

New particle formation events observed in the lower free troposphere

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Atmospheric aerosols can affect the climate directly by absorbing or scattering incoming radiation and also indirectly by acting as a cloud condensation nuclei (CCN). A recent study estimates that the major fraction of CCN comes from gas to particle conversion (nucleation) (Merikanto *et al* (2009)).

During the last decade, many nucleation studies were conducted in the field, however most of them in the planetary boundary layer (PBL). Therefore our knowledge is mainly limited to PBL conditions, and only little information is available about the free tropospheric case.

The aim of this study is to understand what species contribute to new particle formation (NPF) in the free troposphere with a focus on the formation of the first nucleating clusters.

In order to monitor and characterize new particles formation processes, a number of state-of-the-art instruments were deployed continuously at the Swiss high alpine research station Jungfraujoch (3580 meters altitude) (Baltensperger *et al* (1998)). Although the station is regularly in clouds (40% of the time), NPF are quite often encountered (Boulon *et al* (2010)).

We deployed for the first time two Atmospheric Pressure interface TOF Mass Spectrometers (APi-TOF, Junninen *et al* (2010)) and a CI-APi-TOF (Jokinen *et al* (2012)) at such a high altitude. The two APiTOFs could measure the chemical composition of the positive and negative ions during these events and the CI-APi-TOF provided information on the chemical composition of the neutral species during the nucleation events.

Several nucleation events were observed at the Jungfraujoch during the campaign, mostly under clear sky conditions. Figure 1 shows the size distribution of neutral particles (top two panels) and of the ions (bottom two panels) measured with a neutral air ion spectrometer (NAIS) during such a nucleation event. We will present for the first time a detailed analysis of the evolution of the particles during NPF and also the chemical composition of the small clusters measured with these advanced mass spectrometers.

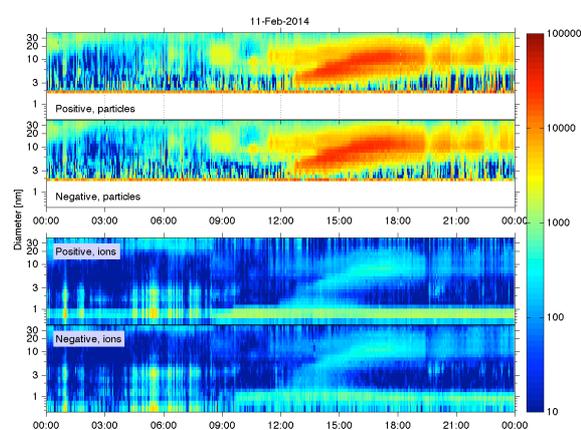


Figure 1. Size distribution of neutral particles (top two panels) and of ions (bottom two panels).

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