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Topics: 7. Atmospheric composition

Comparison of water vapor, clouds, and precipitation derived from satellite sensor to measurements by airborne remote sensing instruments on 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. On a global scale, atmospheric water can be observed with the help of satellites, which, however, miss small scale features due to the coarse spatial resolution. Measurements with a finer resolution can be performed on airborne remote sensing platforms, such as the novel German High Altitude and Long (HALO) range research aircraft. Within the NARVAL (Next-generation Aircraft Remote sensing for VALidation studies) campaign, HALO was 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 frontal convection over the Northern Atlantic.

Within this presentation, we will show comparisons between integrated water vapor, liquid water path, and precipitation derived from the measurements of the aircraft instrumentation collected during the NARVAL campaigns to the ones from co-located satellite observations. The amount of missed LWP and precipitation, due to the coarser resolution of the satellite observations, is investigated. Furthermore, the improvements achieved by utilizing microwave frequencies planned for future satellite missions (around the 118 GHz absorption line) are shown. The new frequency combinations and the expected performance of the new retrieval capabilities for water components of the atmosphere are evaluated against the existing products.