# Properties of Arctic mixed-phase clouds explored by multi-frequency radars

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Arctic clouds pose a large challenge to weather and climate models. The new G-band radar GRaWAC (G-band Radar Water vapor profiling and Arctic Clouds) is a frequency-modulated continuous wave radar with two frequencies at 167.3 and 174.8 GHz. Measuring at higher frequencies than conventional cloud radars and near the 183 GHz water vapor absorption line enables for extracting water vapor profiles in clouds by making use of the differential absorption technique for the measurements at the two frequencies. In combination with radar measurements in the W-band, the high frequencies also make the observations of small hydrometeors in the non-Rayleigh regime possible, enabling future retrievals of hydrometeor phase and size distribution.

The data used for this objective are from the ship-based campaign VAMPIRE that took place from August to October 2024 in the Central Arctic Ocean on the research vessel Polarstern and from a ground-based intensive operation period from January to March 2025 in Ny-Ålesund, Svalbard. The G-band radar GRaWAC alongside a W-band radar measured in both campaigns, with the ground-based observation expanded by a Ka-band radar. The addition of a third band enables an analysis of icy hydrometeor formation on top of the size retrieval from two frequency bands. First results show the presence of mixed-phase clouds which will be evaluated along with their environmental conditions. The contribution will present the corrected radar data of the ship campaign, considering the influence of gas attenuation, and first analyses of microphysical properties in mixed-phase clouds and water vapor profiles.