66th International Astronautical Congress 2015

EARTH OBSERVATION SYMPOSIUM (B1)
Interactive Presentations (IP)

Author: Dr. Bernard Foulon
Office National d'Etudes et de Recherches Aérospatiales (ONERA), France, bernard.foulon@onera.fr

Mrs. Françoise Liorzou
Office National d'Etudes et de Recherches Aérospatiales (ONERA), France, francoise.liorzou@onera.fr
Dr. Bruno Christophe
Office National d'Etudes et de Recherches Aérospatiales (ONERA), France, bruno.christophe@onera.fr
Mr. Vincent Lebat
Office National d'Etudes et de Recherches Aérospatiales (ONERA), France, vincent.lebat@onera.fr
Dr. Phuong-Anh Huynh
ONERA, France, phuong-anh.huynh@onera.fr

WHY THE MICROSTAR ACCELEROMETER CAN IMPROVE THE GRASP MISSION?

Abstract

The Geodetic Reference Antenna in Space (GRASP) is a micro satellite mission concept dedicated to the enhancement of all the space geodetic techniques, and promising revolutionary improvements to the definition of the Terrestrial Reference Frame (TRF). GRASP collocates GPS, SLR, VLBI, and DORIS sensors on a dedicated spacecraft in order to establish precise and stable ties between the key geodetic techniques used to define and disseminate the TRF. GRASP also offers a space-based reference antenna for the present and future Global Navigation Satellite Systems (GNSS). By taking advantage of the new testing possibilities offer by the catapult facility at the ZARM drop tower, the ONERA's space accelerometer team proposes an up-dated version of its ultra sensitive electrostatic accelerometers which have contributed to the success of the last Earth's gravity missions CHAMP, GRACE and GOCE. Called MICROSTAR, and built around a cubic proof-mass with its electronics packaging similar to the GRACE Follow-On one, it provides the 3 linear accelerations with a resolution better than 1E-11 ms-2/Hz1/2 into a measurement bandwidth between 10-3 Hz and 0.1 Hz. In addition, the instrument provides also the 3 true angular accelerations about its 3 orthogonal axes with 5E-10 rad.s-2/Hz1/2 resolution. The integration of such an ultra sensitive accelerometer at the center of mass of the GRASP satellite can provide not only improvement of the Precise Orbit Determination (POD) by accurate measurement of the non-gravitational force acting on the surface of the satellite but provide also the possibility to calibrate with an accuracy better than 100 m the change in the position of the satellite center of mass as it is performed in the GRACE mission. In the same way, the precise motion of the antennas can be determined, assuming some rigid structure between them and the accelerometer as it is done between the star sensors, the optical cube assembly of satellite laser ranging system and the accelerometer in the GRACE-Follow On mission. In spite of the constraints due to its implementation on board the satellite, the accelerometer shall bring a noticeable improvement in the GRASP mission scientific return.