

System Earth changes continuously. Variations of Earth's interior, the atmosphere, the hydrosphere, and near-Earth space give rise to changes in global fields, particularly in Earth's magnetic and gravity fields. The main focus of this Priority Programme is to quantify terrestrial transport mechanisms and solar-terrestrial interactions. The research programme builds on data from satellites in low-Earth orbits, such as CHAMP, GRACE, GOCE, and Swarm, and supporting ground observations and numerical modeling efforts. Swarm is a European multi-satellite constellation, launched in November 2013 with an expected mission duration until at least 2021. The mission consists of three identical satellites that are equipped with a complementary set of instruments for monitoring the Earth's magnetic and gravity field and its space environment. Results of the research programme activity rely on an interdisciplinary approach from dedicated research areas that are applied to improve the understanding of terrestrial coupling processes. In its first phase (2015-2018) nineteen scientific projects have been supported within the Priority Programme. The second phase (2018-2022) will promote the the multidisciplinary aspects between 5 new and 10 follow-up projects and is focusing on coupling phenomena between magnetic and gravity field and the space environment.

The key to an enhanced description of the Earth interior and its space environment is a multidisciplinary approach from mainly four research topics:

#### Geomagnetic Field:

study of its dynamics and evolution, analyzing its different sources, including the Earth's core, mantle induction, lithosphere, oceanic, ionospheric and magnetospheric currents, geodynamo simulations and their link to the observations.

#### Gravity Field:

global variations of mass balances, interaction and exchange mechanisms (hydrological cycle, ice melting in polar regions, sea level change, groundwater, ocean tides), length-of-day variation, mitigation of ionospheric effects on orbital solutions, and gravity field models.

#### Ionosphere/Magnetosphere System:

E-region ionospheric currents and field-aligned currents at higher latitudes and its coupling to the magnetosphere, contributions of currents and particle precipitation in energy budget of the atmosphere.

#### Thermosphere/Ionosphere System:

quantification of contributions of the sun (EUV, solar wind) and of the lower and middle atmosphere (waves and tides) to the variability of the upper atmosphere, ionospheric irregularities including quantification of communication and navigation system disturbances.

Results related to these topics are published within an open special issue from EGU Copernicus' journals *Annales Geophysicae* and *Solid Earth* called "Dynamics and interaction of processes in the Earth and its space environment: the perspective from low Earth orbiting satellites and beyond". All publications resulting from this programme are available at:

[www.spp-dynamicearth.de/publications](http://www.spp-dynamicearth.de/publications)



Swarm fleet, artistic illustration.  
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