Comparative Characterisation of Maritime Clouds in Dry and Wet Season over the Tropical North Atlantic by Airborne Observations

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1. Motivation
- The representation of trade wind clouds still poses a major uncertainty in climate models.
- To gain a better understanding of the relevant processes and to evaluate process-model performance detailed observations are needed that are not available from the current satellite fleet.

2. Campaign Setup
Next-Generation Aircraft Remote-Sensing for Validation campaigns (NARVAL) using the High Altitude Long range research aircraft (HALO).

3. Water Vapor Environment
- Agreement within the measurement uncertainties of amplitude and variance between HAMP and spaceborne Special Sensor Microwave Imager / Sounder (SSMIS).

4. Clouds Close-Up
- High cloud variability observed within the resolution (7x4 km) of the Global Precipitation Measurement (GPM) Microwave Imager (GMI) and even within HAMP footprint (1x1 km).

5. Dry vs. Wet Season
- Sharp moisture boundary in dry season around 3 km.
- Variable and high reaching moisture in wet season.

6. Acknowledgment and reference
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Fig 1: Operational area represented by a subset of all released drop sondes. White box: Area of investigation

Fig 2: Example of HAMP and SMART measurements. Figure published in [1].

Fig 3: Integrated Water Vapor (IWV) measured by SSMIS (background) and HAMP (flight track) on Dec. 15, 2013. The encircled area is shown in Fig 4 in more detail. Figure published in [1].

Fig 4: Comparison of coincident IWV measurements. Top: HAMP measurements per SSMIS pixel. Middle: Direct comparison with HAMP uncertainty (red). Bottom: time difference. Figure published in [1].

Fig 5: GPM underpass with GMI swath (89 GHz) and flight track. Orange circle: moment of underpass.

Fig 6: Comparison of HAMP and GMI brightness temperatures at 90 GHz and 49 GHz during underpass. Note different viewing angles.

Fig 7: Zoom in Fig 5. Top: Brightness temperature measurements of HAMP and GMI in native spatial resolution. Bottom: 1600 nm channel of hyperspectral cross-track imager specMACS on HALO. View in nadir direction. Red lines: 3dB beam width of HAMP.

Fig 8: Dropsonde Moisture Profiles.

Fig 9: Top: Frequency distribution of IWV along flight tracks in the Tropics. Bottom: Water vapor satellite images.

Fig 10: Cumulative occurrence of LWP for non-precipitating (solid) and precipitating (dashed) clouds along flight tracks in the Tropics.

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