Geophysical Research Abstracts
Vol. 21, EGU2019-13428, 2019
EGU General Assembly 2019

Future magnetometry missions- Lessons learned from Swarm

Peter Brauer and Jose M. G. Merayo
Technical University of Denmark, DTU Space, Measurement and Instrumentation, Lyngby, Denmark (pb@space.dtu.dk)

During the last 5 years the Swarm mission has delivered high quality scientific measurements of the Earth's magnetic field. The vector field magnetometer (VFM) delivers measurements of the magnetic vectors and is supported by the star camera (STR) to provide the orientation, the GPS to provide the position and the absolute scalar magnetometer (ASM) to provide in-flight calibration. This measurement concept is inherited from earlier missions like CHAMP and Ørsted and has proven successful to map the magnetic field of a planet. In design of future mapping missions it is important to benefit from lessons learned on the Swarm satellites. The sensor used on the VFM is identical to the sensors used on CHAMP and Ørsted and provides in-flight measurements with the same unprecedented precision that was determined during the pre-flight calibration. In-flight calibration of the scalar-value is essential due to the thermo-elastic and hygroscopic material of the sensor shell. In future missions the material of this shell should be replaced. The mechanical link between the VFM and the STR is provided by the mechanically stable Optical Bench (OB) on Swarm. The OB is a complex structure using silicon carbide (SiC) as the base material but has been found to slightly flex during thermal load. On other missions, the STR has proven to be a strong tool to measure flexure of mechanical structures and this should be exploited for the OB design in future missions. The magnetic cleanliness program of Swarm is based on a relatively long boom and characterization of the main contributors to magnetic perturbations (bus and AOCS currents). The cleanliness program, however, did not sufficiently include thermoelectric contributions on the perturbation. In future missions materials prone to induce thermoelectric currents near the magnetic sensors should be avoided or properly analyzed in connection with the magnetic cleanliness program. We discuss the lessons learned from Swarm, and outline how more accurate measurements can be achieved on future magnetic mapping missions.