EPOS TCS GNSS
Thematic Core Service @ European Plate Observing System

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8. BFKH, Budapest, Hungary
9. IMO, Reykjavik, Iceland
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What is EPOS?

EPOS is a long-term project for the integration of research infrastructures for Solid Science in Europe.

One of the three priority projects of European Commission within ESFRI

EPOS integrates the existing (and future) advanced European facilities into a single, distributed, sustainable infrastructure taking full advantage of new e-science opportunities.

25 COUNTRIES
Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom

4 INTERNATIONAL ORGANIZATIONS
Orfeus, Ensc, Euref, Internamagnet

256 NATIONAL RESEARCH INFRASTRUCTURES

4939 SEISMIC STATIONS

2272 GPS RECEIVERS

464 TB SEISMIC DATA

118 LABORATORIES

828 INSTRUMENTS

Several PetaBytes of solid Earth Science data will be available

Several thousands of users expected to access the infrastructure
How will EPOS work?

**Legal & Governance**

The ERIC (European Research Infrastructure Consortium) has been chosen as the **legal model** for EPOS.

**Financial**

A financial plan has been adopted to guarantee the **long-term sustainability** of infrastructure – the countries will pay for it.

**Technical**

Technical solutions designed and adopted to **implement the access** to data and services.
National Research Infrastructures (NRI)
Thematic Core Services (TCS)
Integrated Core Services (ICS)

**How will EPOS work?**

*Functional Architecture*

- Data generation & standardization
- Sustainability and operation
- Quality checked repositories
- Thematic integration
- Engagement of communities
- Community service provision
- Metadata registry
- Processing
- Aggregation
- Integrated analyses
- Visualization

**Interoperability Brokerage**

**NRI**

**TCS**

**ICS-C**

**ICS-d**

**Computational Resources**

**National Research Infrastructures (NRI)**

**Thematic Core Services (TCS)**

**Integrated Core Services (ICS)**

**Community-specific integration**

**novel e-infrastructure**
• The preparatory phase ended by November 2014 with the participation of 23 countries.

• 19 of which have already signed a letter of intent (LoI) for joining the EPOS-ERIC to be hosted in Italy (Rome);

• At the completion of the Implementation Phase (started in October 2015), it is expected that most of the EU28 countries will be involved in EPOS.
EPOS Today

Each of the communities (e.g. GNSS) gets organized:
- Set up their governance (to speak with ‘one voice’ in EPOS)
- Define the data and data products to provide to the EPOS portal
- Construct the (IT) interfaces between their community and the EPOS portal

GNSS
Contribution based on collaboration between the geodetic/geophysical community where the EUREF community is an essential player

Easy-to-find data and data products (open access) as well as tools for visualization, processing and analysis through the EPOS portal

Focus on Solid Earth science the internal structure and dynamics of planet Earth, from the inner core to the surface
EPOS-GNSS

List of core stakeholders:

- BKG Bundesamt für Kartographie und Geodäsie, DE
- BFKH Government Office of Capital City Budapest, HU
- INGV Istituto Nazionale di Geofisica e Vulcanologia IT
- GOP Geodetic Observatory Pecný, CZ
- CNRS-UGA Université Grenoble Alpes, FR
- CNRS-OCA Observatoire Cote d’Azur, FR
- IMO Icelandic Meteorological Office, IS
- LM Lantmäteriet, SW
- ROB Royal Observatory of Belgium, BE
- UBI/C4G Univ. Beira Interior/Colaboratory for Geosciences, PT
- WUT Warsaw University of Technology, PL

DDSS* - Data, Data Products, Services & Software

5 Analysis Center’s
3 Portals (M3G, Data, Products)
11 DDSS* Providers
3 NOA (GR), KOERI (TR), INCDFP RA (RM)
Added value of EPOS TCS GNSS Data & Products for GNSS community

• Sustainability within EPOS:
  • Countries that join EPOS-ERIC commit to maintain their GNSS infrastructure integrated in EPOS (stations, operation).
  • DDSS Providers chosen based on the commitment of the 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

The timeline for the development phases is as follows:

- **Specification Phase**: 2017
- **Development Phase**: 2018
- **Validation Phase**: 2019
- **Operational Phase**: 2019
GLASS work flow

GLASS data provider

GNSS Data Gateway

GNSS Products Gateway

Users

Long-Term Monitoring Center

M3G Center

GNSS analysis center

GNSS analysis center

GLASS

GLASS

PROVIDERS

USERS

EPOS

New station metadata

station metadata added to database

New RINEX metadata

RINEX file url

Positions, velocities

Velocities

Strain rates

Quality Control Information

GLASS work flow
RINEX Repositories / Data Centers

RINEX Data: need to be available (local or external – url link) and GLASS will run on top of it (no need to adapt directory structure).

- GLASS software will act when a new file become available by:
  - Checking the file metadata (Header) against the Site metadata (Anubis)
  - Run additional checks on file contents (Anubis)
  - Provides the url location to the data portal (local and externals)

GLASS Applications

- Site Information
- Data Quality
- url location
- M3G Metadata Monitoring
- Long term data monitoring
- Data Portal(s)
PORTAL (Metadata Management and distribution system for Multiple GNSS Networks)

• The system allows upload, validate, and distribute GNSS station metadata (e.g. site logs)
• Its main purpose is to serve to submit and validate metadata and contribute to the densification of GNSS networks.

Requirements for usage

• EPOS-GNSS Supplier Letter from the Data Supplier, including the information on the Operational Centre responsible for maintaining the station metadata in M3G.
• This Operational Centre will then receive a login account on the M3G web site.
DATA PORTAL

http://glass.unice.fr:8080/epos_validation/#/site
http://glass.unice.fr:8080/epos_validation/#/site
**DEVELOPED PRODUCTS STATUS**

**Current status:** Prototype Products already generated

- **Daily solutions + metadata**
  - 2 Pan-European processing centers (INGV, UGA-CNRS)
  - EUREF solutions (WUT)
  - Densified solution EPOS/EUREF (BFKH)

- **Daily time-series & velocity fields + metadata**
  - Single technique Solutions (INGV, UGA-CNRS)
  - Combined Solution (BFKH)
  - EUREF Reference Frame Solution (ROB)
  - Validation (UBI)

- **Strain Rate maps + metadata**
  - Global + Regionals (LM)
http://gnssproducts.epos.ubi.pt/
PRODUCTS PORTAL

http://gnssproducts.epos.ubi.pt/
http://gnssproducts.epos.ubi.pt/
SUMMARY

GLASS

• Software package to manage, validate, and distribute GNSS data & metadata and associated products.
• Implementation Phase, under development until 2019. First version available for testing in late Summer – interested? Please contact us: wp10@epos-ip.eu
• To be used in the Operational Phase, after 2019 as GNSS component of EPOS.
• We have shown GLASS four major components: Software repository, M3G software and Data & Products Portals
• All these components work together in a complete integrated package (can be installed as a stand-alone server but the goal is to facilitate the integration of individual repositories/data centers.
• By providing GNSS data through the EPOS ecosystem, using GLASS, the providers can enjoy quality control of their data and dissemination to a large group of users.
• The EPOS ecosystem will provide users easy access to GNSS data & products in Europe, provided in uniform formats.
GNSS TCS - MORE INFORMATION

DOCUMENTATION:

PORTALS:
M3G  https://gnss-metadata.eu/
DATA  http://glass.unice.fr:8080/epos_validation/#/site
PRODUCTS  http://gnssproducts.epos.ubi.pt/

DISSEMINATION:
https://www.youtube.com/watch?v=PpJyfFfCSkQ
https://www.youtube.com/watch?v=f54nlIiid5U
https://www.youtube.com/watch?v=NqlnMhkCgMI