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# Atmospheric Ice-nucleating particle measurements at various locations and altitudes using FAAM research aircraft

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Atmospheric water droplets supercool in the atmosphere reaching temperatures below -35$^o$C when they freeze via homogeneous freezing. However, under the presence of certain aerosol particles known as Ice-nucleating Particles (INPs), ice formation can happen at higher temperatures via heterogeneous freezing. Nucleation by particles immersed in droplets is a critically important process in the evolution and properties of mixed-phase clouds. A major limitation is that there are very few measurements of INP concentrations at altitude.

Here we describe a filter based technique to measure atmospheric Ice-nucleating particles (INPs) in the immersion mode on board of the BAe-146 FAAM aircraft at different locations and altitudes and present the results obtained during three contrasting field campaigns. INP measurements are carried out in parallel with a compositional analysis which consists in scanning the aerosol samples on filters under the Scanning Electron Microscope (SEM), obtaining the size-segregated composition of the atmospheric aerosol particles. This double analysis has been applied already in two aircraft campaigns, EMERGE (London, July 2017) and VANAHEIM (Iceland, October 2017) and it will be performed again during MACSSIMIZE (Alaska, March 2018). The results clearly show that the overall INP concentrations were lower in Iceland than in the UK.

Mineral dust particles are known to be one of the most efficient INPs from many laboratory studies. With our size segregated compositional SEM analysis, we can quantify the surface area of mineral dust present in the sample, and compare it with the INP concentration measured in parallel. This analysis has shown that mineral dust could be the main contribution to the INP concentration, especially at -20$^o$C for all the samples that have been analyzed so far.

We will be measuring INPs and aerosol composition in Alaska in March. Our technique will aim to evaluate if mineral dust, particularly local sources, is significantly contributing to the INP concentration at high latitudes.