

Long-term study of aerosol particle formation in the free troposphere

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Part of this programme: ACTRIS

Keywords: new particle formation; air ions; free troposphere

1. Project description

In the beginning of November 2019, in collaboration with the Paul Scherrer Institute, we installed a Neutral cluster and Air Ion Spectrometer (NAIS) at the Sphinx observatory, Jungfraujoch (3580 m asl). The NAIS is a low-maintenance instrument capable of measuring the air ion number-size distribution between 0.8-42 nm and the particle number-size distribution between 2-42 nm. This makes the NAIS ideal for studying atmospheric nucleation and aerosol particle growth. Our aim is to collect a long-term continuous time series with the NAIS and compare it with other measurements at the research station in order to better understand the processes and trends in new particle formation at high altitudes.

In 2016 and 2017 a different NAIS was measuring at the Jungfraujoch East ridge. We are currently analyzing the results from these measurements.

So far at the Sphinx we have observed very low number concentrations of negative cluster ions (Figure 1), but also at various places around the station including away from the buildings. We believe that the lack of negative cluster ions might be due to an enhanced atmospheric electrode effect. The atmospheric electrode effect repels negative air ions away from the ground, and the effect would be enhanced at mountain peaks and ridges because the earth's electric field is stronger at locations of increased curvature. This would also explain previous similar observations at the East ridge since the Sphinx observatory and the East ridge are both located on a sharp mountain ridge. In order to further understand the phenomenon, and its effect on ion concentrations at the measurement site, we plan on installing an electric field meter at the station in the future.

Collaborating partners / networks

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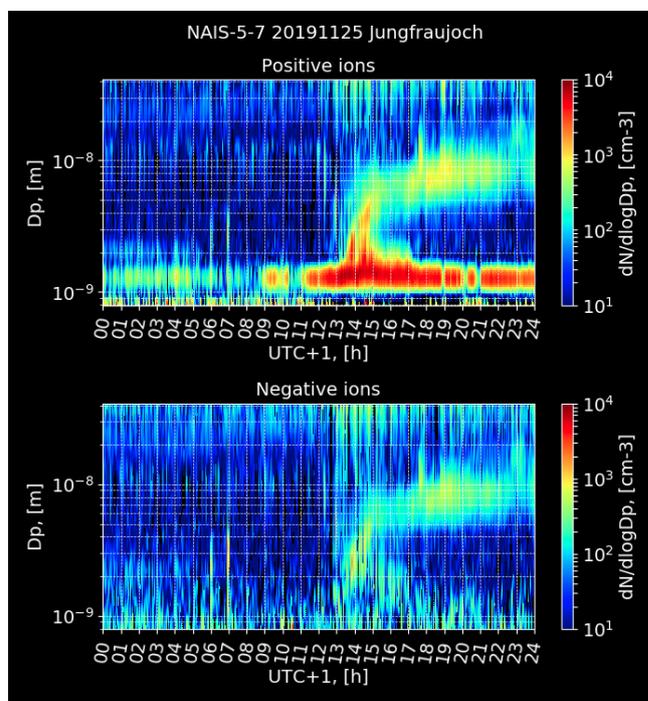


Figure 1. The number-size distribution of negative and positive ions measured at Jungfraujoch by the NAIS on November 25, 2019. At approximately 13:00 h a nucleation event is observed to start. In the 1-2 nm size-range the low concentration of negative ions compared to the positive ions is clearly visible.

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