NARVAL Airborne remote sensing of clouds and precipitation for satellite validation with HALO

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The representation of cloud and precipitation processes is one of the largest sources of uncertainty in climate and weather predictions. By satellite remote sensing instruments, atmospheric water can be observed on a global scale, but small scale features are missed due the coarse spatial resolution.

Within the NARVAL (Next-generation Aircraft Remote sensing for VALidation studies) campaign, the novel German High Altitude and LOng (HALO) range research aircraft has been equipped with a remote sensing suite consisting of a 26 channel passive microwave radiometer (22-183 GHz), cloud radar (36 GHz), water vapor lidar, and drop sondes. The first part of the campaign (NARVAL-South in December 2013) investigated cumulus clouds in the trade wind zone, while the second part (NARVAL-North in January 2014) focused on post rontal convection over the Northern Atlantic. In total 14 flights with 130 flight hours were performed including several underflights of CloudSat.

Within this presentation, we will give an overview of the first measurements taken by the passive and active microwave instruments onboard HALO in comparison to satellite observations by CloudSat and polar-orbiting satellites like AMSU and SSMIS. Scientific analysis will include drizzle formation in warm clouds and ice scattering effects of cold convective clouds. Furthermore, we will present results of retrieval studies for temperature, humidity, and hydrometeors from the passive and active instruments as well as their combination.