



# 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**

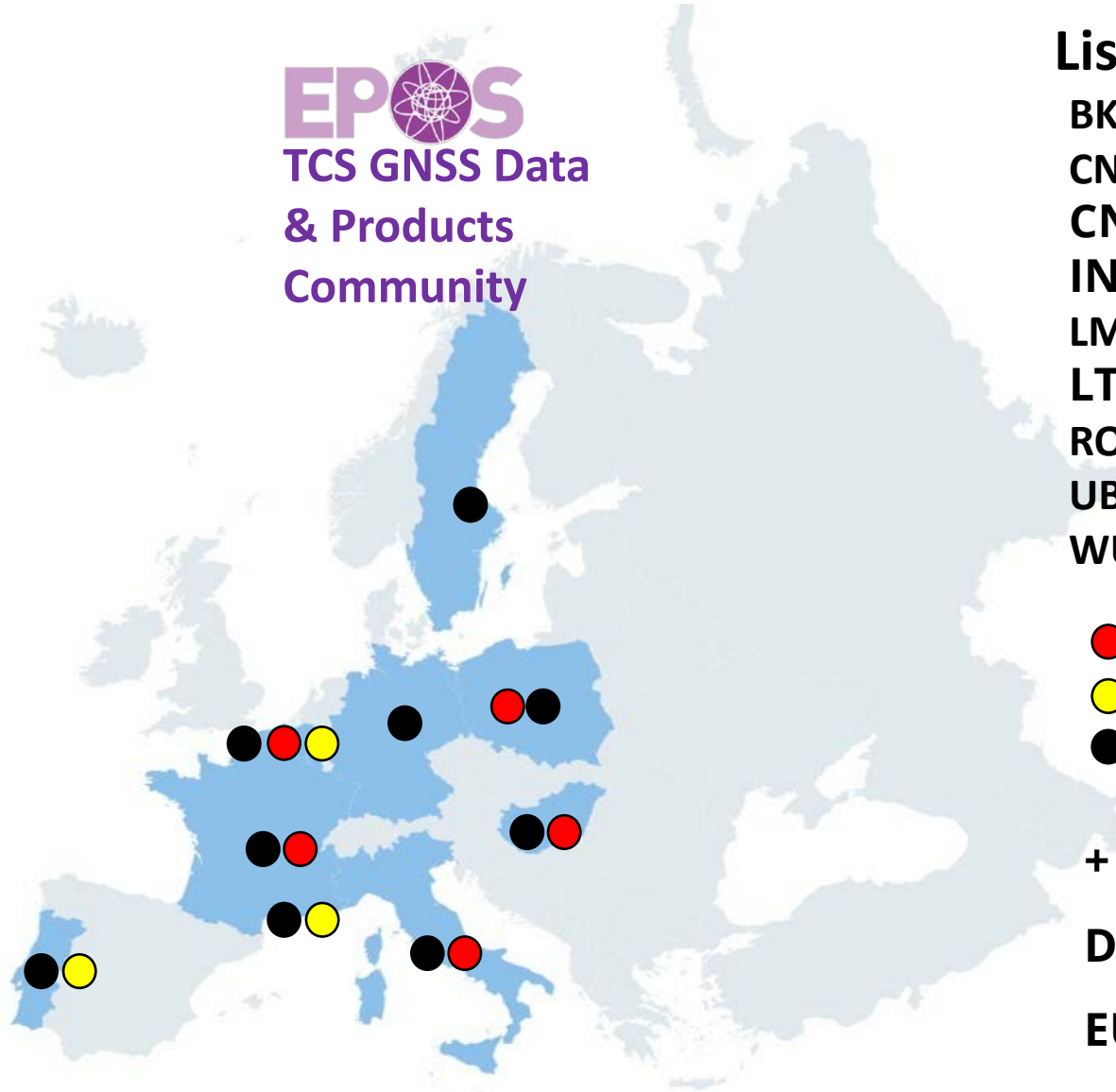
# Objectives TCS GNSS Data & Products

- **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

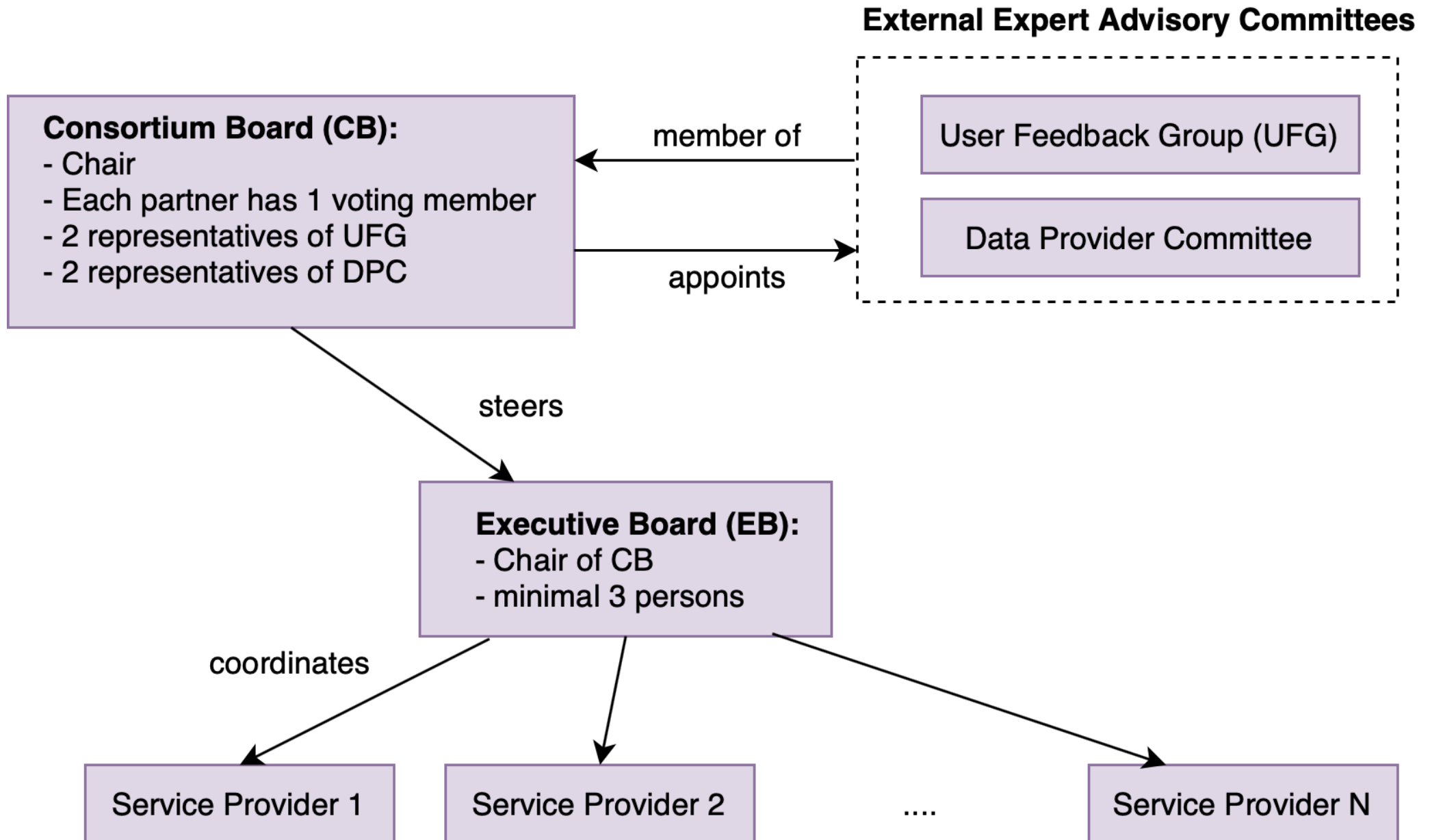
- 5 Product Centers
- 3 Portals (M3G, Data, Products)
- 11 Service Providers

+

**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

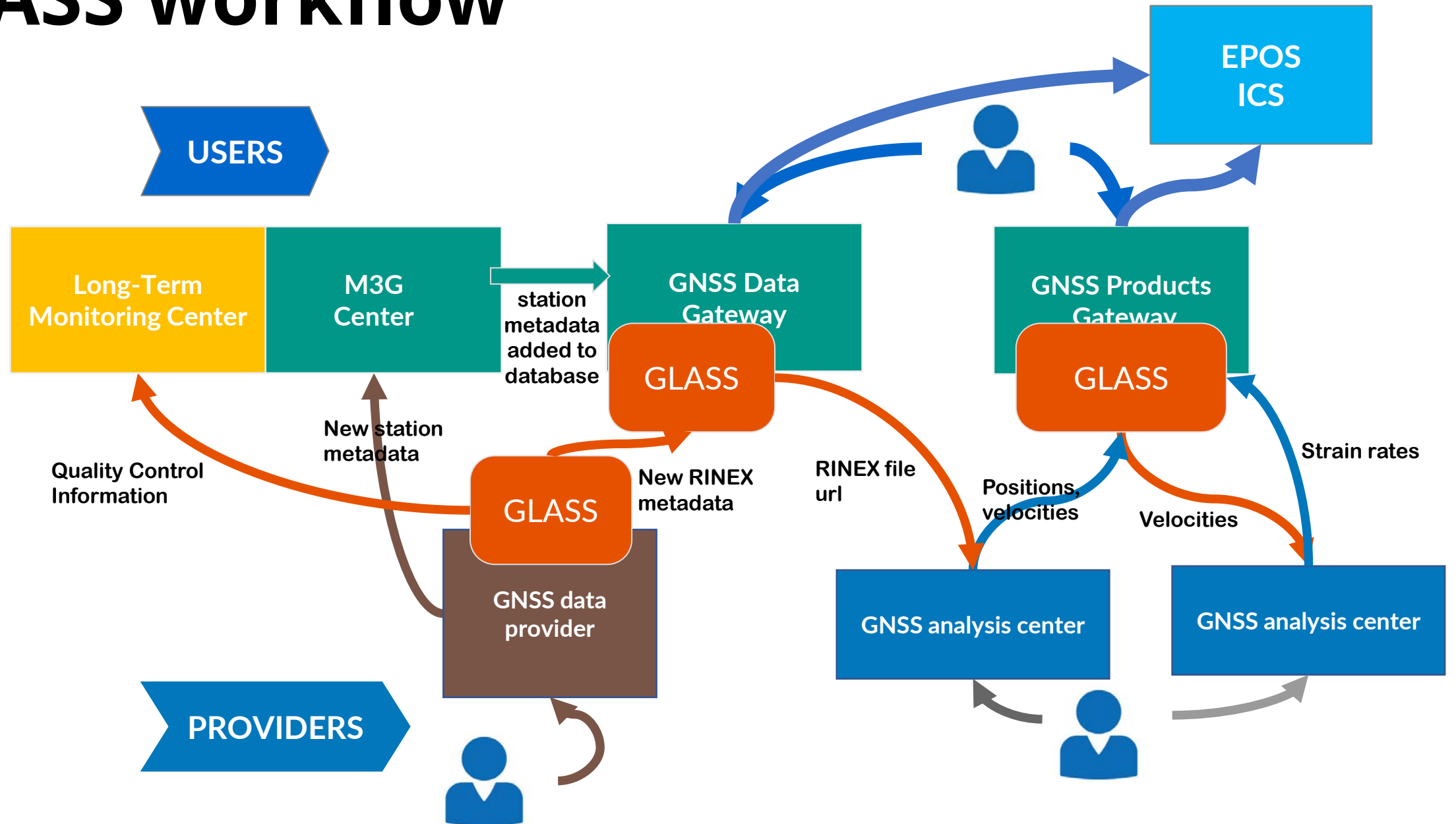
**GLASS intends to be an integrated software package to be deployed in a GNSS infrastructure to:**

- 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

Map showing GNSS stations across Europe and the Mediterranean region. Legend:  EPN stations,  EPN densification stations,  EPOS stations.

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

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

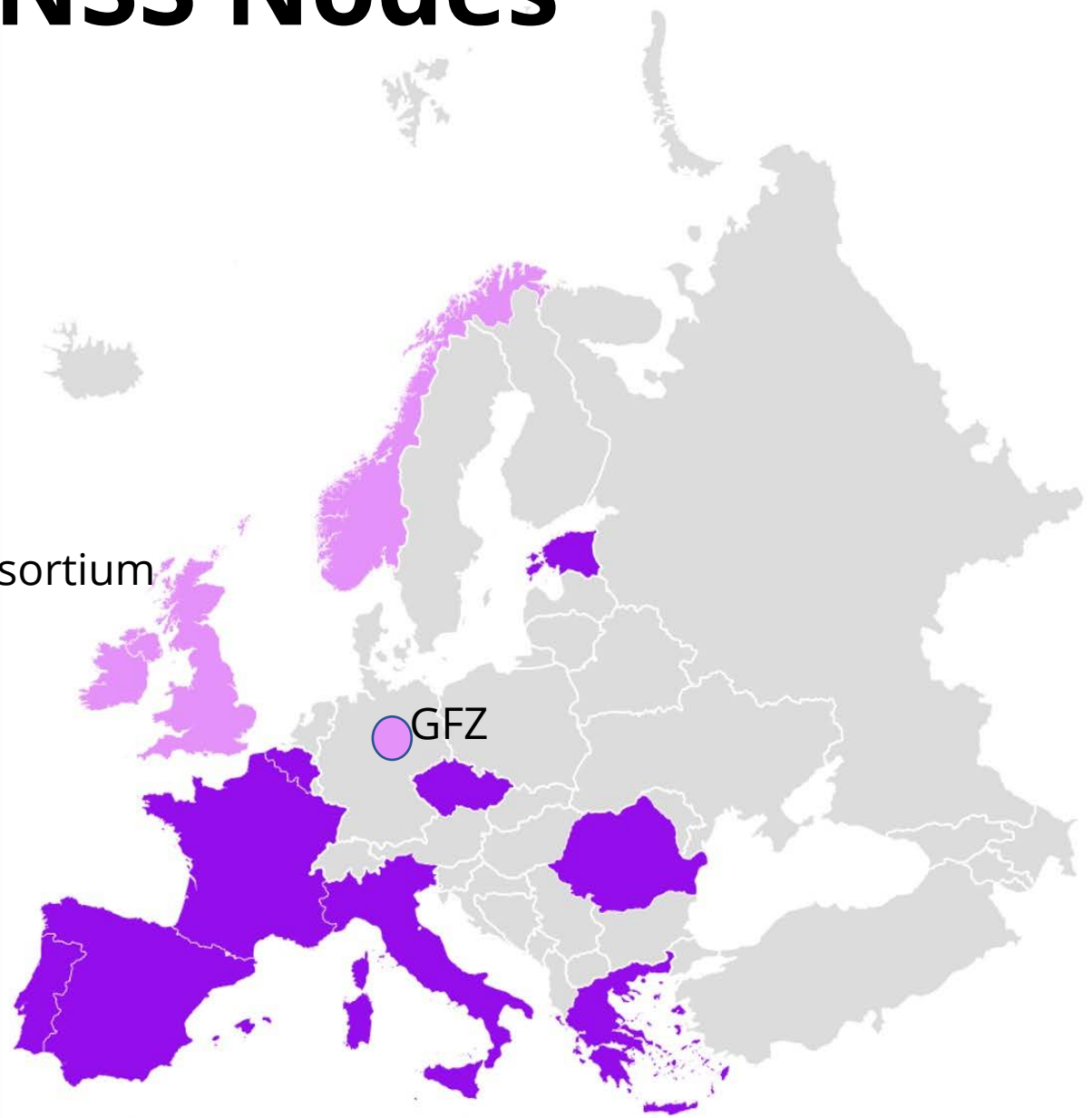
The screenshot displays the EPOS GNSS PRODUCTS PORTAL interface. The main map shows the European continent with numerous purple dots representing GNSS stations. A purple box on the map says "Please select to download selection." The interface includes a navigation menu with "SINEX", "Info", "Data Portal", 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

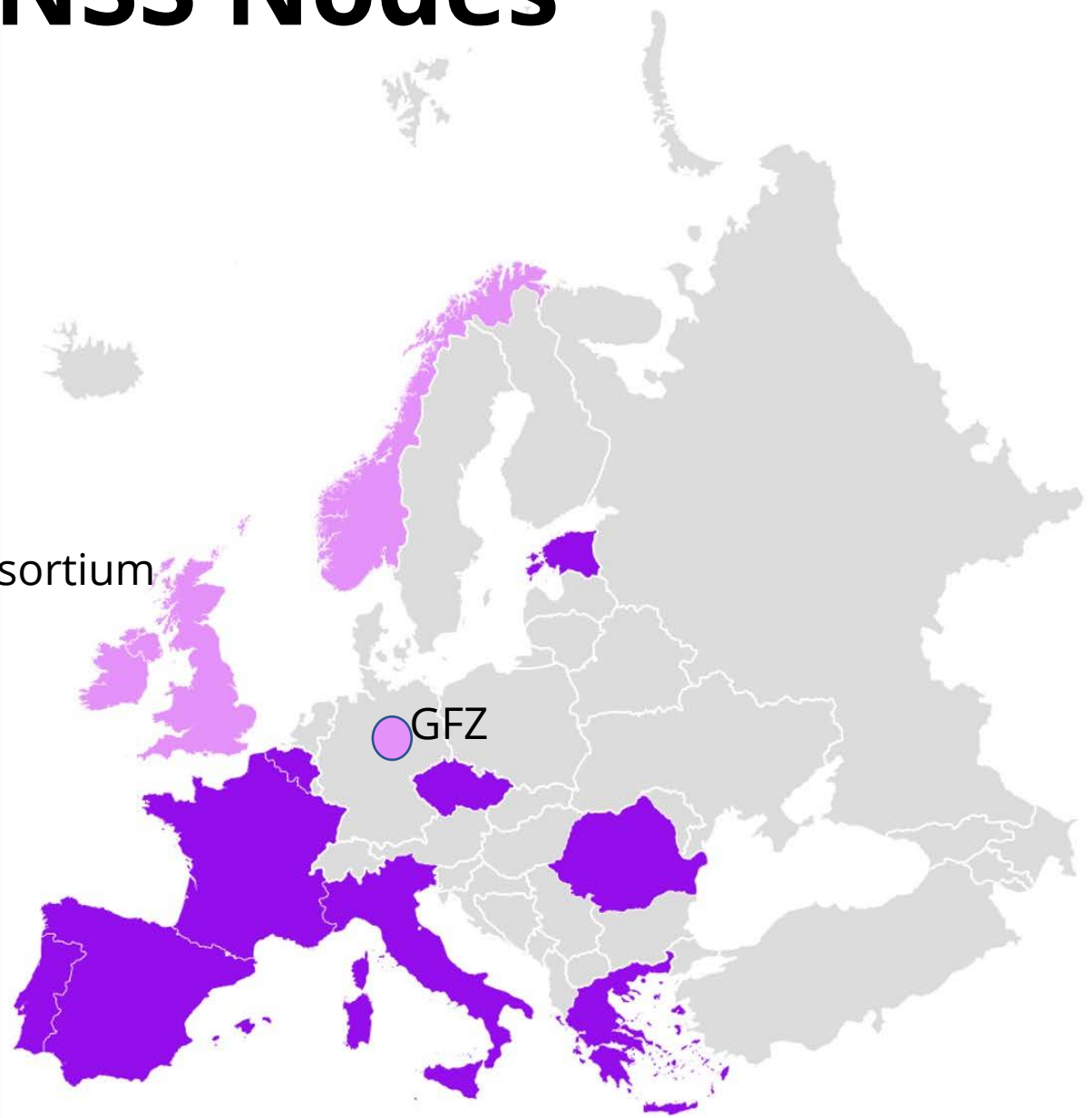


**National Nodes**  
**PanEuropean Node**  
**International Collaboration**

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

# EPOS-GNSS Nodes

EarthScope Consortium



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

**North Africa & Middle East  
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)