

VAMPIRE dataset - Arctic clouds, water vapor and sea ice emissivity

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The interplay of atmosphere and sea ice becomes increasingly complex and hard to model in a warming Arctic, with several climate variables factoring in. The VAMPIRE dataset aims to provide insight on three of these variables: properties of mixed-phase clouds, atmospheric water vapor, and sea ice emissivity. Particularly in the Arctic, where data are scarce, water vapor, clouds, and precipitation present significant challenges for weather and climate models and are essential components of feedback mechanisms affecting the Arctic amplification. While satellites provide much-needed data on clouds and water vapor over the Arctic region, they are impacted by the highly variable surface emissivity.

The VAMPIRE dataset was collected in summers 2024 and 2025 during four months in total in the Central Arctic Ocean on the research vessel *Polarstern* and details Arctic mixed-phase clouds, water vapor and sea ice emissivity. On board were a dual wavelength G-band radar, a W-band cloud radar, two microwave radiometers spanning from 22.24 GHz to 340 GHz and scanning between atmosphere and surface, alongside wind and precipitation measurements, and 6- to 12-hourly radiosondes were launched every day. The contribution will detail the dataset, retrievals and synergies applied to the data and the possibilities the dataset offers.