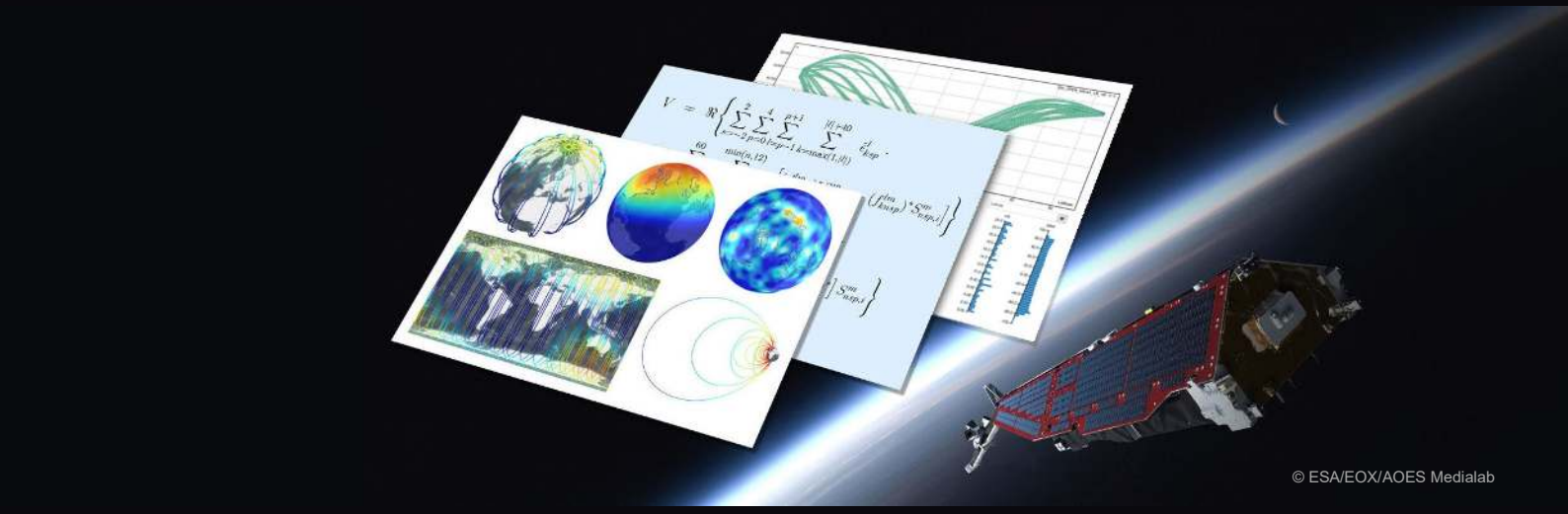
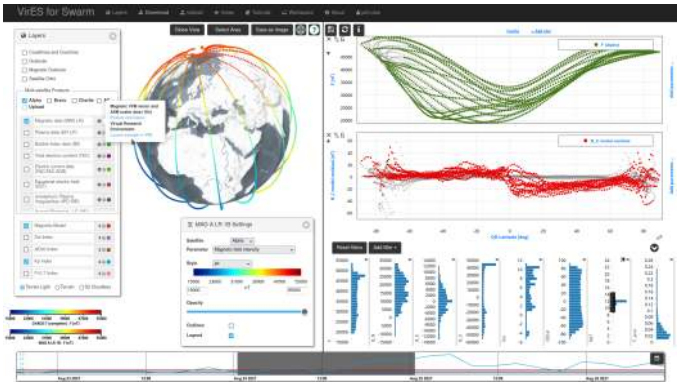


Earth's magnetic field and ionosphere

as observed by satellite

VirES for Swarm is a family of web-based services for manipulation, visualization and retrieval of data (primarily but not exclusively) from the **ESA Swarm mission**. It provides a highly interactive **web client** as well as the Jupyter-based **Virtual Research Environment (VRE)** for custom in-depth data exploration. For direct access to the data and integration with your processing workflow, it also provides own **VirES API** (python client provided) and community standard **Heliophysics API (HAPI)**.

Web Client

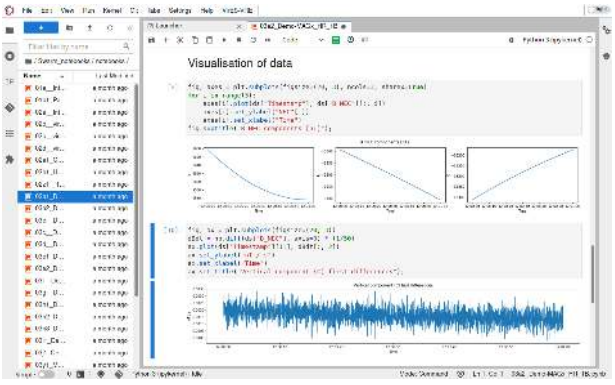


Data from various collections can be plotted over the globe and in vertically stacked 2D-plot sharing the common x-axis. Customization of the visual style and export of publication-ready graphics is possible.

The time slider and various other controls allow interactive selecting and filtering the displayed data. The selected data can be downloaded in different file formats for further analysis.

For the users' convenience, VirES allows the visualization auxiliary indices and comparison with a rich set of provided geomagnetic models.

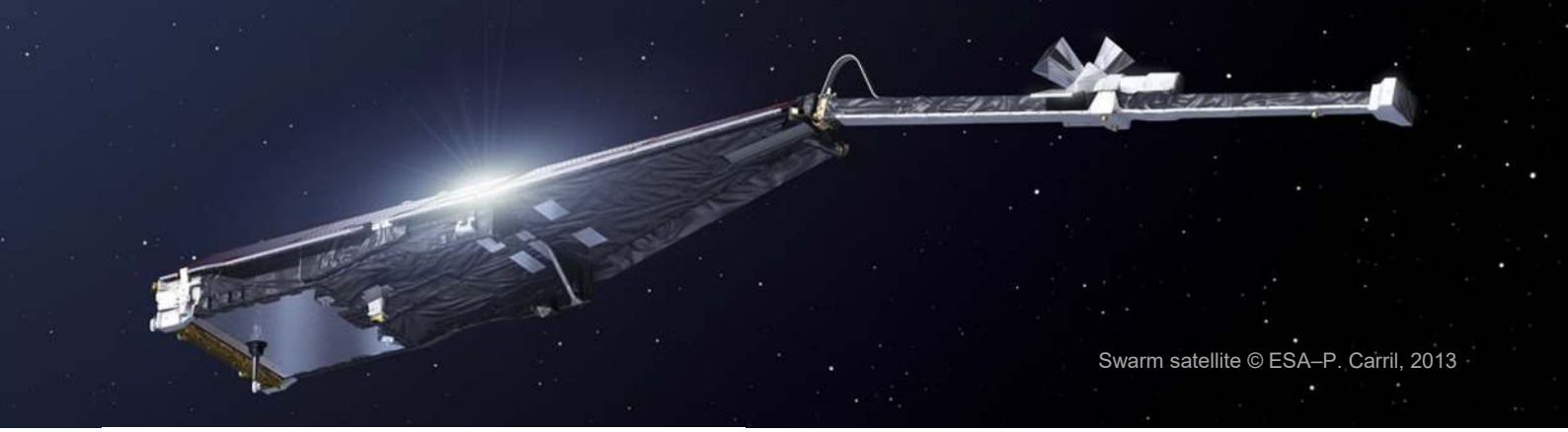
Virtual Research Environment

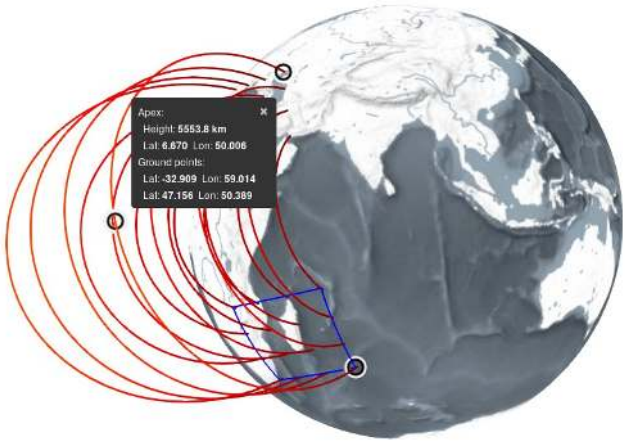


The Virtual Research Environment is a customized JupyterHub service providing a ready-to-use cloud execution environment with a curated set of preinstalled libraries and a large collection of example recipes.

The web-based JupyterLab user interface allows creation of own Jupyter Notebooks with custom data processing and visualization.

These notebooks permit in-line documentation of the executable code and produced results. They can be published with the results included and shared with other users.





Data

Currently, VirES for Swarm hosts data from >150k products in >80 data collections, synchronized to their latest versions. This a brief overview of the available datasets, for details visit the service.

Swarm L1B products:

MAG LR, MAG HR, EFI LP, MOD SC

Swarm L2 products:

AEJ LPL, AEJ LPS, AEJ PBL, AEJ PBS, AOB FAC, EEF TMS, FAC TMS, IBI TMS, IPD IRR, MIT LP, MIT TEC, PPI FAC, TEC TMS

Swarm Advanced products:

EFI TIE, EFI TC02, EFI TC16

Calibrated measurements from platform magnetometers of these missions:

- CryoSat2
- GRACE 1,2
- GRACE-FO 1,2

Geomagnetic virtual observatory datasets negated from measurements of these missions:

- Swarm
- CHAMP
- CryoSat-2
- Oersted

Measurements from the **INTERMAGNET ground magnetic observatories** (1s, 1m, 1h).

Standard **geo-magnetic models** are available in VirES and they are evaluated at the spacecraft (measurement) positions:

- IGRF13
- CHAOS
- MF7
- LCS-1

Swarm L2 SHA geomagnetic models:

- Core Field (MCO SHA): 2D, 2D, 2F
- Lithospheric Field (MLI SHA): 2C, 2D, 2E
- Magnetospheric Field (MMA SHA): 2C, 2F
- Daily Geomagnetic Variation (MIO SHA): 2C, 2D

The global **space weather** context is provided as:

- The disturbance storm time index (Dst Index)
- The disturbances in the horizontal component of the Earth's magnetic field (planetary Kp Index)
- The solar radio flux at 10.7 cm (F10.7 Index)

Derived data such as Quasi-Dipole coordinates, Magnetic Local Time, solar ephemeris, and residuals are calculated and made available for product selection and analysis.

Links

VirES for Swarm service and data are 100% free. Latest versions of common web browsers are supported. To start with VirES go to:

https://vires.services

For more details on the Virtual Research Environment see:

https://notebooks.vires.services