

Publication

Measurement report: Ice-nucleating particles active ≥ -15 °C in free tropospheric air over western Europe

Journal Article (Originalarbeit in einer wissenschaftlichen Zeitschrift)**ID** 4642430**Author(s)** Conen, Franz; Einbock, Annika; Mignani, Claudia; Hüglin, Christoph**Author(s) at UniBasel** [Conen, Franz](#) ; [Einbock, Annika](#) ; [Mignani, Claudia](#) ;**Year** 2022**Title** Measurement report: Ice-nucleating particles active ≥ -15 °C in free tropospheric air over western Europe**Journal** Atmospheric chemistry and physics**Volume** 22**Number** 5**Pages / Article-Number** 3433-3444

Ice-nucleating particles (INPs) initiate ice formation in supercooled clouds, typically starting in western Europe at a few kilometres above the ground. However, little is known about the concentration and composition of INPs in the lower free troposphere (FT). Here, we analysed INPs active at -10 °C (INP -10) and -15 °C (INP -15) that were collected under FT conditions at the high-altitude observatory Jungfraujoch between January 2019 and March 2021. We relied on continuous radon measurements to distinguish FT conditions from those influenced by the planetary boundary layer. Median concentrations in the FT were $2.4-10^{-3}$ and $9.8-15^{-3}$, with a multiplicative standard deviation of 2.0 and 1.6 respectively. A majority of INPs were deactivated after exposure to 60 °C; thus, they probably originated from certain epiphytic bacteria or fungi. Subsequent heating to 95 °C deactivated another 15 % to 20 % of the initial INPs, which were likely other types of fungal INPs that might have been associated with soil organic matter or with decaying leaves. Very few INP -10 withstood heating to 95 °C, but on average 20 % of INP -15 in FT samples did so. This percentage doubled during Saharan dust intrusions, which had practically no influence on INP -10 . Overall, the results suggest that aerosolised epiphytic microorganisms, or parts thereof, are responsible for the majority of primary ice formation in moderately supercooled clouds above western Europe.

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