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The NanoMagSat (Swarm Delta) nanosatellite high-precision magnetic project

Gauthier Hulot (1), Jean-Michel Léger (2), Pierre Vigneron (3), Thomas Jager (4), François Bertrand (5), Pierdavide Coïsson (6), André Laurens (7), and Benoit Faure (8)

(1) Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Université Paris Diderot, UMR 7154 CNRS/INSU, Paris, France (gh@ipgp.fr), (2) CEA, Léti, MINATEC Campus, Grenoble, France (jean-michel.leger@cea.fr), (3) Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Université Paris Diderot, UMR 7154 CNRS/INSU, Paris, France (vigneron@ipgp.fr), (4) CEA, Léti, MINATEC Campus, Grenoble, France (thomas.jager@cea.fr), (5) CEA, Léti, MINATEC Campus, Grenoble, France (francois1.bertrand@cea.f), (6) Institut de Physique du Globe de Paris, Sorbonne Paris Cité, Université Paris Diderot, UMR 7154 CNRS/INSU, Paris, France (coisson@ipgp.fr), (7) Centre National d'Etudes Spatiales, Toulouse, France (Andre.Laurens@cnes.fr), (8) Centre National d'Etudes Spatiales, Toulouse, France (Benoit.Faure@cnes.fr)

NanoMagSat (Swarm Delta) is a 12 U nanosatellite project aiming at complementing the ESA Swarm constellation of satellites currently monitoring the Earth's magnetic field and ionospheric environment on LEO polar orbits (since November 2013). The orbit aimed at is an (approximately) 60° inclination circular 500 km altitude LEO that would allow a quick local time coverage (within a little more than a month) to compensate for the slow local time coverage of the Alpha, Bravo and Charlie of the Swarm constellation, as well as orbit crossing to provide tie points. Such an orbit would prove extremely useful for enhancing the science return of the Swarm mission. The NanoMagSat main science payload would consist of an improved miniaturized version of the ASM magnetometers, which currently provide the 1 Hz absolute scalar reference on the Swarm satellites but also have the experimental ability to either simultaneously provide 1 Hz self-calibrated vector data (vector mode) or 250 Hz scalar data (Burst mode). We will report on the science that has been achieved so far thanks to both these experimental modes on the Swarm satellites, establishing the ability of such ASM instruments to fulfil many of the science goals of NanoMagSat as a stand-alone magnetometer. We will also report on the way the lessons learnt from these ASM have been taken advantage of to considerably improve the design of these instruments, a prototype miniaturized sensor of which is currently under construction. We also expect to be able to report on the latest test results from this first prototype sensor. NanoMagSat already went through a phase 0 study within CNES and is now ready for a Phase A study, aiming at a launch before the demise (not expected before at least 2023) of Swarm. Beyond this maiden mission, additional similar low-cost nanosatellites could form the basis of a future constellation of multiple high-precision nanosatellites for permanent monitoring of the Earth's magnetic field and ionospheric environment.