FROM SWARM DATA VALIDATION TO FAST DIAGNOSIS OF SWARM SYSTEM PERFORMANCE

ROGER HAAGMANS[1], Gernot Plank[1], Stavros Kotsiaros[2], Nils Olsen[2]

1. European Space Agency, Keplerlaan 1, Noordwijk 2201 AZ, Netherlands,
e-mail: roger.haagmans@esa.int
2. DTU Space, NSI, Juliane Maries Vej 30, Copenhagen 2100, Denmark

The objective of the Swarm mission is to provide the best ever survey of the geomagnetic field and its temporal dependency, and to gain new insights into improving our knowledge of the Earth's interior and climate. The Swarm concept consists of a constellation of three satellites in three different polar orbits between 300 and 550 km altitude.
Goal of the current study is to build tools and to analyze partial datasets in order to allow a fast diagnosis of the Swarm system performance during commission phase and operations of the spacecraft. By using a specially designed software package closed loop simulations are performed and the effects on the reconstruction of the magnetic field resulting from various error sources are investigated. We start from the simple noise-free case and move on to more complex and realistic scenarios which include attitude errors, position errors and spectral leakage. In order to not only compare the impact of different error sources, but also investigate the effects of the different noise levels on the magnetic field reconstruction, the magnitude of the different error sources is kept variable. Further extension of this approach will allow testing the influence of external magnetic sources, such as the magnetospheric residual signal, or the impact of data selection on the lithospheric field retrieval. This study initially considers one satellite and emphasises on the lithospheric field reconstruction. At second, it assents to the two lower flying side-by-side Swarm satellites. As a result, the lithospheric field can be recovered from magnetic field gradient data, which enhances the quality of the retrieval. Furthermore, it can be extended to an even more realistic Swarm constellation of three satellites revealing the various advantages of the multi-satellite setup. At last, the magnetic field is retrieved every month of satellite data. The monthly solutions give an overview and provide a fast diagnosis of the Swarm system performance. Once the complete study is carried out conclusions about how the errors interfere and propagate into the models can be drawn.

Swarm, quick-look

Roger Haagmans, Keplerlaan 1 - PO Box 299 - 2201 AZ Noordwijk – NL, +31 71 565 3506,
e-mail: roger.haagmans@esa.int