



GNSS Science Support Centre (GSSC)

ESA's IGS Global Data Centre



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Introduction

The GNSS Science Support Centre (GSSC) is:

- the ESA GNSS data preservation and exploitation environment
- provided by the ESA Science Navigation Operations Section
- supporting the IGS and the international geodetic community.

As an IGS Global Data Center (GDC), the GSSC :

- contributes to GNSS data archiving and dissemination
- collaborates with other IGS DCs, ACs and stations
- makes IGS data and products worldwide open

The GSSC hosts:

- GSSC Archive: a large GNSS data repository,
- GSSC Now: a digital platform for GNSS data exploration
- GSSC Datalabs: data analysis and visualisation
- Navipedia: an online GNSS encyclopaedia

The GSSC Archive has been expanded to include datasets from:

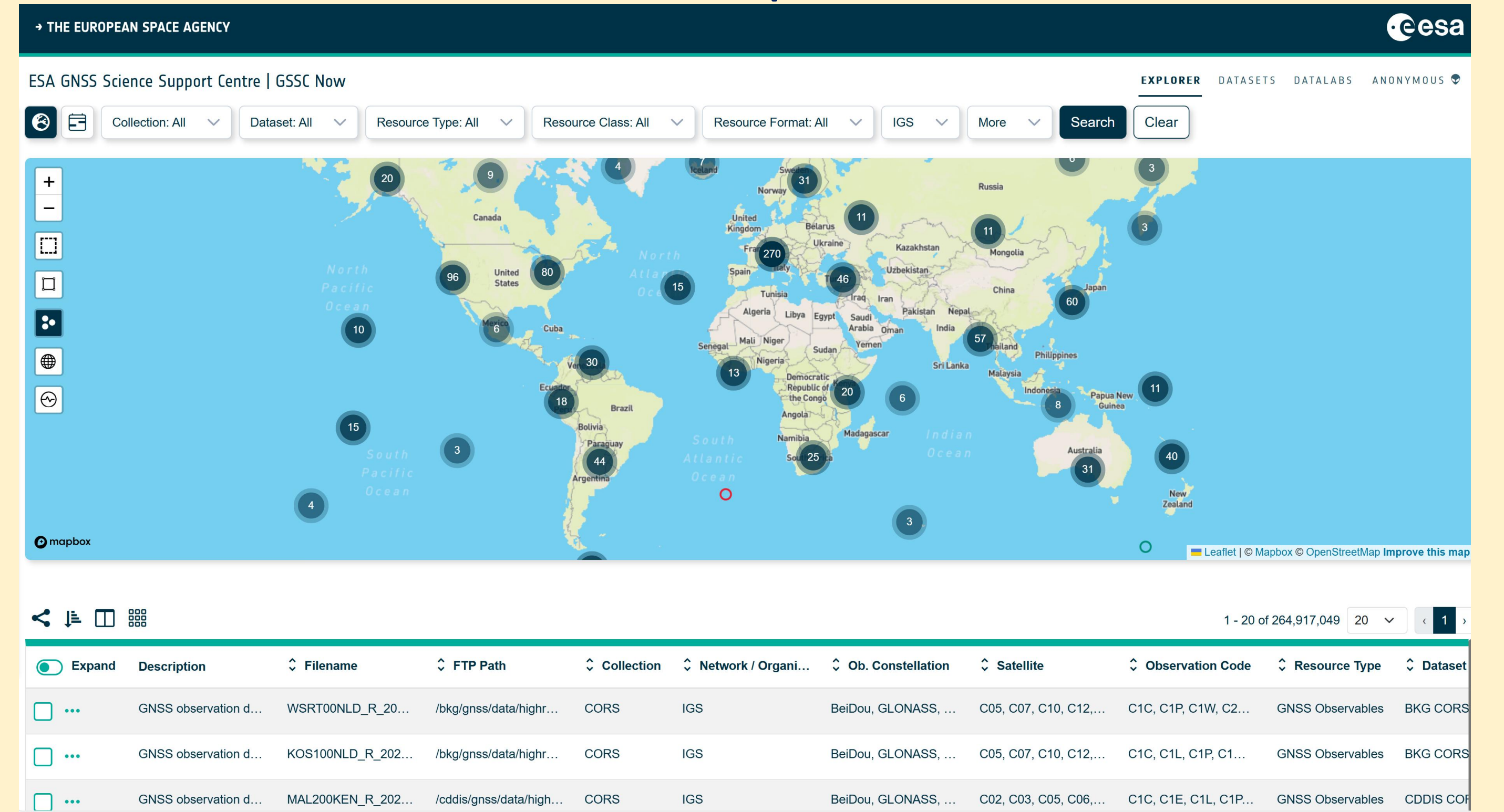
- supplementary ground networks
- relevant scientific services
- GNSS receivers onboard spacecrafts
- GNSS receivers part of ESA experiments.

GSSC Archive anonymously accessible via SFTP/HTTPS

GSSC Datalabs offer via user's web browsers:

- access to the ESA Science Directorate cloud infrastructure
- on-demand data analysis and visualisation tools
- free-of-charge data storage
- containerised desktop-based applications
- expansion to legacy data processing systems
- long-term data, tools and results preservation

GSSC Now – Explorer View



GNSS Data and Products

Assets ingestion:

- relies on fully automated scheduled jobs
- directly pulls from remote sources
- follows pre-defined execution schedules and the time windows
- GSSC operators can manually trigger any necessary jobs upon request

GSSC Now software:

- retrieves, filters, downloads and moves selected files into the appropriate GSSC directory
- submits each file for processing
- regularly checks for gaps between source and GSSC repositories
- Automatically retrieves any missing data

Accredited contributors can upload data directly into GSSC repositories.

GSSC Now Software handles metadata extraction:

- each GSSC repository file metadata is extracted and indexed
- this enables the users faceted search

IGS product type	Source	Scheduled	Scans	GSSC Dataset
Orbits, clocks, ERP positions	CCDIS	Twice a day at 11 and 23	Last 24 hours	CCDIS CORS
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
MGEX products	CCDIS	Twice a day at 11 and 23	Last 24 hours	MGEX Data and Products
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
Ionosphere	CCDIS	Twice a day at 11 and 23	Last 24 hours	CCDIS CORS
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
Differential Code Biases	CCDIS	Twice a day at 11 and 23	Last 24 hours	MGEX Data and Products
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
Troposphere	CCDIS	Twice a day at 11 and 23	Last 24 hours	CCDIS CORS
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
IGS data type	Source	Scheduled	Scans	GSSC Dataset
Daily GNSS	CCDIS	Every hour	Last 24 hours	CCDIS CORS
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
Daily GNSS	BKG	Every hour	Last 24 hours	BKG CORS
Daily GNSS	IGN	Every hour	Last 24 hours	IGN CORS
Merged site navigation files	CCDIS	Every hour	Last 24 hours	CCDIS CORS
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
Hourly GNSS	CCDIS	Every hour	Last 24 hours	CCDIS CORS
		Sunday and Wednesday	Last 7 days	
		Twice a month on 1st and 15th	Previous month	
High-rate GNSS data	CCDIS	Twice a month on 1st and 15th	Previous month	
		Every 15 min	Last 24 hours	CCDIS CORS
High-rate GNSS data	BKG	Twice a month on 1st and 15th	Previous month	
		Every 15 min	Last 24 hours	BKG CORS

Data Format	# Files	Data Type	# Files
RINEX 2	> 154 M	IGS HOURLY FILES	> 135 M
RINEX 3	> 104 M	IGS DAILY FILES	> 73 M
RINEX 4	> 1 M	IGS HIGHRATE FILES	> 18 M

Products	# Files	Others	# Files
IGS Products	> 4 M	IGS Stations logs, SINEX...	> 38 M

Geodetic Data Centre Mirroring

The GSSC Archive:

- collects data from other geodetic Data Centres
- ensures data redundancy
- data long-term preservation
- enhances global data accessibility
- strengthens the global geodetic infrastructure resilience
- minimises the risk of data loss
- ensures continuous access in case of network/server disruption

GSSC data sources for the four geodetic techniques	
Geodetic Technique	Data Source Repositories
GNSS	Crustal Dynamics Data Information System (CDDIS)
	Bundesamt für Kartographie und Geodäsie (BKG)
	Institut Géographique National (IGN)
SLR	Crustal Dynamics Data Information System (CDDIS)
DORIS	Crustal Dynamics Data Information System (CDDIS)
VLBI	Observatoire de Paris (OPAR)

Real-time GNSS Data via ESA's GSSC Caster

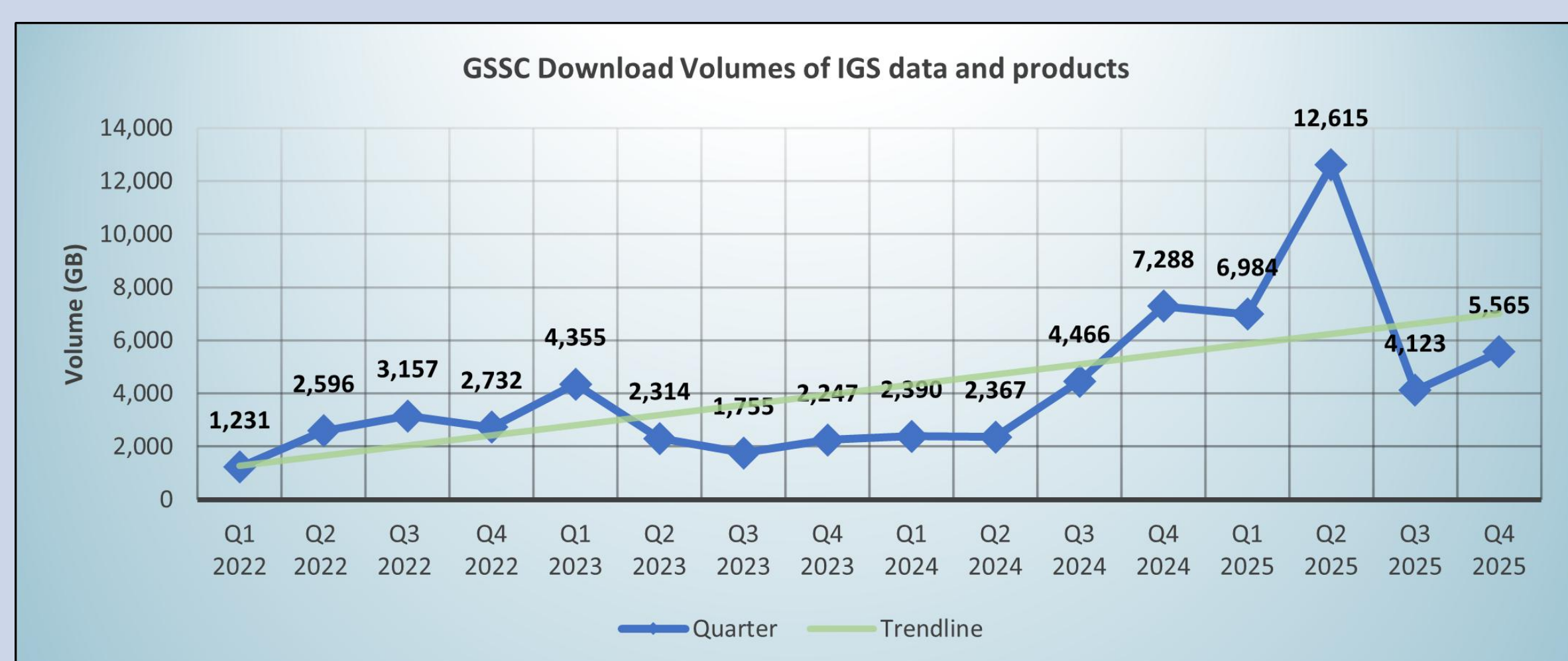
- GSSC Caster ensures reliable and low-latency access for the user community.
- Ongoing improvements focus on service stability, monitoring, and compliance with IGS standards
- GSSC Caster supports high availability and consistent performance for real-time applications.



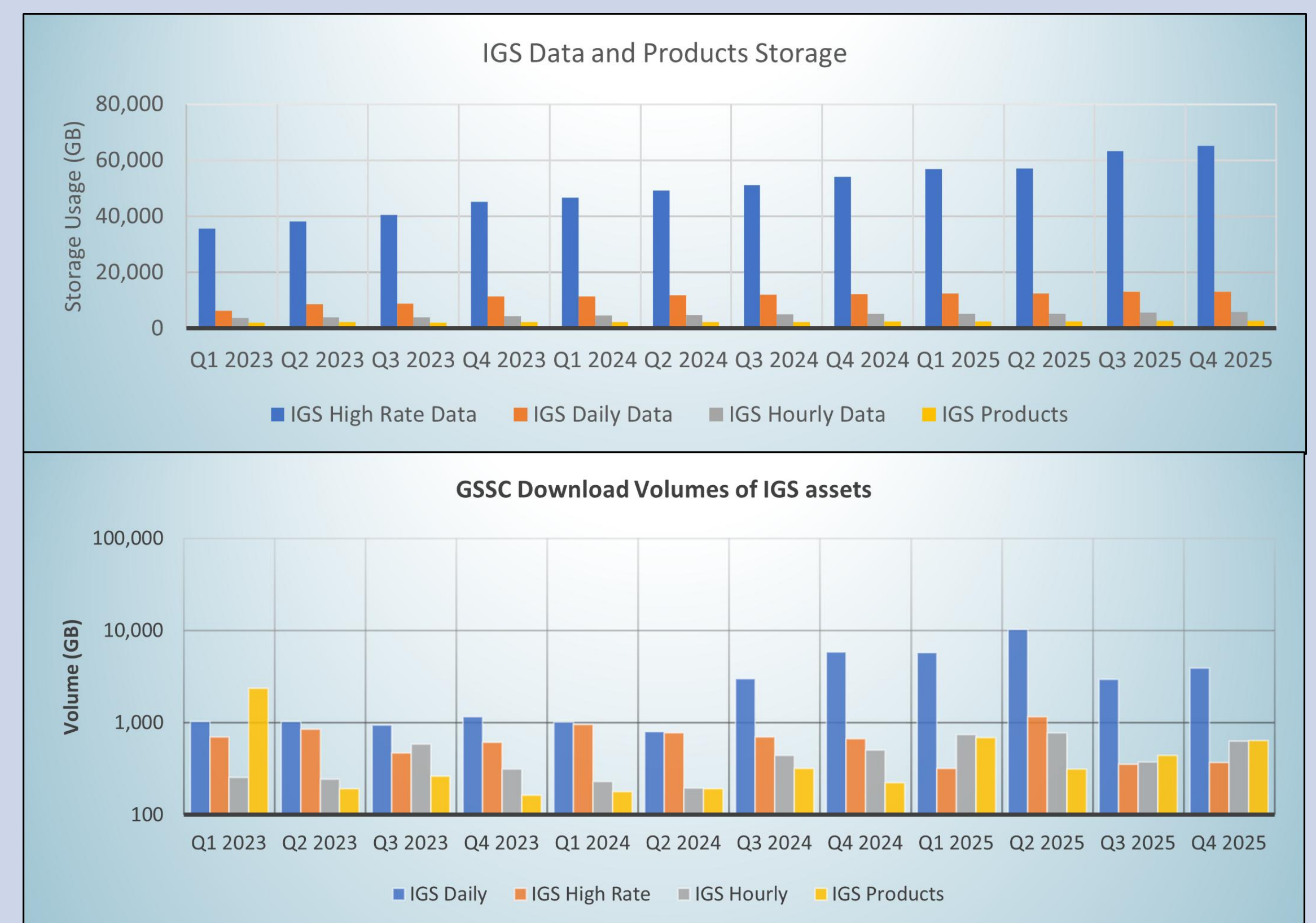
2025 Statistics

The GSSC Archive:

- more than 270 million of IGS assets (data and products)
- collected from other GNSS Global, Regional Data Centers and IGS Analysis Centers
- publicly available to scientific researchers and the overall GNSS community
- accessible via FTP, SFTP, HTTPS, NTRIP Caster and a REST API
- Datasets accesses and download volumes keeps growing



GSSC is established as a key asset to the worldwide scientific community



2025 Highlights

- ESA Navigation Support fully relies on GSSC Archive
- GSSC Archive mirrors IGS, ILRS and now also IGS DCs datasets
- GNSS Now 2.0 is operational:
 - Reliability
 - performance optimizations
 - new features
 - stability improvements.
- GSSC servers the ESA Genesis Mission:
 - started archiving and distributing data
 - detailed its interface with the global scientific community
 - receives data from ESA Navigation Support Office

GSSC will archive and distribute NovaMoon mission data

GSSC engaged with the GNSS community with

- Navipedia contribution capabilities
- regular news updates

GSSC was represented in:

- European Geosciences Union G^{al} Assembly 2025
- UN International Committee on GNSS, Korea
- several other prominent international forums

New collaborative ties were pursued with

- educational institutions
- industry stakeholders
- research organizations

These accomplishments were made possible through the dedicated efforts and close collaboration of the teams from ESA, GMV and Starion.

GSSC Evolution

GSSC 2026 priorities:

- further adapt to meet the requirements of the Charter for IGS Service Data Centres.
- support the ESA Navigation Support Office Analyse Centres role
- evolve its Archive to support Earth Orientations Parameters data and products
- further align with user needs, especially ESA Genesis and NovaMoon missions data.
- improve data discovery and usability through enhanced browsing capabilities
- tighter integrate with ESA Datalabs to streamline data and services access
- support more efficient exploitation by the user community
- include DOI minting for datasets and tools
 - strengthen data traceability
 - support open science practices
- release GSSC software components Open Source
 - on github.com/esa
 - under the ESA Public License (ESA-PL)
 - enable transparency, reuse, and collaboration
- Last and far from least, continued improvements in:
 - archive robustness
 - security measures
 - quality services

