Airborne remote sensing in the Arctic used to evaluate models and satellite observations

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The phenomenon of Arctic Amplification is most evident in the rise of the near-surface air temperature observed in the last decades being at least twice as strong as the global average. The mechanisms behind that are widely discussed. Many processes and their feedback mechanisms are still poorly understood, especially considering the role of clouds. To increase the understanding of such processes and to improve their representation in models, direct observations are needed, but are barely available. Within the research initiative "Arctic Amplification: Climate relevant atmospheric and surface processes and feedback mechanisms (AC)3", several airborne campaigns aimed to provide observations of clouds and precipitation by state-of-the-art remote sensing instruments.

Within this contribution, we will present measurements and datasets from the remote sensing suite operated onboard the Polar 5 research aircraft of the Alfred-Wegener Institute for Polar and Marine Research (AWI) during four airborne campaigns over the Arctic ocean and sea ice out of Svalbard. The measurements provide unique opportunities for the evaluation of satellite products and atmospheric models, e.g., cloud vertical structure, liquid water path, and sea ice emissivity. We assess models and reanalysis with two approaches: (i) model-to-observation via the forward simulator PAMTRA and (ii) the development of products from the observations from the synergy of cloud radar, lidar, and microwave radiometer measurements.