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Measurements and new model calculations for the airborne Fast Ice Nuclei CHamber FINCH-HALO

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Abstract

Ice nuclei (IN) initiate the formation of primary ice in tropospheric clouds. In mixed phase clouds the primary ice crystals can grow very fast and form precipitation by the Bergeron-Findeisen process [*Findeisen, 1938*] at the expense of evaporating water droplets. Thus, IN are essential for the development of precipitation in mixed phase clouds at middle latitude. However, the role of IN in the development of clouds is still poorly understood and needs to be studied further[*Levin and Cotton, 2007*]. A Fast Ice Nuclei CHamber (FINCH-HALO) for airborne operation on the High And LOng Range research aircraft (HALO) was developed at the Institute for Atmospheric and Environmental Sciences, University Frankfurt. The setup of the new FINCH-HALO instrument is based on the laboratory version of the IN counter FINCH [*Bundke, 2008*]. IN particles are activated within the chamber at certain ice super-saturation and temperature by mixing three gas flows, a warm moist, a cold dry, and an aerosol flow. After activation the particles will grow within a processing chamber. In an optical depolarisation detector droplets and ice crystals are detected separately. Using an additional fluorescence channel it is possible to classify IN for their biological content- see [*Bundke et al., EGU2010-9432, Bundke, et al, 2009*], for details.

First measurements at ice onset temperatures down to -40°C will be shown. Furthermore CFD calculations of a newly designed inlet section will be presented. In this improved design only two air flows are mixed to provide supersaturation and temperature conditions needed for IN activation. A feasibility study demonstrate, that measurements at ice onset temperatures down to -60°C are possible by combining the new inlet section with a new powerful cooling unit.

References

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