ON-FLIGHT CHARACTERIZATION OF THE SMOS PAYLOAD DURING THE COMMISSIONING PHASE

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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]. Its single payload, the Microwave Imaging Radiometer with Aperture Synthesis (MIRAS), was manufactured by EADS-CASA Espacio (ES) and is now integrated to the platform (CNES/ALCATEL PROTEUS) and ready to be launched, expectedly before summer 2009, just after IGARSS!.

In two weeks after launch, the satellite will have reached the operational status, with all deployments completed, attitude and thermal control established and in the final orbit. The In-Orbit Commissioning Phase (IOCP) will then immediately start and will have an estimated duration of 5.5 months [2]. When finished, the mission will be declared ready for the nominal operational phase.

The main objectives of the IOCP are to bring the satellite and instrument into a fully operational condition, to optimize the satellite and payload on-board software, to verify that the performance of the satellite and payload meets its requirements, to verify the mission operations procedures and to bring the ground processing segment into a fully operational condition.

These objectives can be classified in two main categories: First, instrument verification, aimed at ensuring that the scientific data content in the products have the expected quality; and second, ground segment verification, oriented to ensure that a regular stream of data products is available.

The IGARSS contribution will present the tests and activities that have been designed for the instrument-based part of the IOCP.

2. INSTRUMENT BASED TESTS

The instrument-based activities within the IOCP are categorized as characterization, calibration, verification and validation [2]. They will include a systematic check of the instrument functionality and a progressive cycling through the instrument modes. This will ultimately provide the verification of the instrument technical requirements of the mission. The main tests are described in the following subsections.

2.1. Instrument Thermal Stability

This test will provide understanding of both the intra orbit and inter-orbit temperature variations. Data collected from two days (28 orbits) of continuous operation will be used. Physical temperature monitoring will provide a reference for the variations that will be expected during nominal operations.

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2.2. Instrument Electrical Stability

In this test, the variation of the calibration parameters along the orbits and with respect to physical temperature will be assessed. A total of 57 orbits (4 days) of continuous switching between the different internal calibration modes is considered. The outcome of this test will be the computation of the sensitivity coefficients of all parameters, such as gains and offsets, in order to fill up a data base to be used for processing.

2.3. First Deep Sky View

The Deep Sky View is an external calibration in which the satellite attitude will change so that it will point to the deep sky. Measurement of a constant target will provide absolute calibration, as well as instrument response defined as the flat target response.

2.4. First Image

Once the instrument fully characterized, a continuous set of 14 orbits will provide sufficient observation data to allow processing to at least level 1B and to provide brightness temperature maps of selected zones of the Earth.

2.5. Full-polarimetric operation

MIRAS can also operate as a full-polarimetric radiometer, measuring all four Stokes parameters. Although this is not the nominal mode of operation considered, during commissioning phase it will be tested and the results compared to the nominal dual-pol operation.

3. CONCLUSIONS

The main activities foreseen for the SMOS in-orbit Commissioning phase in relation to the instrument characterization are defined. During the IGARSS conference, this information will be updated and the expected results shown.

4. REFERENCES

[1] Hubert Barré, Berthyl Duesmann, and Yann Kerr, "SMOS. the mission and the system," *IEEE Transactions on Geoscience and Remote Sensing*, vol. 46, no. 3, pp. 587–593, March 2008.

[2] Michael Brown, "Smos in-orbit commissioning phase plan," Tech. Rep. SO-PL-ESA-SYS-5505, issue 1.1, ESA-ESTEC, The Netherlands, 8 August 2008.