Geophysical Research Abstracts
Vol. 13, EGU2011-6023-2, 2011
EGU General Assembly 2011

Validation of SMOS measurements over ocean and improvement of sea surface emissivity model at L Band

Xiaobin Yin (1), Jacqueline Boutin (1), Nicolas Martin (1), and Paul Spurgeon (2)

(1) Laboratoire d'Océanographie et du Climat-Expérimentation et Approches numériques / Institut Pierre Simon Laplace – UMR 7159 CNRS/IRD/UPMC/MNHN, Paris, France, (2) ARGANS Ltd, Plymouth, England

SMOS (Soil Moisture and Ocean Salinity) has been successfully launched in November 2009 and is the first interferometric radiometer at L band (1.4GHz) in orbit. Since its launch, extensive comparisons were conducted between SMOS brightness temperatures (TB) and TB simulated by the forward models used in the SMOS Level 2 ocean salinity processing software (L2OS) for the retrieval of sea surface salinity (SSS) by the European Space Agency processing chain over the ocean. The L2OS uses ECMWF (European Centre for Medium-Range Weather Forecast) forcings as prior values and forward models to simulate SMOS TB in the antenna frame; SSS and other geophysical parameters are then derived through an iterative retrieval method that minimizes the quadratic differences between SMOS TB and simulated TB. The forward model simulates the emissivity by a rough sea surface, the atmospheric emission and absorption, the scattering of celestial and atmospheric radiation by the rough ocean surface, and then applies geometric and Faraday rotations of the Stokes vectors to the satellite instrument. The noise in SMOS TB as deduced from the standard deviation of the difference between simulated TB, and SMOS measurements over part of an half orbit is consistent with the expected radiometric noise but a systematic bias dependent on the location in FOV is observed and needs to be removed before SSS retrievals. The North-South variations of SMOS TB are at first order consistent with simulated TB and are consistent with North-South variability of SSS, wind speed and SST. Using the Durden and Vesecky (1985) wave spectrum multiplied by a factor two in the two-scale model (the model that was first chosen as default model in L2OS to simulate the impact of the sea surface roughness on the sea surface emissivity), we found discrepancies between measurements and model simulations in regions with high wind speed above 15 m/s. We investigate to which extent these discrepancies can be attributable to imprecisions in 1) the emissivity model and 2) ECMWF predicted wind speeds that have been interpolated to the time of SMOS observations. We test other modellings of sea surface roughness and foam effects at L-band and we compare ECMWF-SMOS wind speeds to wind speeds deduced from SSMI (Special Sensor Microwave Imager) F16 and F17 radiometers measurements that flew less than one hour apart from SMOS. We then propose a new forward model. We estimate the quality of SMOS retrieved SSS by comparing it with ARGO measurements and discuss it given the imprecisions of the forward model and of the wind speed used as prior value in the L2OS.