Field measurements of ice nucleating particles on the High Altitude Research Station Jungfraujoch

LARISSA LACHER[1*], ULRIKE LOHMANN[1] AND ZAMIN A. KANJI[1]

[1]Institute for Atmospheric and Climate Science, ETH Zurich, Switzerland (*correspondence: larissa.lacher@env.ethz.ch)

Despite their importance in the Earth's system, fundamental knowledge on the formation and further development of clouds containing ice is still missing [1]. Only a tiny fraction of ambient aerosol particles are ice nucleating particles (INP) but continuous measurements of their concentrations in an environment relevant for ice and mixed-phase clouds are rare. We perform measurements with our newly built instrument HINC (Horizontal Ice Nucleation Chamber) [2] at the High Altitude Research Station Jungfraujoch in the Swiss Alps. The site provides free tropospheric conditions with seasonal influence from convectively lifted boundary layer air [3] [4]. Furthermore, it is regularly affected by Sahara dust events [5]. By measuring during different seasons of the year we address the question of an annual cycle of INP concentrations in the free troposphere and investigate the influence of boundary layer air and Saharan mineral dust. We sample aerosols at 242 K in the deposition nucleation mode, which is relevant for the formation of pure ice clouds [6], and in the condensation freezing mode, representative of mixed-phase cloud formation conditions. [7]. Results from the first two field campaigns in August 2014 and January 2015 are compared to previous measurements on Jungfraujoch. The concentrations range from almost zero to hundreds of INP l^{-1} and are generally an order of magnitude higher in the condensation freezing mode as compared to deposition mode. Increased INP concentrations are measured during springtime, when the site might be influenced from biological material. Highest concentrations are observed during Sahara dust events. With the continuation of these measurements we have a longer time series and climatology and therefore a better understanding of the evolution of INP concentration on Jungfraujoch.

[1] Boucher *et al*. (2013), in the 5th assessment report of the IPCC. [2] Kanji & Abbatt (2009), *Aerosol Sci. Technol.* **43**, 730-38. [3] Lugauer *et al*. (1998), *Tellus B*. **50**, 76-92. [4] Zellweger *et al*. (2003), *Atmos. Chem. Phys.* **3**, 779-96. [5] Collard Coen *et al*. (2004), *Atmos. Chem. Phys.* **4**, 2465-2480. [6] Cziczo *et al*. (2013), *Science* **340**, 1320 – 1324. [7] Welti *et al*. (2014) *J. Atmos. Sci.* **71**, 16-36.