Conen, Probing secondary ice formation at around -15 °C in mixed-phase clouds, EGU General Assembly 2019, Vienna, Austria, April 12, 2019 (oral presentation).
https://meetingorganizer.copernicus.org/EGU2019/EGU2019-7048.pdf

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