SOME RESULTS ON SMOS-MIRAS CALIBRATION AND IMAGING

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1. INTRODUCTION

SMOS (acronym of Soil Moisture and Ocean Salinity) is an European Space Agency (ESA) mission aimed at providing global maps of soil moisture over land and sea surface salinity over oceans [1]. The mission payload is the Microwave Imaging Radiometer with Aperture Synthesis (MIRAS) [2], an L-band, Y-shape 2D interferometric radiometer manufactured by EADS-CASA Espacio (ES) and integrated to a generic PROTEUS platform manufactured by Thales Alenia Space. SMOS was successfully launched on 2nd November 2009 from the Plesestz cosmodrome by a launcher from Eurockot. The payload was switched on on 17th November and since then raw data measurements are being received regularly by the ground segment data acquisition station, located near Madrid (ES). Although not fully calibrated, they already provide the first-ever global brightness temperature maps at L-band. Fairly good images have been produced by using the calibration parameters measured during the MIRAS ground characterization [3, 4]. Figure 1 shows an example of several snapshots in a pass over Australia in dual polarization mode. Since the polarization is mixed in the field of view, the definitions Horizontal and Vertical refer to the sub-satellite track. Some artifacts due to imperfect calibration are seen, but the overall result is that the instrument is capable of producing good brightness temperature images.

2. ON FLIGHT CHARACTERIZATION

The first three months of operation will be dedicated to make a complete and systematic check of the payload, including the retrieval of all calibration parameters and their temperature dependance. The MIRAS testing software [5], specially developed by the UPC team for this purpose, will be used to carry out this activity, leading eventually to the final specification of the payload performances in terms of radiometric accuracy, radiometric sensitivity and spatial resolution.

The presentation at IGARSS will focus on the payload commissioning, describing the different tests carried out and the results obtained. The overall performance of MIRAS after calibration using internal and external modes will be presented, and also the expected quality of the Level 1B data, both in dual polarisation mode and for full polarimetric. At the dates of the symposium the satellite will be already operational, so the results on payload calibration will be consolidated. The following specific aspects will be covered:

- Systematic check of all instrument modes
- Retrieval of internal and external calibration parameters
- Computation of temperature sensitivity coefficients
- Assessment on imaging capability and inversion algorithms
- Assessment on calibration rate requirements
- Instrument overall performance evaluation
- Dual-Pol vs Ful-pol assessment

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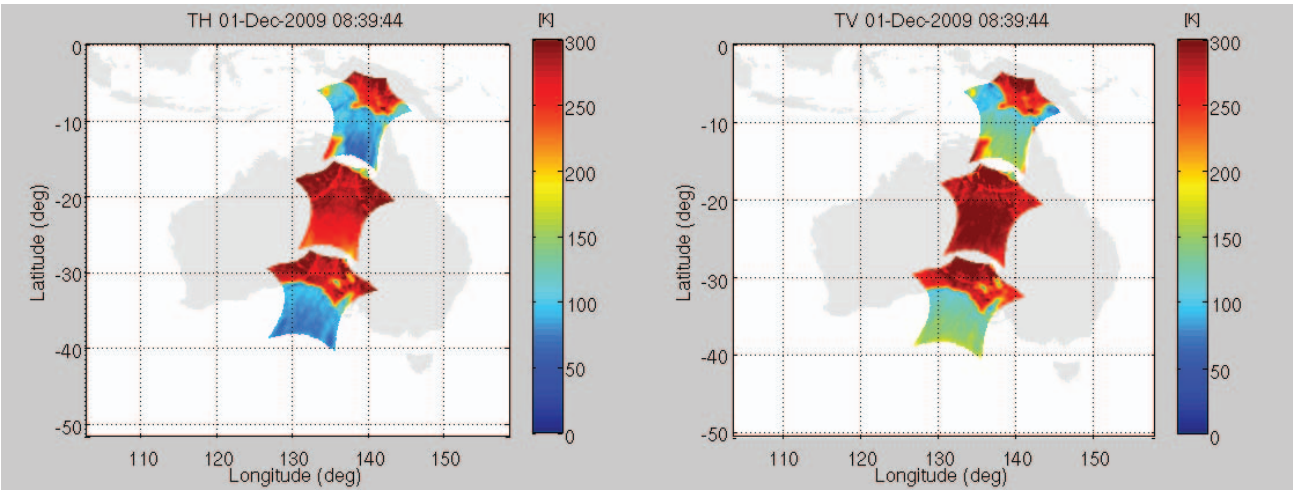

Fig. 1. L-Band brightness temperature maps at instrument reference frame retrieved over Australia in a descending orbit Left: H-polarization at satellite track. Right: V-polarization at satellite track

3. CONCLUSIONS

SMOS is already producing fairly good brightness temperature images both in H-polarization and in V-polarization by using the calibration parameters measured on ground during the payload characterization carried out two years ago. This is doubtless a good indicator of the quality of the characterization, which will be repeated during the first three months of the mission in what is called the "instrument commissioning phase". New results are expected to be encountered and the final instrument performance will be determined. During the IGARSS conference, the most up-to-date information will be given and the main results shown.

4. REFERENCES

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