



# 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**

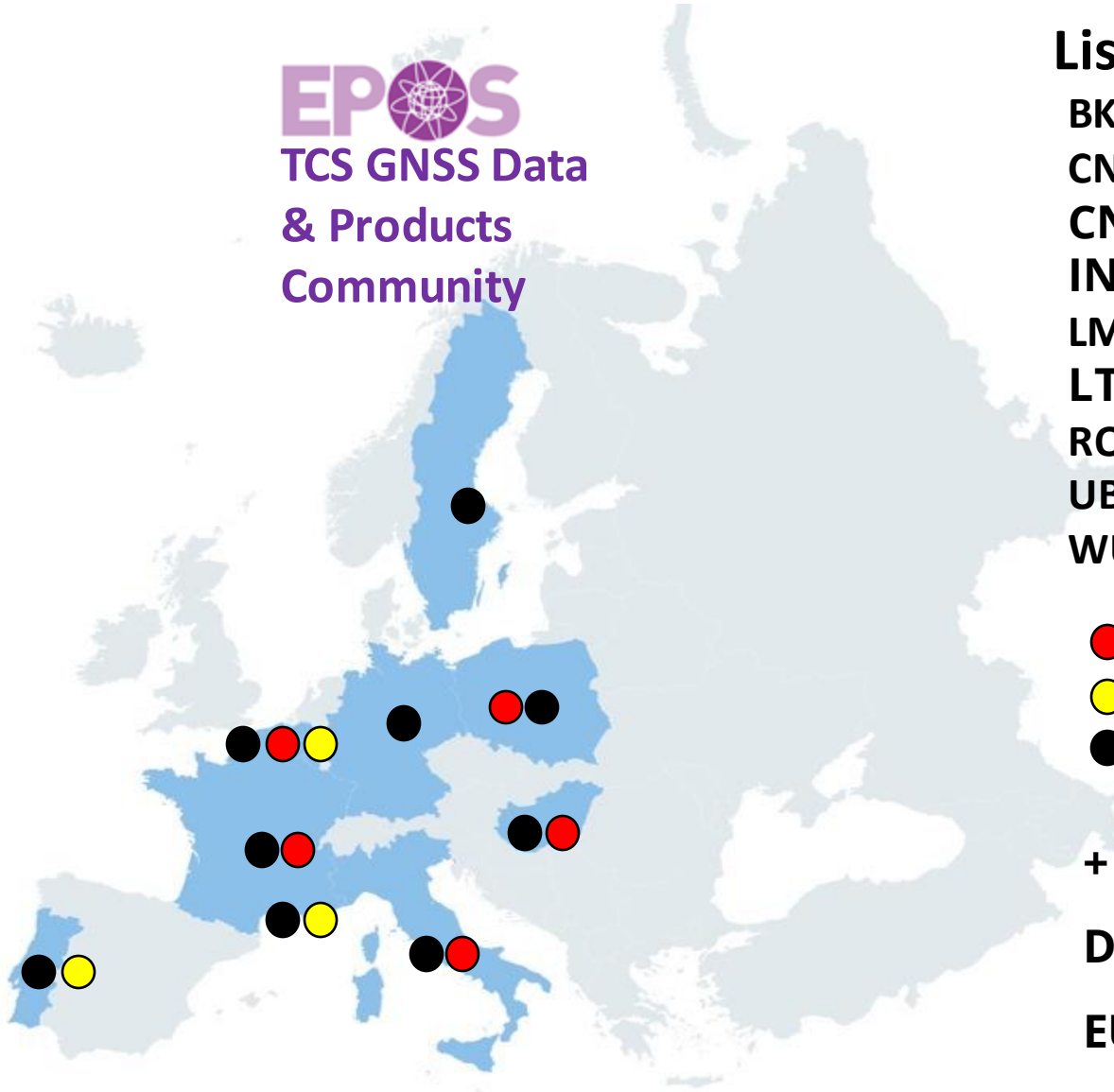
# Objectives TCS GNSS Data & Products

- **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 ;**
- **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)



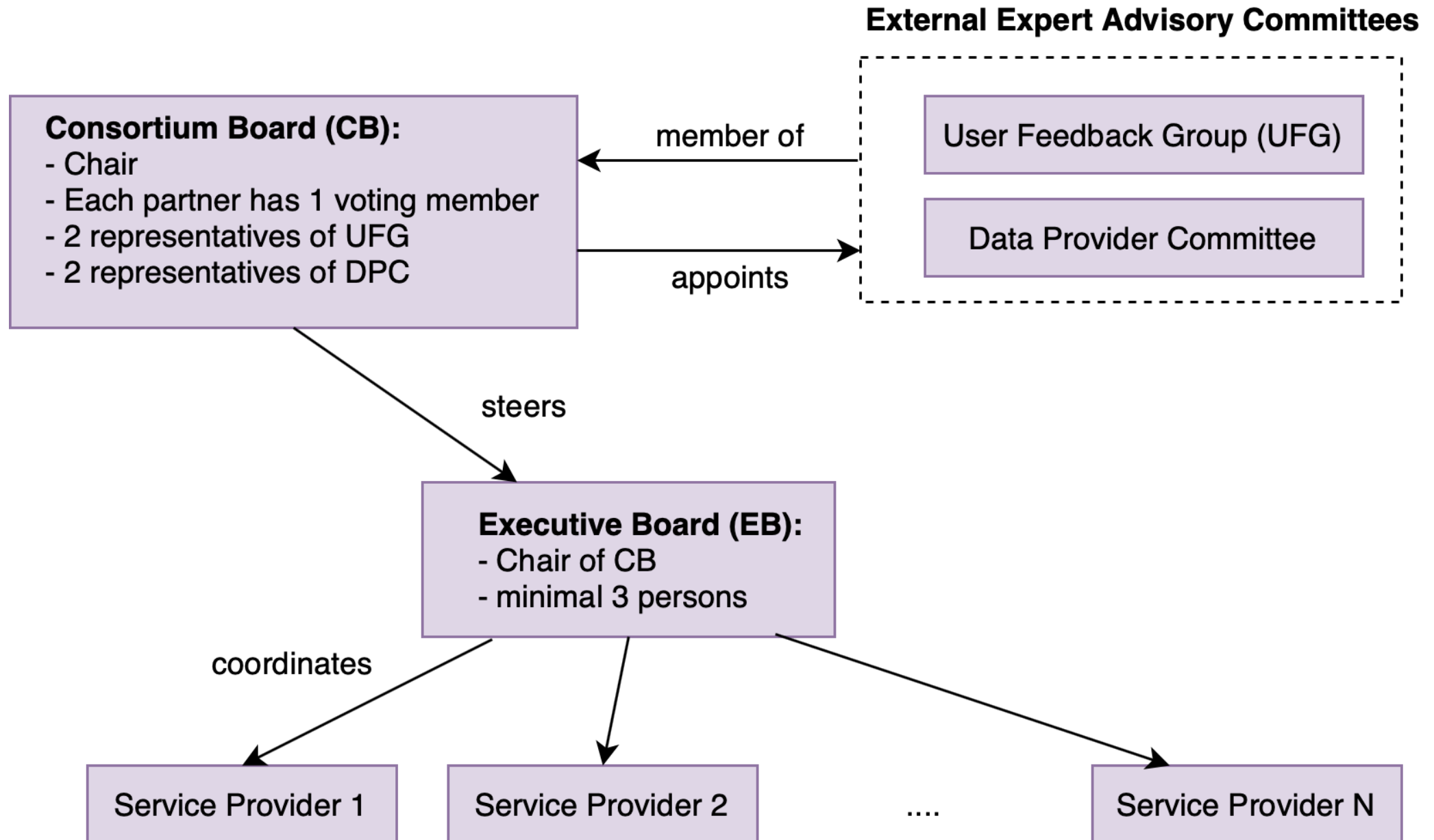
11 Service Providers

+

**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 & webservice	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

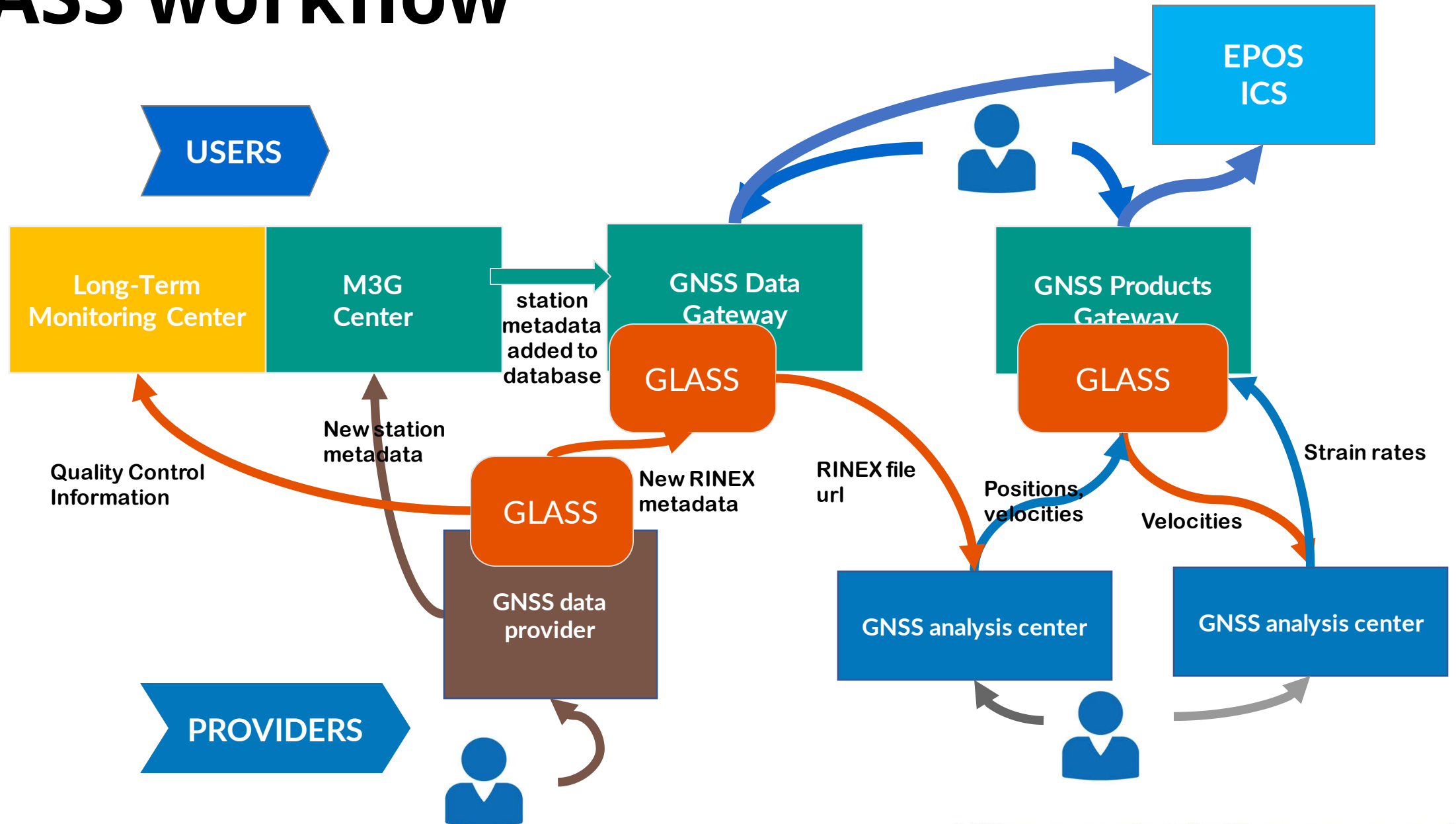
**GLASS intends to be an integrated software package to be deployed in a GNSS infrastructure to:**

- 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/>

The screenshot displays the M<sup>3</sup>G Center website. At the top, the logo 'M<sup>3</sup>G' is followed by the text 'Metadata Management and Distribution System for Multiple GNSS Networks'. A navigation bar includes links for Agencies, Stations, Metadata Catalog, EPOS Data Nodes, Networks, Documentation, and About, along with a Login button. A large 'Welcome!' banner is positioned below the navigation. The main content area is divided into three columns. The left column, titled 'Supported GNSS networks', lists three networks: EUREF Permanent Network (EPN), EPN Densification Network, and the European Plate Observing System (EPOS) Network, each with a play button icon. The middle column, titled '2577 GNSS stations with metadata in M<sup>3</sup>G', features a map of Europe with numerous green dots representing station locations. A legend indicates that EPN stations, EPN densification stations, and EPOS stations are all 'On'. The right column, titled 'Updates', lists several recent updates for specific stations, including TPOL00HUN, TATA00HUN, SZFV00HUN, PUSP00HUN, MONO00HUN, JASZ00HUN, BOLG00ITA, and MSEL00ITA, with details about receiver and antenna changes. A pagination bar at the bottom of the updates section shows '1' and '2'.

# EPOS-GNSS Data Gateway

gnssdata-epos.oca.eu/

gnssdata-epos.oca.eu/site

Rechercher

Les plus visités

GAMIT

Wagtail - Editing Regu...

https://data.geus.dk/e...

http://ics-c.epos-ip.or...

EUREF Permanent GN...

EPOS GNSS - Take-off ...

TCS webserver setup r...

fondamentaux projets...

ICS-TCS / Documentat...

Général (IGN) | Micros...

ICS-TCS / POT-reports...

Command Line Client

History

Help

Products portal

M3G

ICS

Metadata Search

Files Search / Download

Clear

Show advanced search

This button allows to show and hide more advanced parameters

Networks

Spatial selection

Rectangle

Lat-Lon Bounding Box

Circle

Latitude

Longitude

Radius (Km)

Zoom: CTRL+SCROLL Leaflet

Marker	Site Name	Lat	Lon	Alt	Install Date	End Date	Country	State	City	Agency	Network
greater than		greater than	greater than	greater than	greater than	greater than					ex: epn.igs...
less than		less than	less than	less than	less than	less than					inverse filter
✓ 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	Albarracin	40.409	-1.437	1,177.850	2010-01-19 00:00:00		Spain	Teruel	Albarracin	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

gnssproducts.epos.ubi.pt

**EPOS** GNSS PRODUCTS PORTAL

SINEX Info Data Portal Login

Please [click](#) to download selection.

**Data Controls**

Timeseries **Velocities** Power Spectral Density Strain Rate

**Filters**

**Networks**

EPOS ☒ CZEPOS ☒ C4G ☒ RING ☒ EPN ☒ IGS ☒

**Analysis Centres**

LTK-EUREF ☒ INGV ☒ LTK ☒ ROB-EUREF ☒ UGA-CNRS ☒

1000 km

Show 10 entries

Search: IGS

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 checked="" type="checkbox"/>
BRST00FRA	Brest	65.52	France	Brest	Institut National de l'Information Géographique et Forestière	EPN & IGS	<input checked="" type="checkbox"/>
BRUX00BEL	Brussels, BE	158.26	Belgium	Brussels	Royal Observatory of Belgium	EPN & ROB_GNSS & IGS	<input checked="" type="checkbox"/>
EBRE00ESP	Ebre	107.32	Spain	Roquetes	Institut Cartogràfic i Geològic de Catalunya	EPN & IGS	<input checked="" type="checkbox"/>
FFMJ00DEU	Frankfurt / Main	178.19	Germany	Frankfurt / Main	Bundesamt fuer Kartographie und Geodäsie	EPN & IGS	<input checked="" type="checkbox"/>
FLRS00PRT	Santa Cruz das Flores	79.86	Portugal	Santa Cruz Das Flores	Direcção-Geral do Território	EPN & IGS	<input checked="" type="checkbox"/>

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

# EPOS-GNSS Nodes

National Nodes

PanEuropean Node

International Collaboration

EarthScope Consortium

GFZ

North Africa & Middle East  
in the future?

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# 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**