



Swarm Optical Bench Stability

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Swarm mission constellation, launched into orbit on November 22, 2013, consists of three satellites that precisely measure magnetic signal of the Earth. Each of the three satellites is equipped with three μ ASC Camera Head Units (CHU) mounted on a common optical bench (OB), which has a purpose of transference of the precisely determined attitude from the star trackers to the vector magnetometer (VFM) measurements.

Although pre-launch analyses were made to minimize thermal and mechanical instabilities of the OB, significant signal with thermal signature is discovered when comparing relative attitude between the three CHU's. These misalignments between CHU's, and consequently geomagnetic reference frame, are found to be correlated with the optical bench temperature variation.

In this paper, we investigate the propagation of thermal effects into the μ ASC attitude observations and demonstrate how thermally induced attitude variation can be predicted and corrected in the Swarm data processing. The results after applying thermal model significantly improves attitude determination which, after correction, meets the requirements of Swarm satellite mission. This study demonstrates the importance of the OB pre-launch analysis to ensure minimum thermal gradient on satellite optical system and therefore maximum attitude accuracy.