

Comparative Characterisation of Maritime Clouds and Water Vapor between Dry and Wet Season Over the Tropical North Atlantic

Marek Jacob¹ Kevin Wolf² Sabrina Schnitt¹ Emiliano Orlandi³
Mario Mech¹ André Ehrlich² Susanne Crewell¹
missing someone? any order complaints?

¹University of Cologne, Cologne, Germany, ²University of Leipzig, Leipzig, Germany,
³Radiometer Physics GmbH, Meckenheim, Germany

Trade wind clouds are one major uncertainty in climate models. The observation of these clouds by satellites is limited by the satellite resolution and the ground-based observation lacks in stations. Therefore, the series of Next-Generation Aircraft Remote-Sensing for Validation campaigns (NARVAL) using the High Altitude Long range research aircraft (HALO) was started to assess North Atlantic trade clouds on an appropriate scale. In this presentation we take the advantage of the synergy of the HALO active and passive Microwave Package (HAMP) in combination with the solar radiation measured by the Spectral Modular Airborne Radiation measurement system (SMART) to characterize shallow clouds in the Caribbean. The two NARVAL campaigns covered a dry season as well as a wet season in December 2013 and August 2016, respectively.

Based on a cloud mask developed derived from SMART, about 12000 cloudy profiles describing 4100 individual clouds could be detected during the dry season (NARVAL-I) with about 70 % of the clouds having a length of less than 2 km. Corresponding retrieval of the liquid water path (LWP) using passive microwave measurements reveals that these small clouds contain little water with a third of the clouds having a LWP of less than 50 g m^{-2} . This is in contrast to the wet season. We present that these small clouds are difficult to measure by the space-borne Special Sensor Microwave Imager/Sounder (SSMIS) due to its coarse resolution. The Moderate Imaging Spectroradiometer (MODIS) is able to identify the smaller clouds, but it quantitatively suffers in terms of LWP of precipitating clouds.

Differences of cloud characteristics between the tropical dry and wet seasons are revealed based on measurements of 70 flight hours during the dry season ab 85 flight hours during the wet season.