

GSSC Now and the Navigation Support Office

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Overview

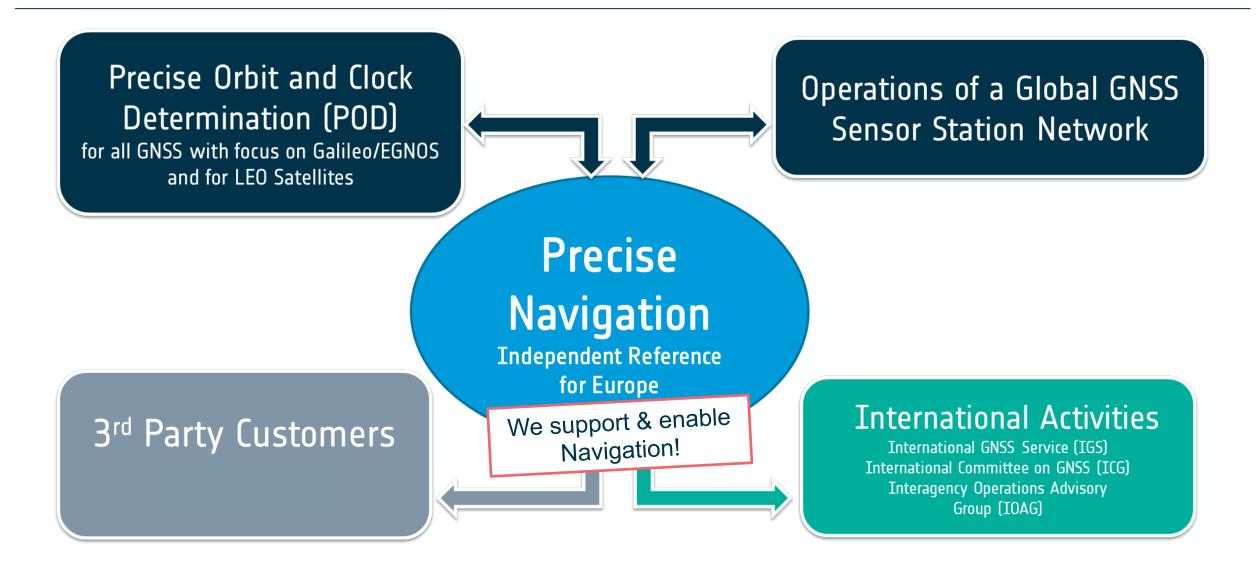


- Navigation Support Office Activities
- Cooperation between Navigation Support Office and GSSC
- Benefits for End User of GN data and products
- Way forward



Navigation Support Office





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Navigation Support Office & Navigation Facility at ESOC

What we do:

- Provide the geodetic reference for ESA missions, EU space programmes (Galileo, EGNOS, Copernicus)
- Contribute to the International Terrestrial Reference Frame (ITRF) and to Universal Time Coordinated (UTC)
- Operational Precise Orbit and Clock Determination for all GNSS and for LEO & HEO satellites (ESA missions & Copernicus).
- Data Processing in **real-time** and **non-real-time**
- Processing of all Space Geodetic Techniques: GNSS, SLR, VLBI, DORIS, ISL, and space ties (e.g. GENESIS)
- Represent ESA in **international bodies** ensuring the consideration of ESA and EC interests e.g. in standardisation processes
- Develop, maintain and operate Geodetic infrastructure including software for Precise Orbit Determination and high accuracy GNSS data processing as well as ESA's GNSS Observation Network (EGON)







Strategic cooperation to foster Europe's independence in Navigation

Common Goal

Europe's independent Reference for Navigation

Navigation Support Office

- Geodetic Infrastructure
- Geodetic Reference
- Earth Rotation Parameter
- Precise Orbit Determination Solutions
- Atmospheric products

GSSC

- Data Archive and dissemination
- Product Archive and dissemination
- Data Provider
- GNSS Datalabs

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Precise Navigation Products

- High-accuracy GNSS products (e.g. orbits, clocks, biases in batch & real-time)
- Precise Orbit Determination from LEO to Lunar Orbit, with challenging requirements on accuracy, timeliness and availability

Geodetic Reference and Earth Orientation

- Provide the link between the coordinate systems on Earth and in space.
- Represent a critical input for Precise Orbit Determination
- We generate independent high-quality products.

Atmospheric Estimates & Predictions

e Navigation Support Office records GNSS station data and generates GNSS products for all constellations (GPS, Galileo, Glonas Beidou, QZSS) on an operational basis. All products are characterized by high precision, availability and reliability. In the following the RINEX codes are used to identify the systems: Galileo (E), GPS (G), Glonass (R), Beidou (C), QZSS (J GOCE reentry orbi SLR based produ ailed information concerning the processing strategy and models adopted for the products generation are available in ou Analysis Strategy Summaries for JGS and ESOC MGNSS ORIS base STANDARD PRODUCTS AND DATA Our latest published products are freely available on our web page (can be retrieved via file browser or http://download/methods (e.g. waet or curl GNSS station data (RINEX) and historical products can be found on ESA's GNSS Science Archive and Service Centre (GSSC Earth Rotation All products currently available on navigation-office.esa.int are or will be soon available at GSSC

PUBLICATIONS EVENTS

navigation support office

PRODUCT

ABOUT US ACTIVITIES

 We generate lonospheric and Tropospheric products, which we distribute to ESA Internal (Flight Dynamics, Space Weather) and externals (e.g. IGS).

Coordinated Universal Time (UTC)

• We operate the Timing Facility at ESOC, where local timescale generation is based on two active hydrogen masers operated in a thermally stable environment.



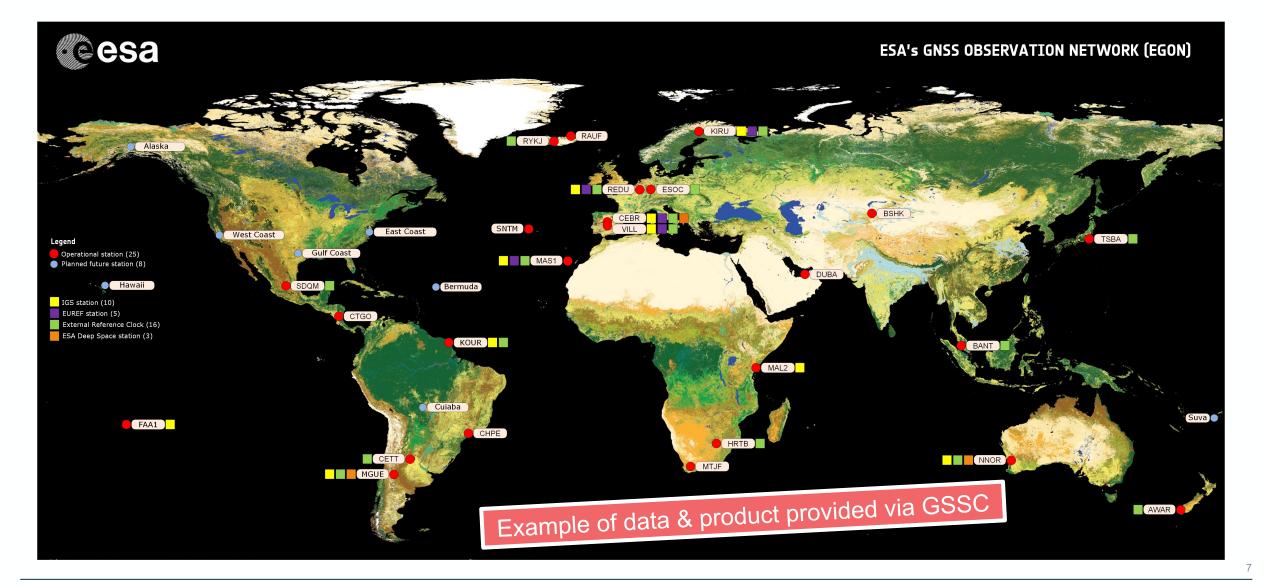
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ESA'S GNSS Observation Network (EGON) – GNSS data

Generated by the Navigation Support Office



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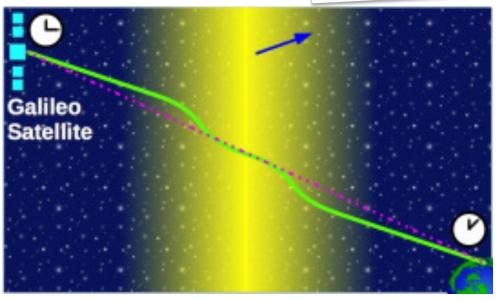
GNSS Scientific support data

Generated by the Navigation Support Office

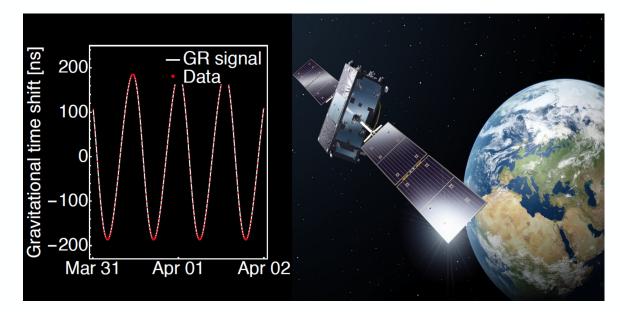


The Navigation Support office generates highly accurate orbit and clock products tailored to the specific needs of different studies such as for the Galileo gravitational Redshift Experiment with eccentric sATellites (GREAT) or the Galileo Survey of Transient Objects Network (GASTON), ...

Example of data & product provided via GSSC



https://h2020nav.esa.int/project/h2020-038-10



https://www.esa.int/Applications/Navigation/Galileo satellites prove Einstein s Relativity Theory to highest accuracy yet

GNSS Scientific support data

Generated by the Navigation Support Office



eesa

The Navigation Support office generates highly accurate orbit and clock products tailored to the specific needs of different studies such as for the Galileo gravitational Redshift Experiment with eccentric sATellites (GREAT) or the Galileo Survey of Transient Objects Network (GASTON), ...

Example of data & product provided via GSSC

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ESA GNSS Science Support Centre | GSSC Now [BETA]

EXPLORER **DATASETS** DATALABS ANONYMOUS 👽

	Collection	^ Dataset	CACCESS Policy	Datalabs	≎ doi	≎ Comments	Description	≎ License	Metadata	Network / Organi	≎ Re
>	GASTON	GASTON (1 week of	Public	gLAB, UPC Clocks V	Not Available	To be ingested. Plea	Public dataset -1 we	ESA Data Policy [ES	Topologic Dark Matte	ESA	Precis
	GASTON	GASTON (Full datas	Restricted	gLAB, UPC Clocks V	Not Available	To be ingested. Plea	Restricted Full datas	ESA T&C [ESA T&C	Topologic Dark Matte	ESA	Precis
	GESTA	GESTA Experiments	Public	Octave, UPC Clocks	Not Available	Available (FTP only)	Galileo Experimentat	ESA Data Policy [ES	Not Available	ESA	Broad
	GOCE	GOCE Mission	Public	Octave, UPC Clocks	Not Available	Available	Gravity field and Oce	ESA Data Policy [ES	GOCE, LEO, Low Ea	ESA	Attitud
	GREAT	GREAT Experiment (Public	gLAB, UPC Clocks V	https://doi.org/10.577	Available	Public dataset of the	ESA Data Policy [ES	Relativity,Experiment	ESA	Precis
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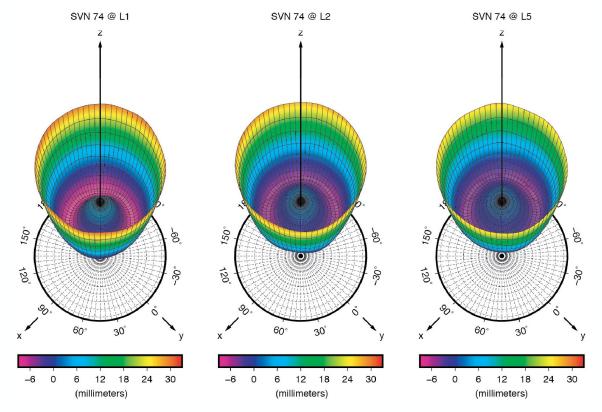
GNSS Metadata

Generated by the Navigation Support Office

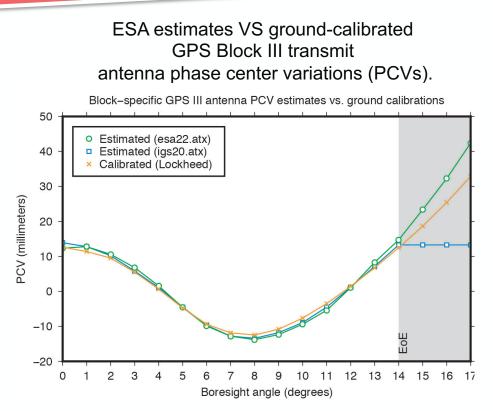


Multi-GNSS satellite and users Metadata, like:

- Phase Center Offsets & Variations (ANTEX files)
- Satellite Mass and Center of Mass location and evolution
- Satellite Manoeuvres and Attitude history files



Example of metadata to be provided via GSSC



Source:

Navigation Support Office's GPS World article New type on the block: Generating high-precision orbits for GPS III satellites

Atmosphere Estimates & Predictions (e.g., Iono, Tropo)

Generated by the Navigation Support Office



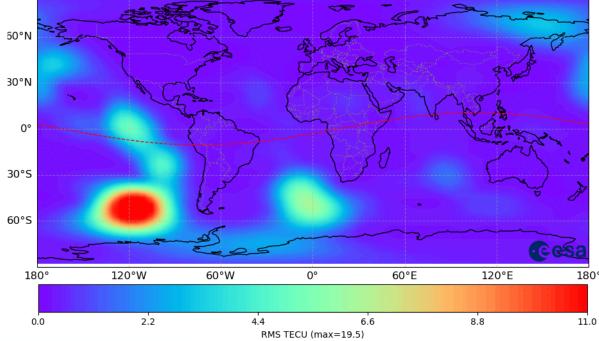
Example of data & product to be provided via GSSC

ESOC'S GLOBAL IONOSPHERE MAPS FOR DAY 325, 2023, 00:00:00 SH: SPHERICAL HARMONIC MODEL FROM 276 STATS; N = 15, M = 15 60°N 50°N 30°N 30°N 0° 0° 30°S 30°S 60°S 60°S **ces**a 120°W 0° 180° 60°W 60°E 120°E 180° 180° 22.0 110.0 0.0 44.0 66.0 88.0 0.0

Midterm goal:

- Generation of ionospheric predictions at the GSSC.
- Publication of ionospheric predictions at the GSSC

ESOC'S GLOBAL IONOSPHERE MAPS FOR DAY 325, 2023, 00:00:00 SH: SPHERICAL HARMONIC MODEL FROM 276 STATS; N = 15, M = 15



Source: Navigation Support Office's Ionosphere TEC and RMS maps estimates

11



12

 The long-term goal is the seamless integration of the Navigation Support Office Data, Metadata Products and Service into the GSSC.

Objective is to perform both data analysis and product publication in the GSSC systems

- Evolve Navigation Support data, metadata, product and service portfolio
 Next to come: Ionosphere Predictions, Earth Rotation Prediction Service, new GNSS metadata: Consistent set of antenna phase centre offsets and variations for all GNSS
- Support new Geodesy missions.

Next to come:



Making GSSC a unique place in Europe for Navigation Support.



Thank you very much for your attention!

