



# GNSS Data and Products

**Rui Fernandes & EPOS-GNSS TCS\***  
\* TCS – Thematic Core Service

# Outline

- **EPOS – GNSS Community**
- **High quality GNSS Data and Products for Solid Earth sciences**
- **Flow of Data & Products**
- **e-Infrastructure:**
  - **Portals / Nodes / Repositories**
- **Connection with other projects/efforts:**
  - **EPN-Densification, EPOS National Projects, EarthScope Consortium**
  - **Africa, Latin America**

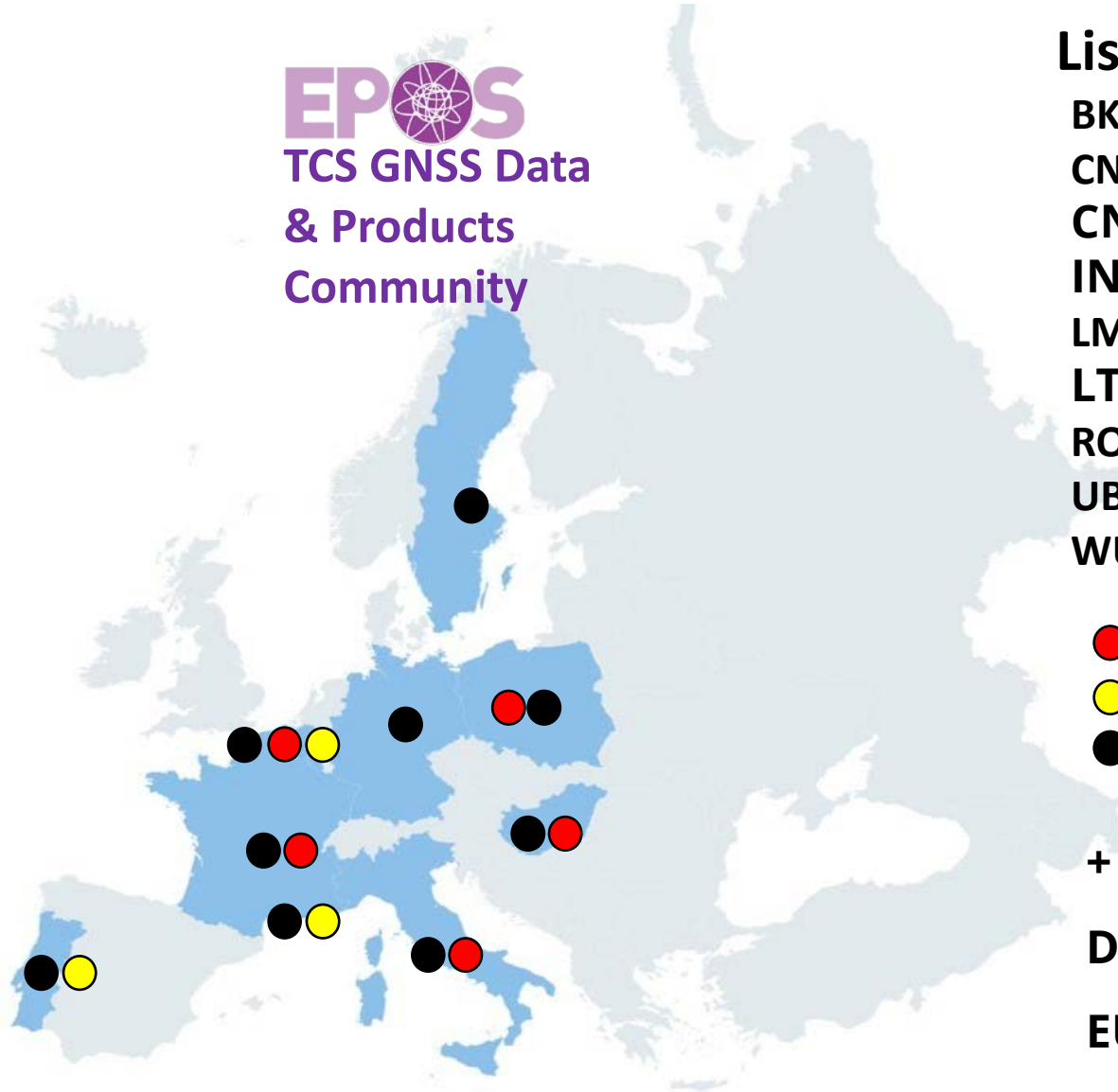
# Objectives TCS GNSS Data & Products

- **Maintain the governance of TCS GNSS Data & Products in EPOS;**
- **Interact with the geodetic community in Europe, at national and Pan-European (EUREF) levels;**
- **Ensure interoperability between EPOS GNSS services (data and products) and EPOS ICS<sup>\*</sup> ;**
- **Promote multidisciplinary interoperability with other disciplines within EPOS;**
- **Implement distributed dissemination of file-based GNSS data (currently for ~1500 stations), and derived Products: CRD, VEL, STR (currently ~2700 stations).**

*\*Integrated Core Service*

# EPOS-GNSS

**EPOS**  
TCS GNSS Data  
& Products  
Community



## GNSS TCS (EPOS-ERIC) Partners

### List of Pan-European Service Providers:

**BKG** Bundesamt für Kartographie und Geodäsie, DE

**CNRS-OCA** Observatoire Cote d'Azur, FR

**CNRS-UGA** Université Grenoble Alpes, FR

**INGV** Istituto Nazionale di Geofisica e Vulcanologia IT

**LM** Lantmäteriet, SW

**LTK** Lechner Knowledge Center, HU

**ROB** Royal Observatory of Belgium, BE

**UBI/C4G** U. Beira Interior/Colaboratory for Geosciences, PT

**WUT** Warsaw University of Technology, PL

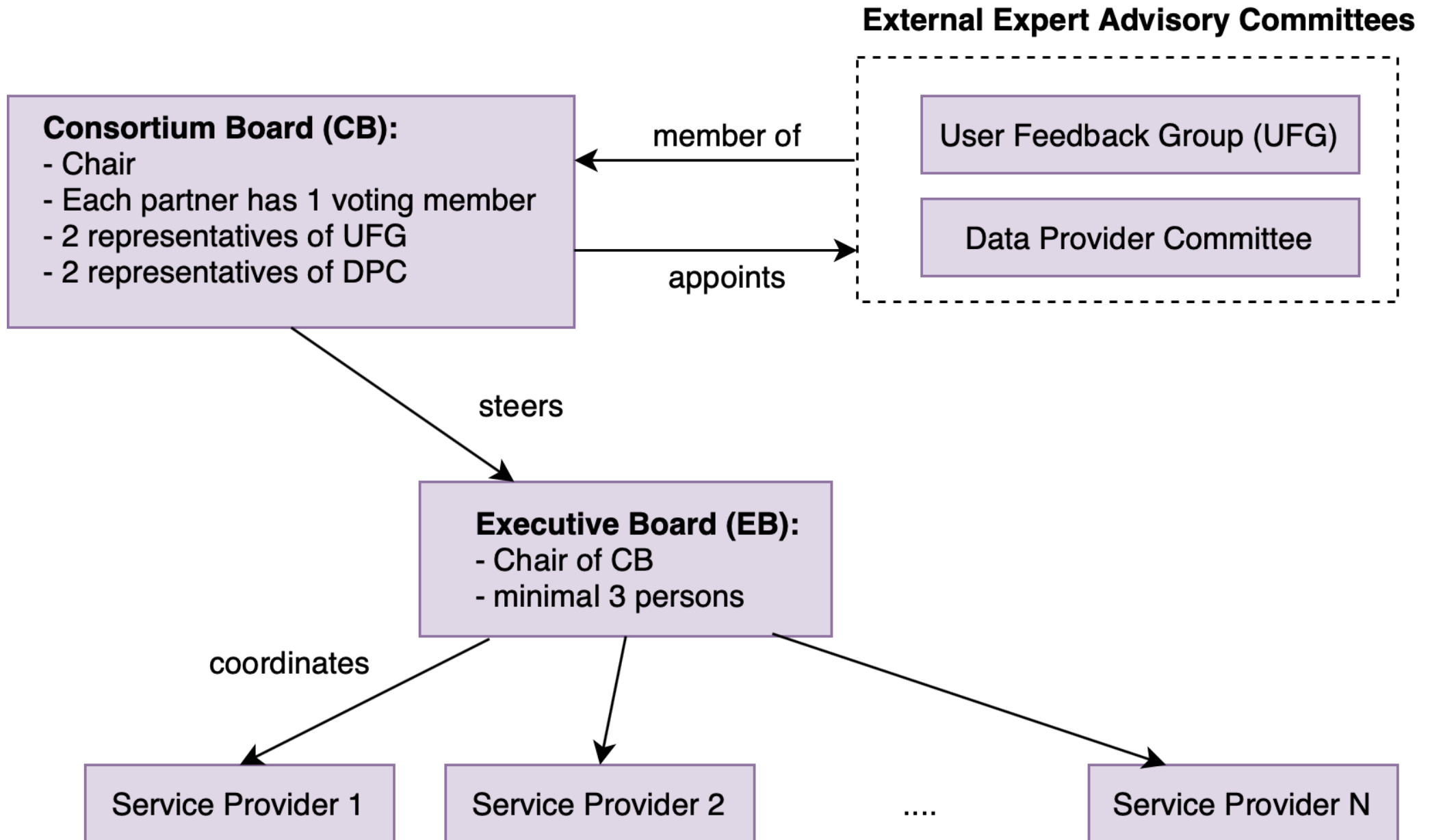
- 5 Product Centers
- 3 Portals (M3G, Data, Products)
- 11 Service Providers

+

**Data Providers** (National Research Infrastructures)

**EUREF** (Data, Data Products & Services)

# Governance Structure



# DDSS – Data, Data Products, Services, Software

| TYPE                         | SERVICE NAME                           | SERVICE DESCRIPTION  | PROVIDER | COUNTRY |
|------------------------------|--|--|----------|---------|
| <b>Governance</b>            |  |  |          |         |
| GOV                          | TCS Governance                         | Secretariat, Consortium board activities   | UBI/C4G  | PT      |
| SERVICE                      | TCS Harmonisation                      | Harmonisation with GNSS Federated Data Providers   | ROB      | BE      |
| SERVICE                      | TCS Outreach                           | Promotion of TCS data and products   | UBI/C4G  | PT      |
| <b>Data Dissemination</b>    |  |  |          |         |
| SERVICE                      | Management of data services            | Management of Node Infrastructure  | CNRS-OCA | FR      |
| SERVICE                      | M3G                                    | M3G GNSS Station metadata management service   | ROB      | BE      |
| SERVICE                      | Data Gateway                           | Maintenance & Operation of GNSS Data Gateway   | CNRS-OCA | FR      |
| SERVICE                      | GNSS data validation                   | Long-term data quality monitoring  | ROB      | BE      |
| <b>Product Dissemination</b> |  |  |          |         |
| SERVICE                      | Management of product services         | Management of Product Services   | CNRS-UGA | FR      |
| SERVICE                      | Products Portal                        | M&O of GNSS Products Gateway; Internal validation of GNSS-derived products   | UBI/C4G  | PT      |
| SERVICE                      | PP Products                            | Daily solutions for EPOS stations using PP approach; Velocity Field from Combined EPOS Solutions                           | INGV     | IT      |
| SERVICE                      | DD Products                            | Daily solutions for EPOS stations using DD approach  | CNRS-UGA | FR      |
| SERVICE                      | Combined Products                      | Daily Combined time-series solutions using EPOS and EUREF solutions; Velocity Field from Combined (EPOS + EUREF) Solutions | LTK      | HU      |
| SERVICE                      | Strain Rates                           | Strain rates derived from velocity fields  | LM       | SE      |
| <b>Software Provision</b>    |  |  |          |         |
| SERVICE                      | Management of software services        | Management of Software Services  | UBI/C4G  | PT      |
| SERVICE                      | GLASS @ UBI                            | M&O of GLASS databases, tools & webservices  | UBI/C4G  | PT      |
| SERVICE                      | GLASS @ INGV                           | M&O of GLASS tools   | INGV     | IT      |
| SERVICE                      | GLASS @ OCA                            | M&O of GLASS tools   | CNRS-OCA | FR      |
| <b>EUREF</b>                 |  |  |          |         |
| SERVICE                      | EUREF Permanent Network Central Bureau | EUREF Permanent Network Central Bureau   | ROB      | BE      |
| SERVICE                      | EUREF-ROB data node                    | EUREF-ROB GNSS data archive  | ROB      | BE      |
| SERVICE                      | EUREF-WUT Products                     | Weekly combined positions of EUREF stations  | WUT      | PL      |
| SERVICE                      | EUREF Reference Frame                  | Positions, velocities, and time series of EPN stations   | ROB      | BE      |
| SERVICE                      | EUREF-LTK Products                     | Velocity field from combined EUREF densified solutions   | LTK      | HU      |
| SERVICE                      | EUREF-BKG data node                    | EUREF-BKG GNSS data archive  | BKG      | DE      |

# Added value of GNSS Data & Products for the GNSS community

- **Sustainability within EPOS:**
  - Countries that join EPOS-ERIC commit to maintain their GNSS infrastructure integrated in EPOS (stations, operation).
  - Pan-European Service Providers needed the commitment of their countries to sustain them on long-term (EPOS-ERIC operation).
- **Provision of software tools (GLASS):**
  - Standardized data quality check and visualization
  - Standardized exchange of metadata
  - Seamless data access
  - To be made globally available

# GLASS – What and Why?

GNSS Linkage Advanced Software System

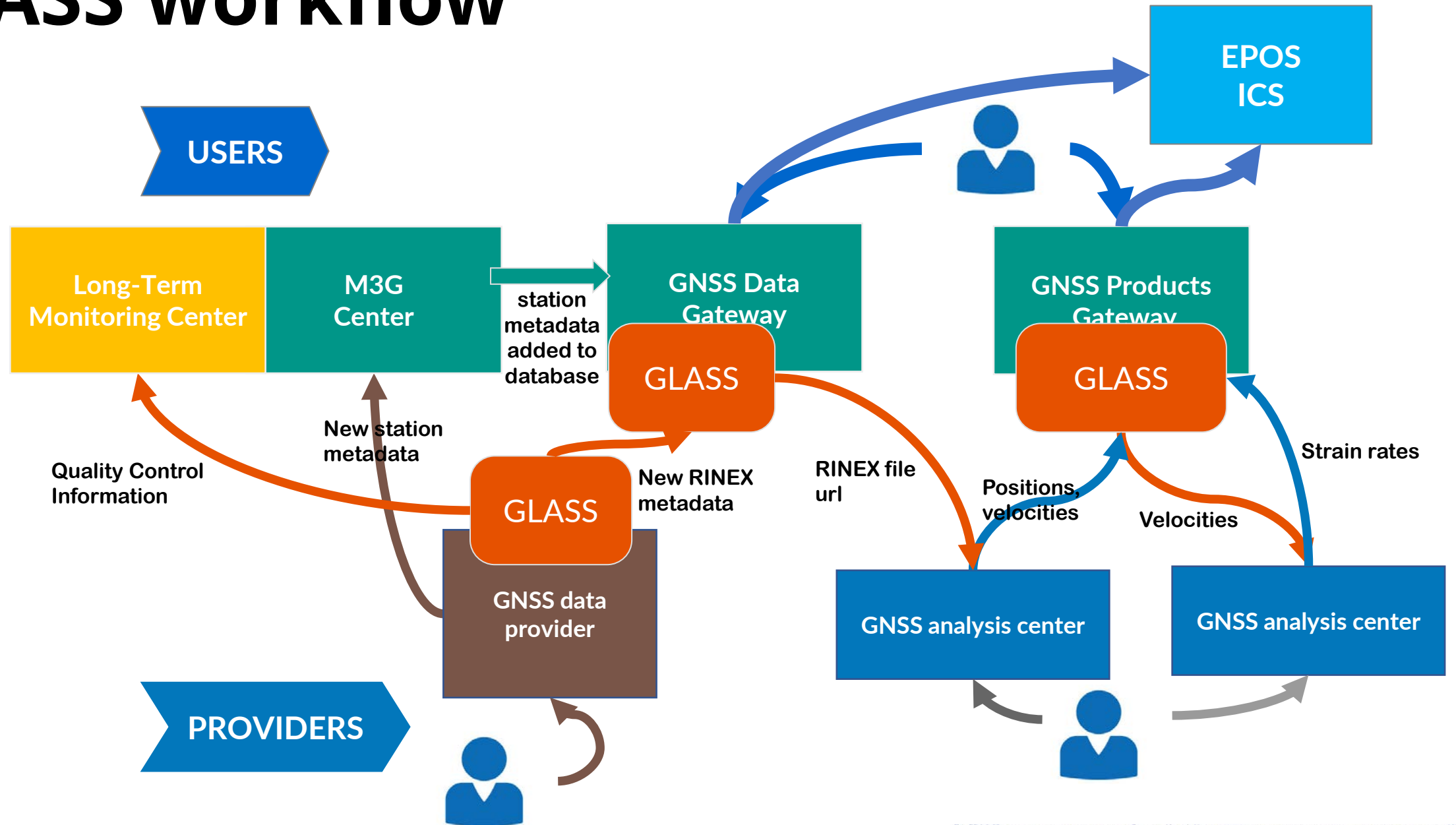
**GLASS intends to be an integrated software package to be deployed in a GNSS infrastructure to:**

- Manage GNSS data (RINEX & metadata) from distributed repositories/data centers:
  - Collect data
  - Validate data
  - Disseminate data
- Provide GNSS products:
  - Coordinate Daily and Time Series
  - Velocity Fields
  - Strain Rate Fields





# GLASS workflow



# M<sup>3</sup>G Center

<https://gnss-metadata.eu/>

**M<sup>3</sup>G** Metadata Management and Distribution System for Multiple GNSS Networks

Agencies Stations Metadata Catalog EPOS Data Nodes Networks Documentation About Login

## Welcome!

### Supported GNSS networks

- EUREF Permanent Network (EPN)
- EPN Densification Network
- European Plate Observing System (EPOS) Network

2577 GNSS stations with metadata in M<sup>3</sup>G

1000 km  
50 Leaflet | Map tiles by Stamen Design, CC BY 3.0 — Map data © OpenStreetMap contributors

### Updates

- TPOL00HUN** yesterday  
Receiver changed to LEICA GRX1200GGPRO (SN:356558)
- TATA00HUN** yesterday  
Antenna changed to LEIAR20 LEIM (SN:21304011)
- SZFV00HUN** yesterday  
Antenna changed to LEIAR20 LEIM (SN:21274024)
- PUSP00HUN** yesterday  
Receiver changed to LEICA GRX1200GGPRO (SN:352257)
- MONO00HUN** yesterday  
Receiver changed to LEICA GRX1200+GNSS (SN:456749)
- JASZ00HUN** yesterday  
Antenna changed to LEIAR20 LEIM (SN:21274011)
- BOLG00ITA** yesterday  
Section 11
- MSEL00ITA** yesterday  
Elevation cut off changed to 0

# EPOS-GNSS Data Gateway

The screenshot shows the EPOS-GNSS Data Gateway interface. At the top, there's a navigation bar with the EPOS logo and 'GNSS DATA GATEWAY'. Below this are search and filter options: 'Metadata Search', 'Files Search / Download', 'Clear', and 'Show advanced search'. A map of Europe is displayed with numerous colored markers representing GNSS stations. To the left of the map is a 'Spatial selection' panel with options for 'Rectangle' (Lat-Lon Bounding Box) and 'Circle' (Latitude, Longitude, Radius (Km)). Below the map is a table of station data.

| Marker      | Site Name        | Lat    | Lon     | Alt       | Install Date        | End Date | Country        | State            | City                   | Agency                     | Network      |
|-------------|------------------|--------|---------|-----------|---------------------|----------|----------------|------------------|------------------------|----------------------------|--------------|
| ✓ AARS00BEL | AARSCHOT         | 50.963 | 4.836   | 104.660   | 2002-10-04 00:00:00 |          | Belgium        | Vlaams-Brabant   | Aarschot               | Royal Observatory ...      | FLEPOS       |
| ✓ ABAN00ESP | Abanilla         | 38.175 | -1.054  | 207.620   | 2013-02-11 00:00:00 |          | Spain          | Región De Murcia | Parque De Bomber...    | Red Geodésica Acti...      | REGAM        |
| ✓ ABEP00GBR | Aberporth        | 52.139 | -4.571  | 187.510   | 2005-07-21 00:00:00 |          | United Kingdom | Ceredigion       | Aberporth              | Ordnance Survey Li...      | OS Net       |
| ✓ ABG000GLP | Abri_geophysique | 16.041 | -61.659 | 1,254.510 | 2017-05-18 00:00:00 |          | Guadeloupe     | Guadeloupe (971) | Saint Claude           | Guadeloupe Seismi...       | VOLC         |
| ✓ ACAL00ESP | Los Alcázares    | 37.731 | -0.861  | 67.590    | 2013-02-11 00:00:00 |          | Spain          | Región De Murcia | Parque De Bomber...    | Red Geodésica Acti...      | REGAM        |
| ✓ ACER00ITA | Acerenza (PZ)    | 40.787 | 15.942  | 764.700   | 2007-07-11 00:00:00 |          | Italy          | Basilicata       | Acerenza (Pz)          | Istituto Nazionale di ...  | RING         |
| ✓ ACIN00ESP | Albarracín       | 40.409 | -1.437  | 1,177.850 | 2010-01-19 00:00:00 |          | Spain          | Teruel           | Albarracín             | Instituto Geografico ...   | N/A          |
| ✓ ACNS00ESP | Alcanices        | 41.700 | -6.352  | 871.200   | 2008-02-14 00:00:00 |          | Spain          | Zamora           | Alcanices              | Instituto Tecnologic...    | N/A          |
| ✓ ACOR00ESP | A Coruna         | 43.364 | -8.399  | 66.960    | 1998-03-06 10:10:00 |          | Spain          | A Coruna         | A Coruna               | Instituto Geografico ...   | EPN          |
| ✓ ADAR00GBR | Aberdaron        | 52.789 | -4.741  | 148.360   | 2009-03-04 00:00:00 |          | United Kingdom | Gwynned          | Aberdaron              | Ordnance Survey Li...      | EPN & OS Net |
| ✓ ADCS00ROU | Adamclisi        | 44.088 | 27.966  | 189.150   | 2019-05-14 00:00:00 |          | Romania        | Constanta        | Adamclisi              | National Institute for ... | N/A          |
| ✓ ADE000GLP | DESIRADE AIRPORT | 16.297 | -61.087 | -40.330   | 2002-09-05 00:00:00 |          | Guadeloupe     | Guadeloupe (971) | Beausejour, La Desi... | Guadeloupe Seismi...       | VOLC         |

<http://gnssdata-epos.oca.eu/>

# EPOS-GNSS Products Portal

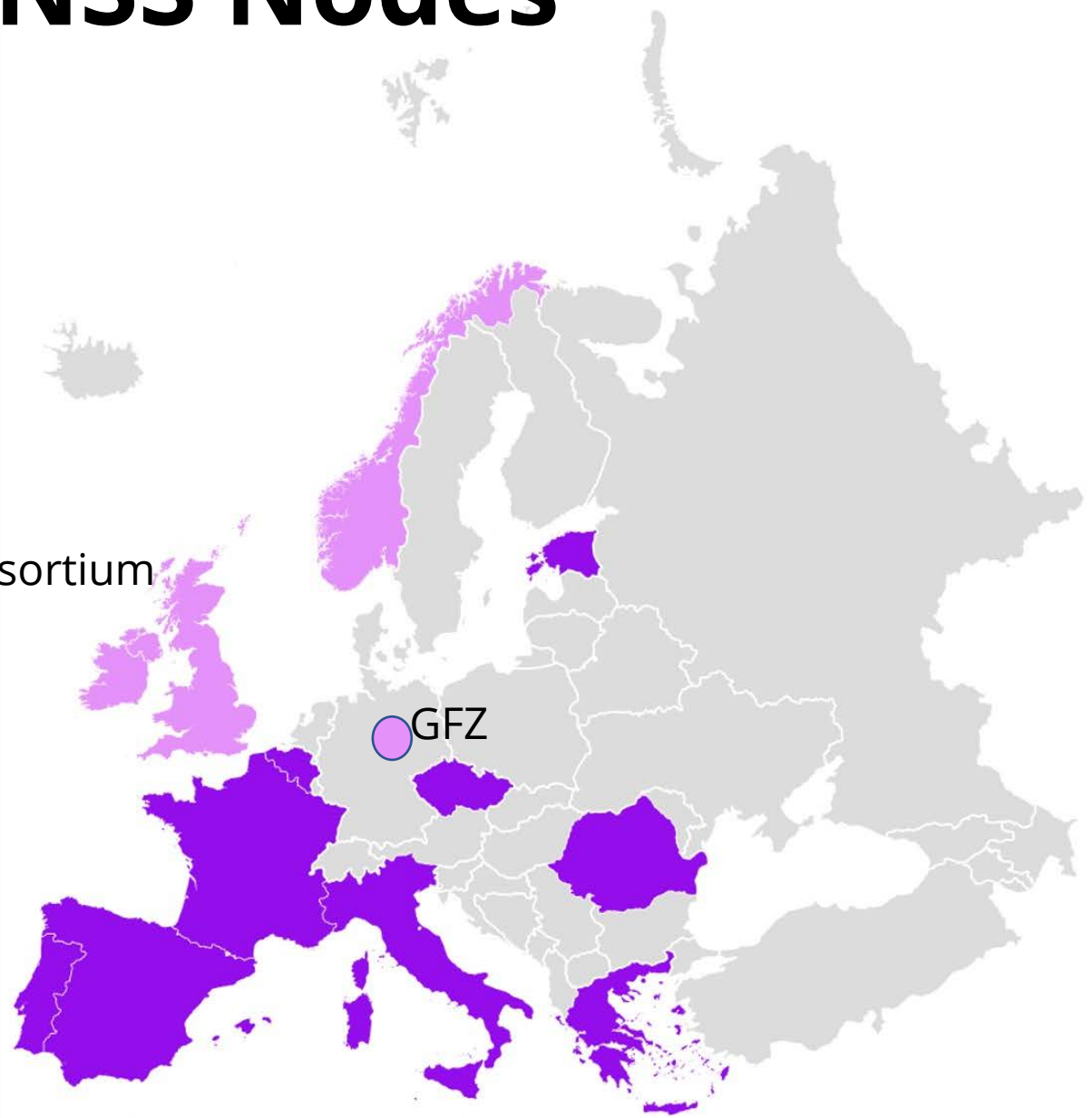
The screenshot displays the EPOS GNSS PRODUCTS PORTAL interface. The main map shows the European continent with numerous purple dots representing GNSS stations. A purple box on the map says "Please select to download selection." The interface includes a navigation menu with "SINEX", "Info", "Data Portal", and "Login". The "Data Controls" section has tabs for "Timeseries", "Velocities", "Power Spectral Density", and "Strain Rate". The "Filters" section allows selecting "Networks" (EPOS, CZEPOS, C4G, RING, EPN, IGS) and "Analysis Centres" (LTK-EUREF, INGV, LTK, ROB-EUREF, UGA-CNRS). Below the map, a table lists station details.

| 9-Char ID | Site Name             | Altitude | Country  | City                  | Agency  | Network              | Availability             |
|-----------|-----------------------|----------|----------|-----------------------|---|----------------------|--------------------------|
| AJAC00FRA | Ajaccio               | 98.78    | France   | Ajaccio               | Institut National de l'Information Géographique et Forestière | EPN & IGS            | <input type="checkbox"/> |
| BRST00FRA | Brest                 | 65.52    | France   | Brest                 | Institut National de l'Information Géographique et Forestière | EPN & IGS            | <input type="checkbox"/> |
| BRUX00BEL | Brussels, BE          | 158.25   | Belgium  | Brussels              | Royal Observatory of Belgium                                  | EPN & ROB_GNSS & IGS | <input type="checkbox"/> |
| EBRE00ESP | Ebre                  | 107.32   | Spain    | Roquetes              | Institut Cartogràfic i Geològic de Catalunya                  | EPN & IGS            | <input type="checkbox"/> |
| FFMJ00DEU | Frankfurt / Main      | 178.19   | Germany  | Frankfurt / Main      | Bundesamt fuer Kartographie und Geodäsie                      | EPN & IGS            | <input type="checkbox"/> |
| FLRS00PRT | Santa Cruz das Flores | 79.86    | Portugal | Santa Cruz Das Flores | Direcao-Geral do Territorio                                   | EPN & IGS            | <input type="checkbox"/> |

<http://gnssproducts.epos.ubi.pt/>

# EPOS-GNSS Nodes

EarthScope Consortium

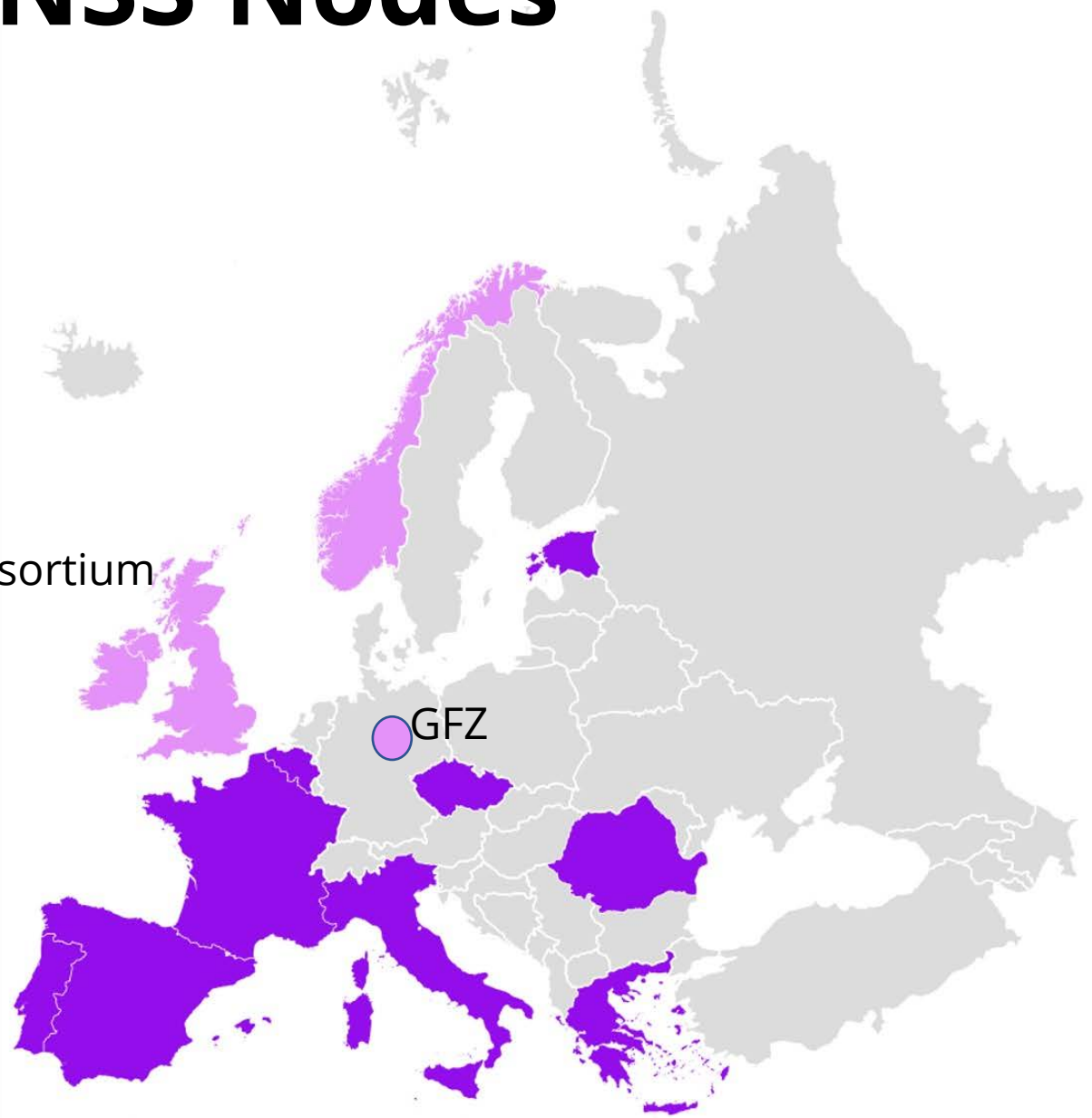


**National Nodes**  
**PanEuropean Node**  
**International Collaboration**

**North Africa & Middle East  
in the future?**

# EPOS-GNSS Nodes

EarthScope Consortium



**National Nodes**  
**PanEuropean Node**  
**International Collaboration**

**Latin America  
in the future?**

# GNSS TCS - MORE INFORMATION

**LANDING PAGE:** EPOS <https://www.epos-eu.org/>  
GNSS <https://gnss-epos.eu/>

## PORTALS:

M3G <https://gnss-metadata.eu/>  
DATA <http://gnssdata-epos.oca.eu/>  
PRODUCTS <https://gnssproducts.epos.ubi.pt/>

## DISSEMINATION:

<https://www.youtube.com/watch?v=NqInMhkCgMI>  
(GNSS-EPOS explained by children)

[contact@gnss-epos.eu](mailto:contact@gnss-epos.eu)