

GP21B-0782 - Towards a LEO Nanosatellite Constellation for Permanent Monitoring of the Earth's Magnetic Field and Ionosphere: The NanoMagSat Nanosatellite Constellation High-Precision Magnetic Project.



Tuesday, 10 December 2019



08:00 - 12:20



Moscone South - Poster Hall

Swirl Topics

Earth Processes - SWIRL

Abstract

The geomagnetic field has been almost continuously monitored from LEO orbits since 1999, complementing ground-based observatory data by providing accurately calibrated scalar and vector measurements with global planetary coverage. The very successful three-satellite ESA Swarm constellation is planned to remain in operation up to hopefully 2024. Further monitoring the field from space with high-precision absolute magnetometry beyond that date is of critical importance for improving our understanding of the long and short-term dynamics of the multiple components of this field. Here, we will report on the fast developing status of the NanoMagSat constellation project, which aims at deploying and operating a constellation of identical 12 U nanosatellites on a combination of inclined (approximately 60°) and polar LEO orbits. The mission instruments would consist of an advanced Miniaturized Absolute scalar and self-calibrated vector Magnetometer (MAM) combined with a set of star trackers (STR) for very precise attitude restitution, a compact High-frequency Field Magnetometer (HFM, sharing subsystems with the MAM), and a multi-needle Langmuir Probe (m-NLP). The dual frequency GNSS receiver on the platform will further provide both precise orbit determination and Total Electron Content (TEC) measurements. The Level 1 data to be produced would include 1 Hz high-precision absolutely calibrated and accurately oriented magnetic vector field (using the MAM and STR), high frequency (at least 1 kHz) very low noise level magnetic scalar (using the MAM) and vector (using the HFM) field, high-frequency (at least 1 kHz) local electron density (using the m-NLP) as well as precise timing, location and TEC products derived from the GNSS receiver. Beyond describing the programmatic status of the project, this presentation will also discuss the science goals of the proposed constellation, highlighting its ability to take over and complement many of the science goals of the ongoing Swarm mission at a much lower cost and to form the basis of a permanent collaborative constellation of nanosatellites for long-term monitoring of the geomagnetic field and ionospheric environment from space.

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