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### GOCE AND GRACE-FO PLATFORM MAGNETOMETERS

The platform magnetometers (**PlatMag**) are not part of the scientific payload. However, after calibration and post-processing of the data, information on the geomagnetic field and electric currents in near-Earth space are derived from **GOCE** (Gravity field and Ocean Circulation Explorer) and **GRACE-FO** (Gravity Recovery And Climate Experiment) missions. These additional data sets are highly valuable for filling gaps in-between dedicated science magnetic field missions, as well as gaps in local time and altitude distributions. The project website of

published articles and data sets is located on GFZ's Information System and Data Center (ISDC).



<https://isdc.gfz-potsdam.de/platform-magnetometer/>

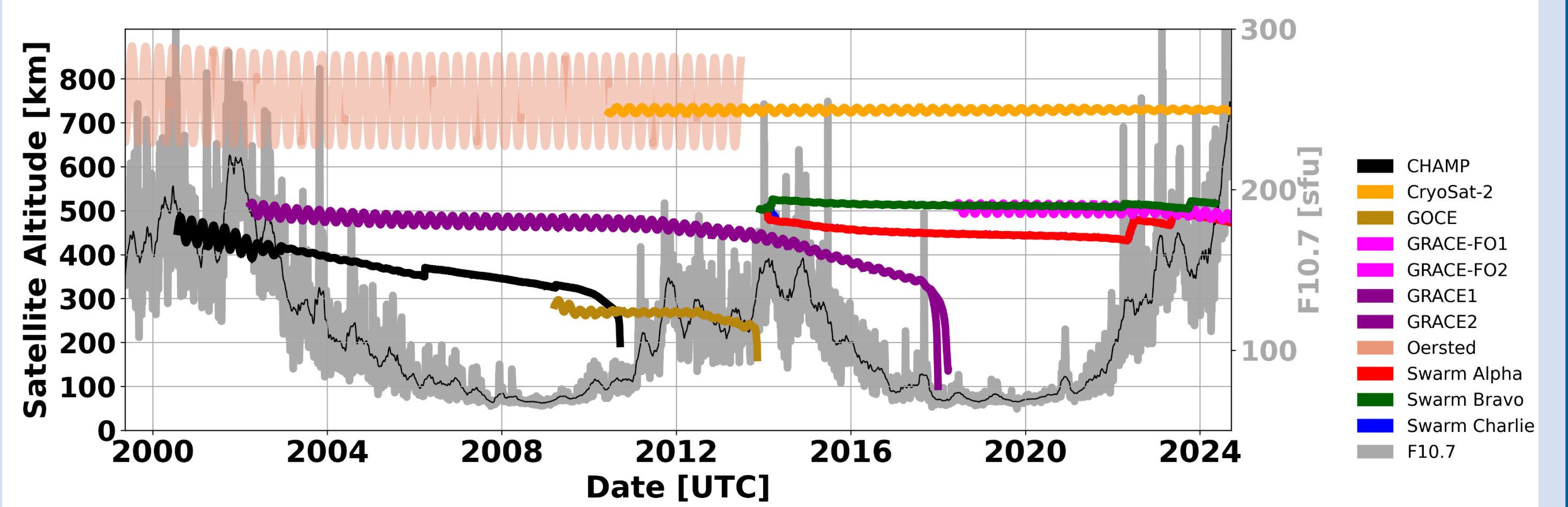


### SWARM DISC

<https://earth.esa.int/eogateway/activities/swarm-disc>



(Swarm **D**ata, **I**nnovation, and **S**cience **C**luster) is an international consortium to enhance the scientific return of the Swarm satellite mission. One of the tasks of the Swarm DISC includes identifying, selecting and running new Swarm products and services; also, including products from other Low Earth Orbit (LEO) missions whose data supports the Swarm mission objectives.



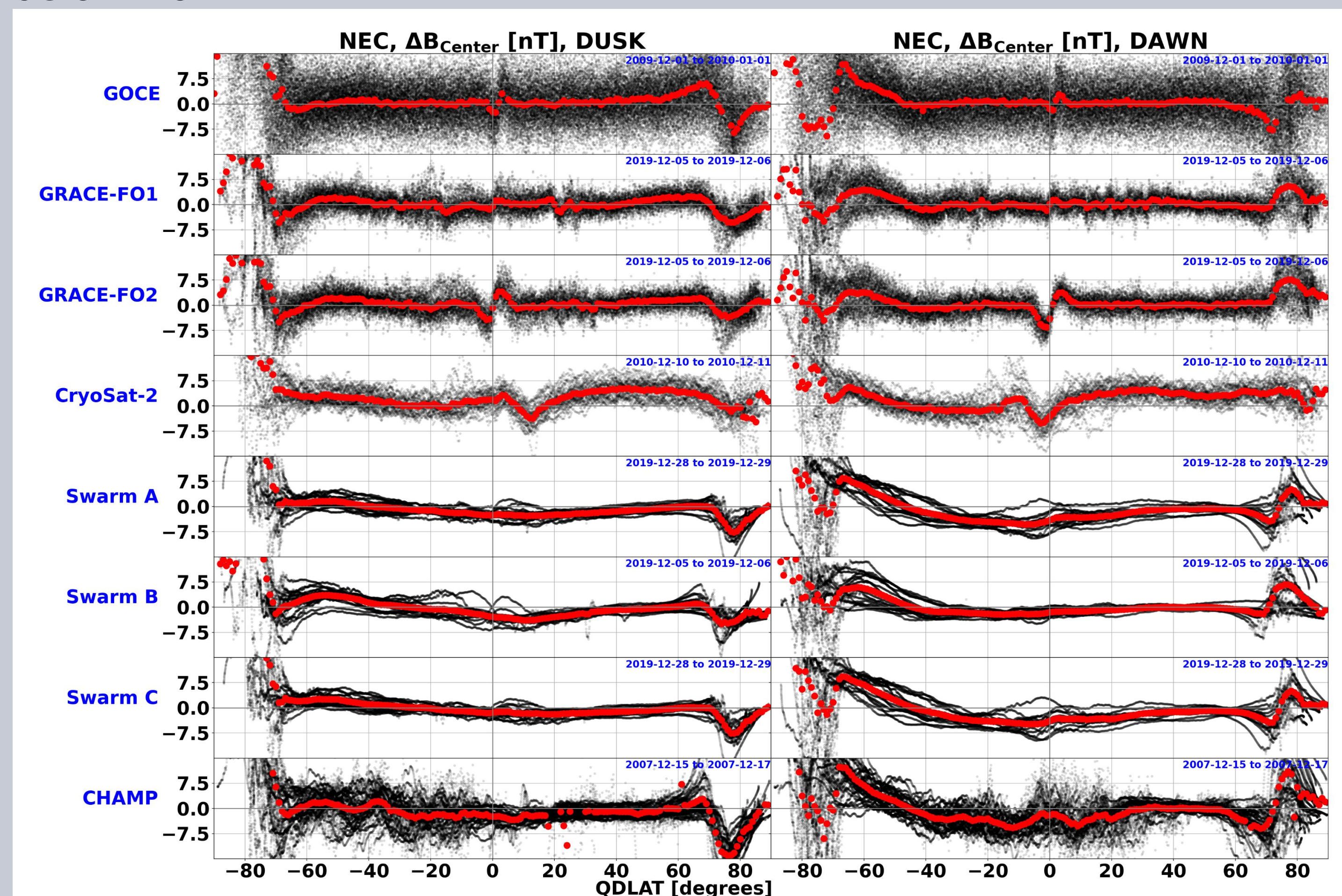
Here, the primary interest is data products that address phenomena in the magnetosphere-ionosphere-thermosphere system. The data products of GRACE-FO are published on ESA's payload data ground segment (PDGS) by GFZ German Research Centre for Geosciences through the Swarm DISC support.

<https://swarm-diss.eo.esa.int/#swarm/Multimission>



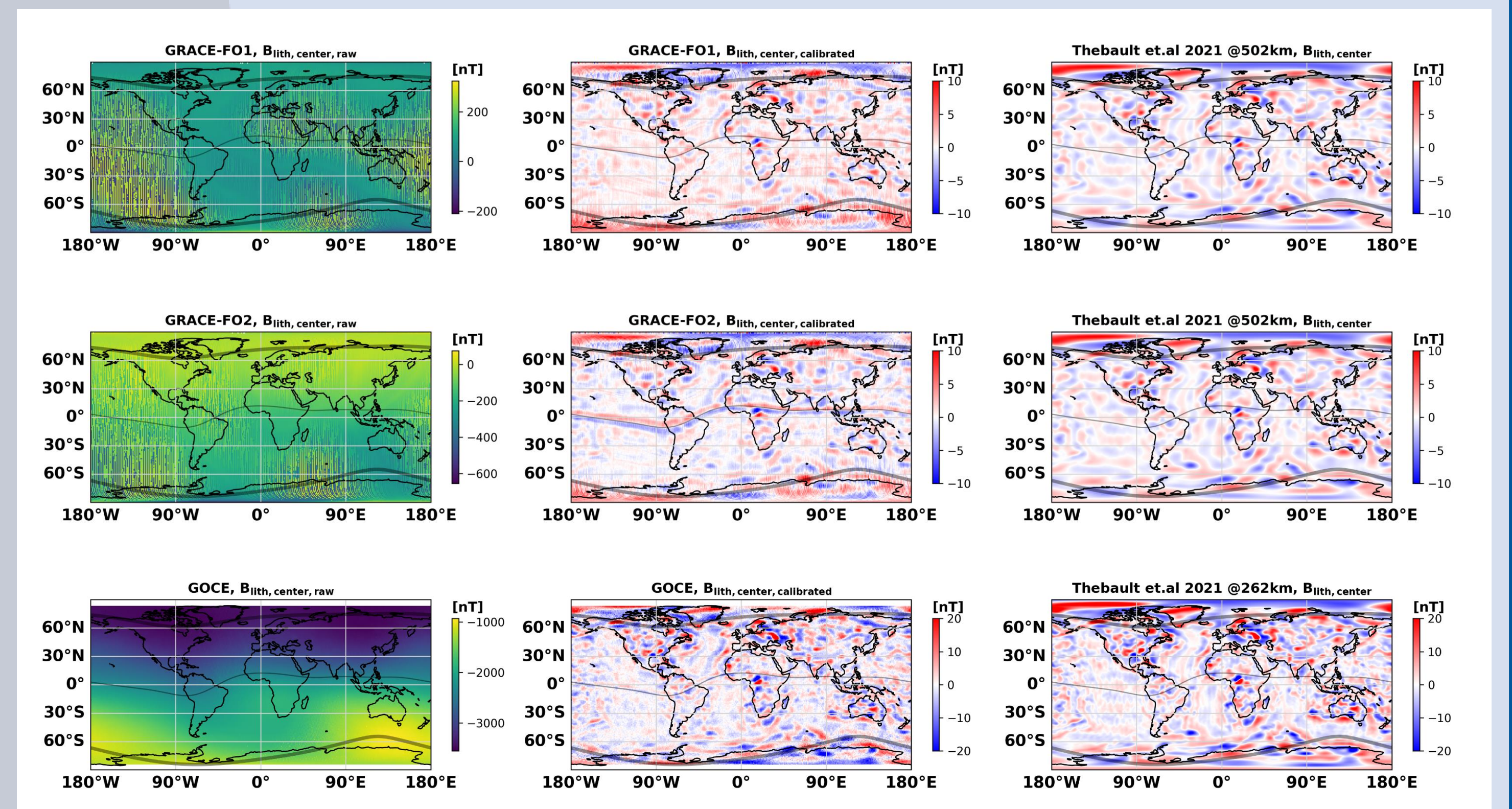
### CALIBRATION RESIDUAL FROM PLATMAG

The figure shows magnetometer residuals wrt the CHAOS7 model for 6/18 or dawn/dusk orbits. As expected, PlatMag results for GOCE, GRACE-FO and CryoSat-2 show higher residuals than for the science missions Swarm and CHAMP, but they remain well below 10 nT.



### LITHOSPHERIC FIELD DERIVED FROM PLATMAG

The maps show lithospheric fields derived from satellite data (left), calibrated satellite data (mid) and model (Thébault et al 2021, <https://doi.org/10.1029/2021GL095147>) (right). The lithospheric fields from satellite data have been derived by removing external and core field contributions (CHAOS7 model). The panels from top to down show a comparison for GRACE-FO1, GRACE-FO2 and GOCE. After calibration and characterisation, most of the expected large-scale structures from the model are now visible in satellite data.



### SUMMARY

- Platform Magnetometers are widely used for on-board navigation. After post-processing, the data sets can be used to fill gaps in-between datasets from dedicated science magnetic field missions like CHAMP and Swarm as well as gaps in local time distribution. Using our new Machine Learning method the **availability of the full satellite telemetry** would improve the calibration and characterisation.
- The calibration of Platform Magnetometers is limited by the availability of high-resolution magnetic models for core, lithospheric and external magnetic fields like CHAOS-7 (<https://doi.org/10.1186/s40623-020-01252-9>) and hence on dedicated science magnetic missions that provide input for magnetic field models.
- For **Space Weather** applications and forecast a **Near-Real-Time product (NRT)** with a latency of a few hours is needed.
- The calibration approach can only be applied to **GRACE-C** mission if the telemetry data becomes available.
- Additional GFZ products include total electron content (GF\_TECxTMS\_2F) and electron density (GF\_NE\_KBR\_2F)