Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10122, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10122
EGU General Assembly 2008

CAROLS campaign: scientific data analysis results

M. Pardé (1), M. Zribi (1), D. Hauser (1), P. Leroy (1), P. Fanise (1), S. Zine (2), N. Reul (3), J. Boutin (2).

(1) CETP – CNRS, Vélizy, France

(2) LOCEAN, UPMC, Paris, France

(3) IFREMER – CERSAT, Plouzane, France

CAROLS, an L-band radiometer (1400 – 1424 MHz), was built and designed by CETP as a companion radiometer to the EMIRAD II from DTU. It is a correlation radiometer with direct sampling and is fully polarimetric (i.e 4 Stockes). It shows sensitivity equal to 0.1 K for 1 s integration time (@300K target) and with stability better than 0.1 K over 15 min. Internal calibration is based on load and noise diode.

This radiometer will be used in conjunction with other airborne instruments (in particular the C-Band scatterometer (STORM) and IEEC GPS system infrared CIMEL radiometer, one visible camera), in coordination with field calibration/validation campaigns for SMOS. Common objectives for land and sea surface investigation are i) to provide independent measurements of Tb over specific well-documented sites, ii) to document the spatial variability of Tb within a SMOS pixel iii) to validate and improve inversion algorithms, iv) to prepare the operational use of SMOS data in models, v) to study the synergy between passive and active microwave data.

An L-Band radiometer was deployed on board the French research aircraft ATR-42 with C- band polarimetric radar. Measurements were conducted in two configurations: with the radiometer alone, using two antennas, one looking at nadir and the other at 33.5˚ incidence angle, and with a C-band radar multi-incidence configuration and one radiometer measurement at 33.5˚. Different calibration tests were performed to validate the instrument precisions and stability prior to the flights; a cryogenic load and clear sky views were used as cold calibration target. Antenna pattern was measured in

an anechoic room in CNES (Centre National d'Etudes Spatiales). Then a validation campaign with four flights was made over southwest France, Hourtin Lake and Bay of Biscay (Atlantic Ocean) in September 2007.

CAROLS retrievals of surface brightness temperatures collected during these four flights were evaluated and compared with ocean emission model output for the different configurations. First, CAROLS retrievals were calibrated using two internal (cold and warm) targets. The second step was the discrimination and removal of data polluted by Radio Frequency Interference (RFI). A significant percentage of the data (10-20%) was contaminated by ground-based RADAR under the flight path.

Flight segments were conducted over a lake for calibrating and validating radiometric measurements. We used a simple model to estimate the lake brightness temperature and compared it to the measurements, assuming that the lake surface was flat. This step allowed us to compute the loss into the Orthomode Tranducer (OMT) and confirm the quality of in-flight measurements. Next, we calculated the exact position of the antennas during pitch and roll maneuvers to perform a Q-Stockes parameter calibration by determining the polarization rotation angle.

Comparisons between ocean brightness temperature measurements and two model estimates were performed for the different view angles, using the pitch and roll maneuver segments and circles done around a buoy in the Bay of Biscay, as well as different wind-wave conditions.

These comparisons will bolster confidence in current models while demonstrating the utility and range of application of the CAROLS instrument for future SMOS calibration/validation studies.