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EPOS – Improving the infrastructure for GNSS data and products in Europe

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3. GOP, Pezny, Czech Republic

5. INGV, Rome, Italy

7. INCDFP RA, Bucharest, Romania

9. IMO, Reykjavik, Iceland

11. CNRS-OCA, Nice, France,

13. WUT, Warsaw, Poland

2. ROB, Brussels, Belgium

4. CNRS-UGA, Grenoble, France

6. NOA, Athens, Greece

8. BFKH, Budapest, Hungary

10. KOERI, Istanbul, Turkey

12. LM, Gävle, Sweden

14. BKG, Frankfurt-am-Main, Germany

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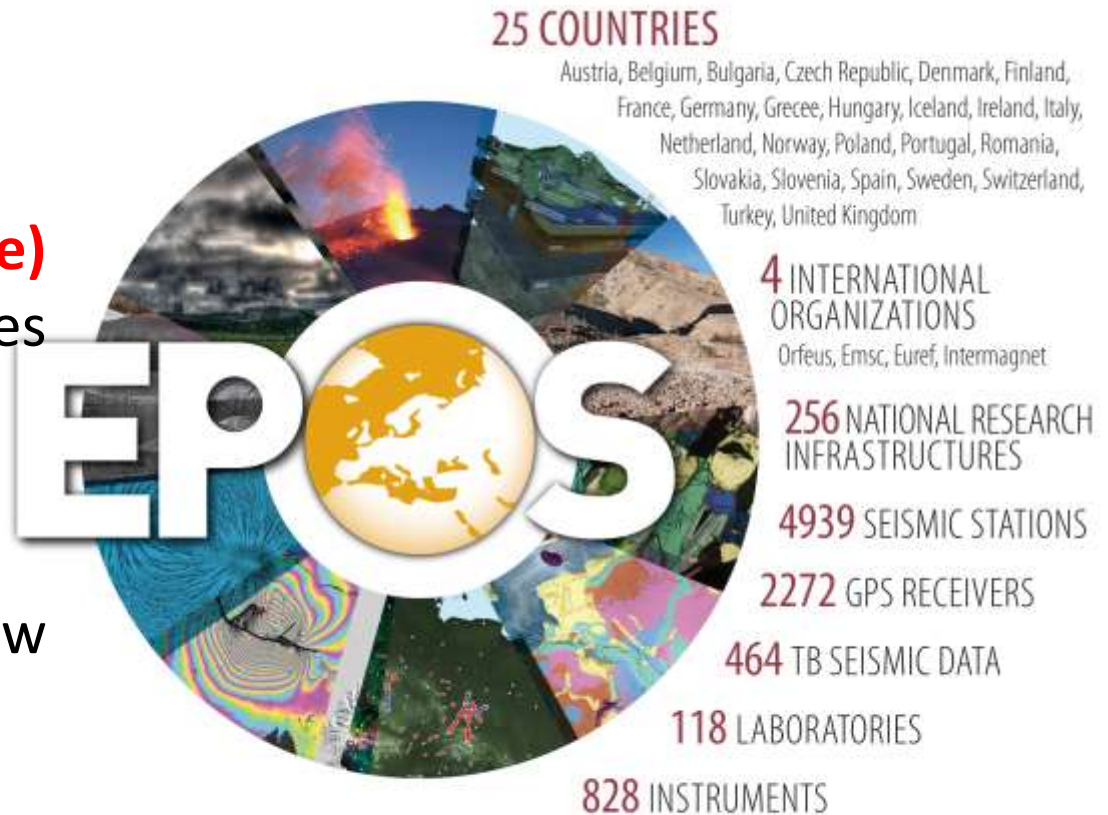
What is EPOS?

EPOS is a **long-term project for the integration**

of research infrastructures for Solid Earth 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**

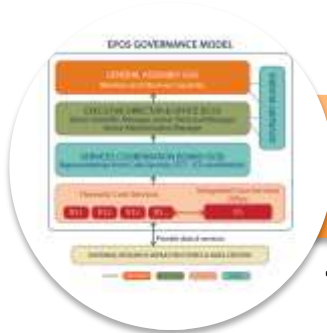


Several PetaBytes of solid Earth Science data will be available

Several thousands of users expected to access the infrastructure

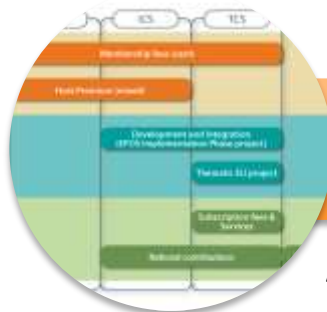
How will EPOS work?

Architecture



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)

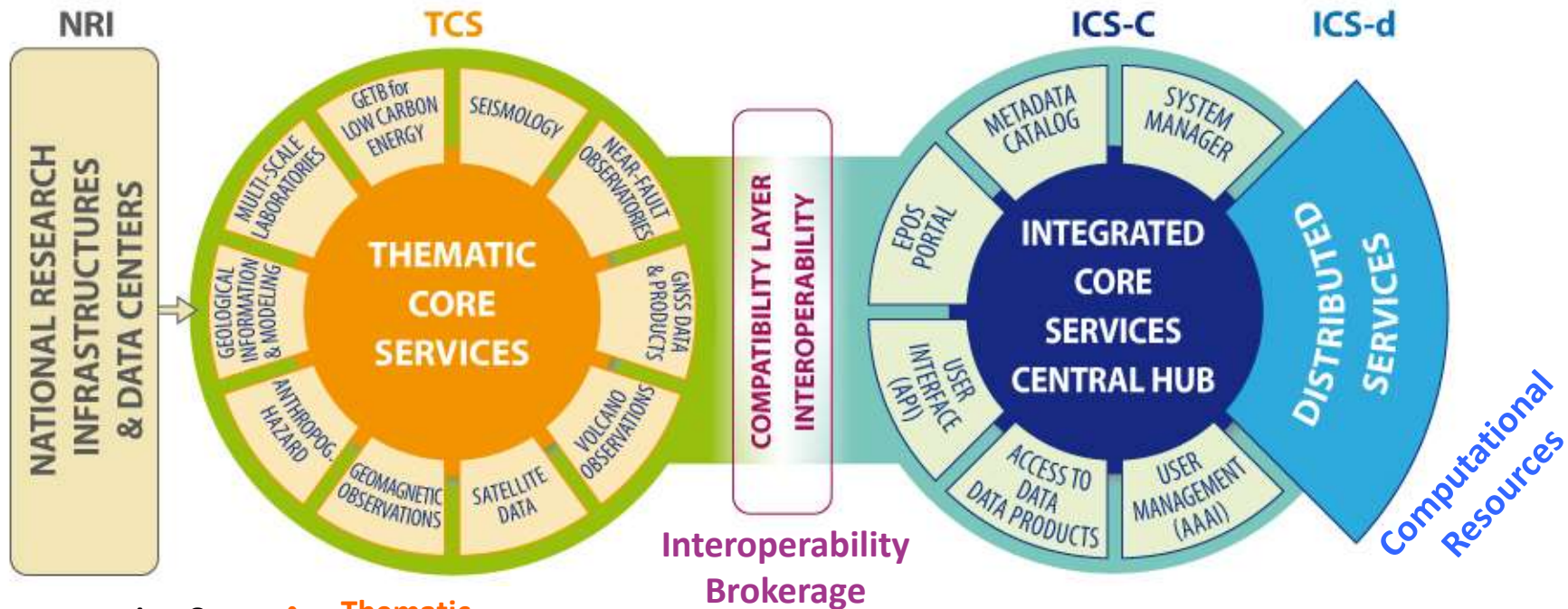
Integrated Core Services (ICS)

How will EPOS work?

Functional Architecture

community-specific integration

novel e-infrastructure



- Data generation & standardization
- Sustainability and operation
- Quality checked repositories

- Thematic integration
- Engagement of communities
- Community service provision

Interoperability Brokerage

- Metadata registry
- Processing
- Aggregation
- Integrated analyses
- Visualization

EPOS Timeline

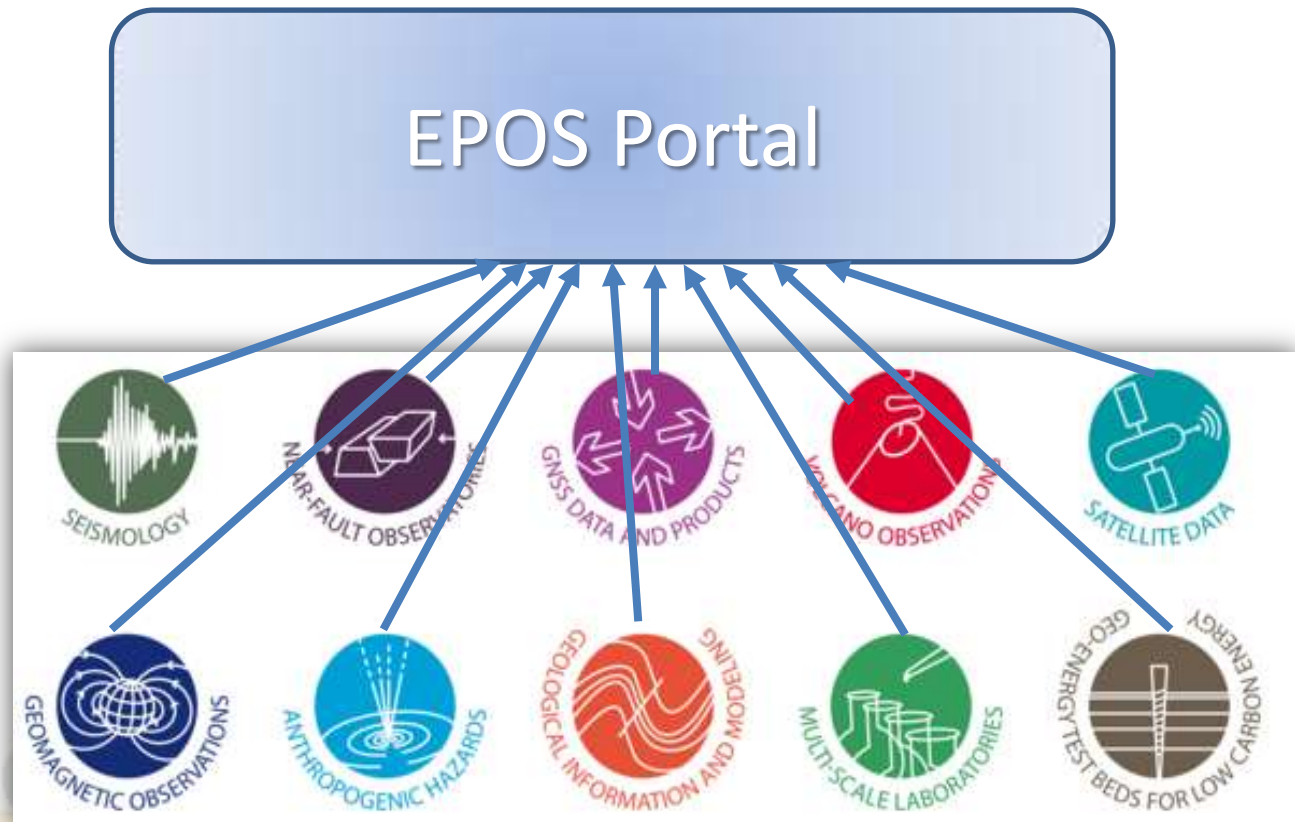


- The preparatory phase ended by November 2014 with the participation of 23 countries.
- 19 of which have already signed a letter of intent (LoI) for joining the EPOS-ERIC to be hosted in Italy (Rome);
- At the completion of the Implementation Phase (started in October 2015), it is expected that most of the EU28 countries will be involved in EPOS.

EPOS in Practice

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

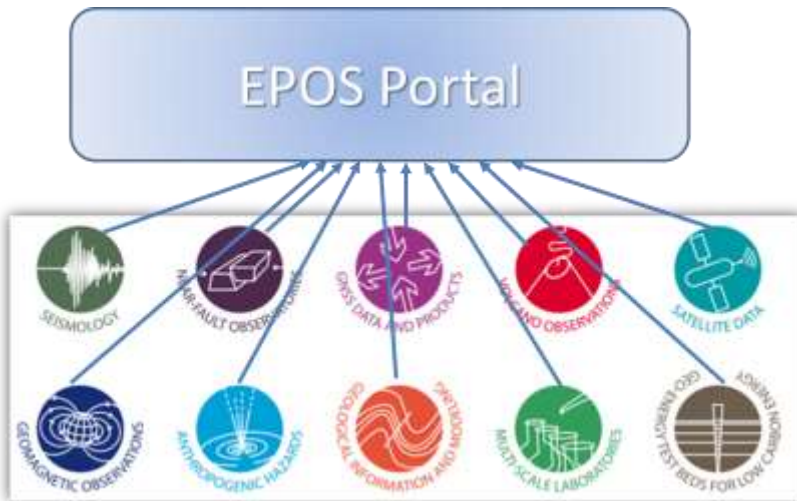
Focus on Solid Earth science the internal structure and dynamics of planet Earth, from the inner core to the surface



EPOS 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 including EUREF

Objectives EPOS-IP (Implementation Phase)

WP10 – GNSS Data & Products

Objective	Status
construct the future governance of TCS GNSS Data & Products in EPOS;	Agreement of Governance Structure
interact with the geodetic community in Europe, at national and Pan-European (EUREF) levels;	Communication channels with Geodetic Community established.
ensure interoperability between EPOS GNSS services (data and products) and EPOS ICS;	Detailed DDSS to be implemented during the EPOS-IP phase defined.
promote multidisciplinary interoperability with other disciplines within EPOS;	Contacts with WP09 (Near-Fault) and WP11 (Volcanos) about GNSS data management
implement distributed dissemination of file-based GNSS data for about 2000 stations (and and derived Products: CRD, VEL, STR) in the first 2 years with the goal of reaching 3000 by the end of the EPOS-IP.	GLASS software (including Data & Products Portal) being developed. Prototype Products tested.

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 – components

GLASS encompass the following key elements:

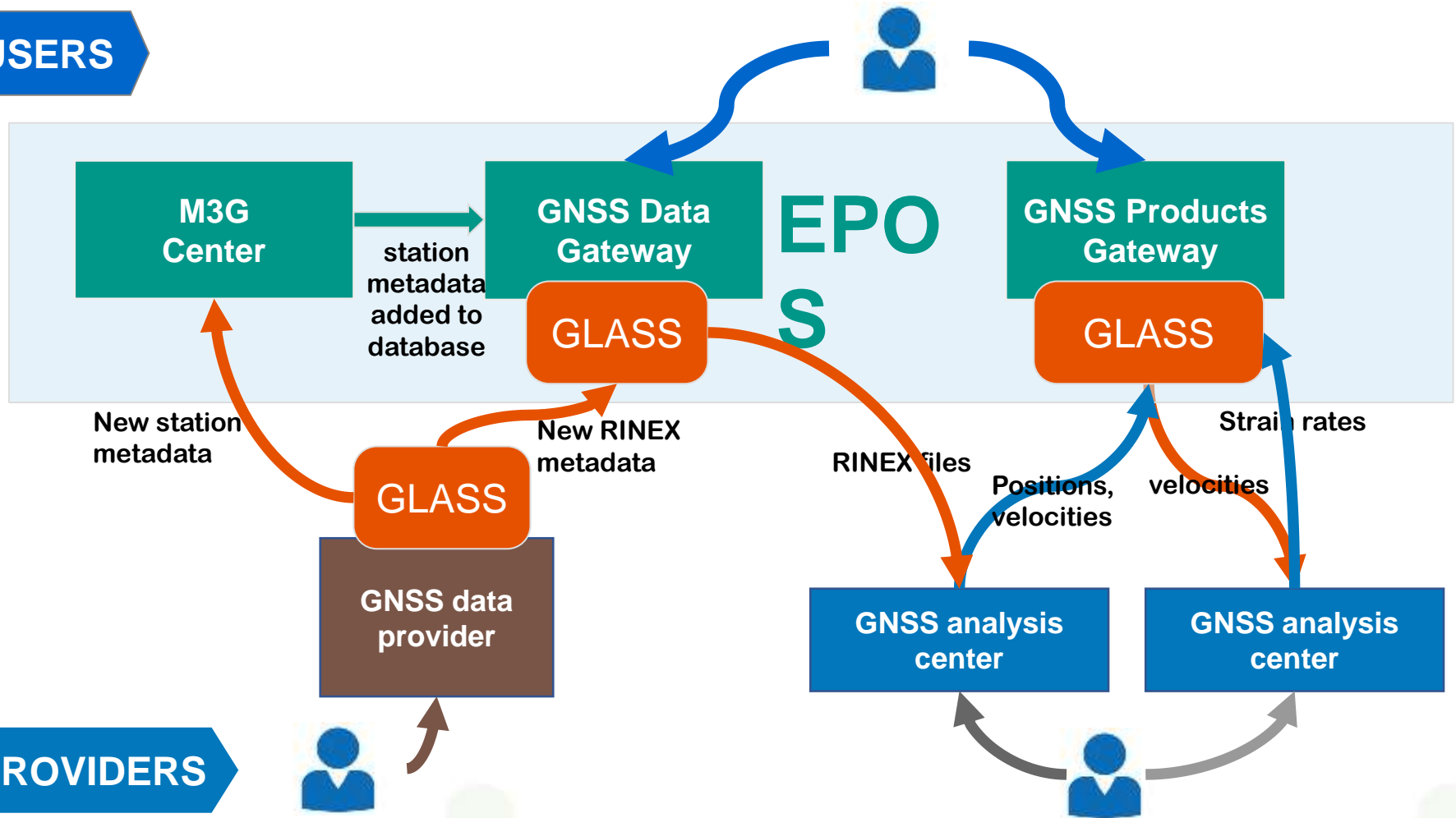


- **Physical components** – repositories/data centers
 - **Primary** - default repository, decided by the data provider
 - **Secondary** - alternative repository
 - **Mirror** - a repository that act as a mirror of another
- **Web services** – portals, monitoring tools, data and products mining solutions
- **Software applications** – managing interactions between repositories and services



GLASS work flow

USERS



PROVIDERS

RINEX Repositories / Data Centers

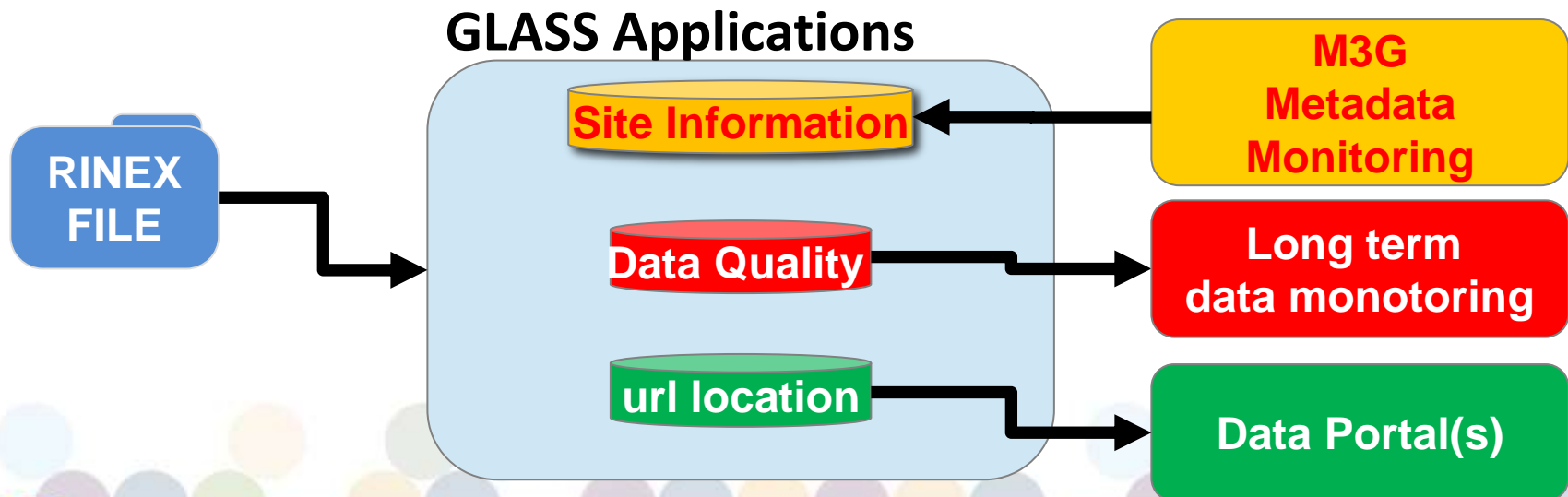
FILES

RINEX Repository
(Data Center)

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 the Site metadata (Anubis)
- Run additional checks on file contents (Anubis)
- Provides the url location to the data portal (local and externals)



M3G – Metadata Management system for Multiple GNSS Networks

to be maintained by ROB - Belgium

SITE LOG SUBMISSION DEMO



Agency Name

Password

Remember Me

Reset Password

Login

Reset

M3G – Metadata Management system for Multiple GNSS Networks

SITE LOG SUBMISSION DEMO

View current log

Update site log

Export site log

Import site log from local disk

Sitelog BRUX

NETWORKS & STATIONS

- Stations
- BRUX00BEL
- Site log
 - DENT00BEL
 - DOLU00BEL
 - WARE00BEL
 - TEST00BEL
- Profile
- Logout

BRUX Site Information Form (site-log)

International GNSS Service
See Instructions at:
<ftp://igs.cb.jpl.nasa.gov/pub/station/general/siteinfo>

0. Form

Prepared by (full name) : Bruyninx Carine
Date Prepared : 2017-04-07
Report Type : UPDATE
If Update:
Previous Site Log : BRUX_20170103.log
Modified/Added Sections : 0,3,12

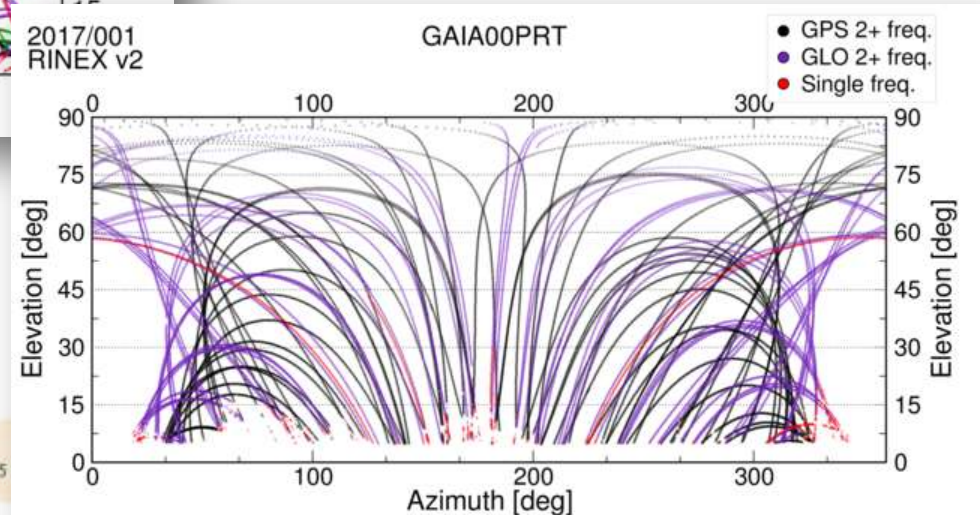
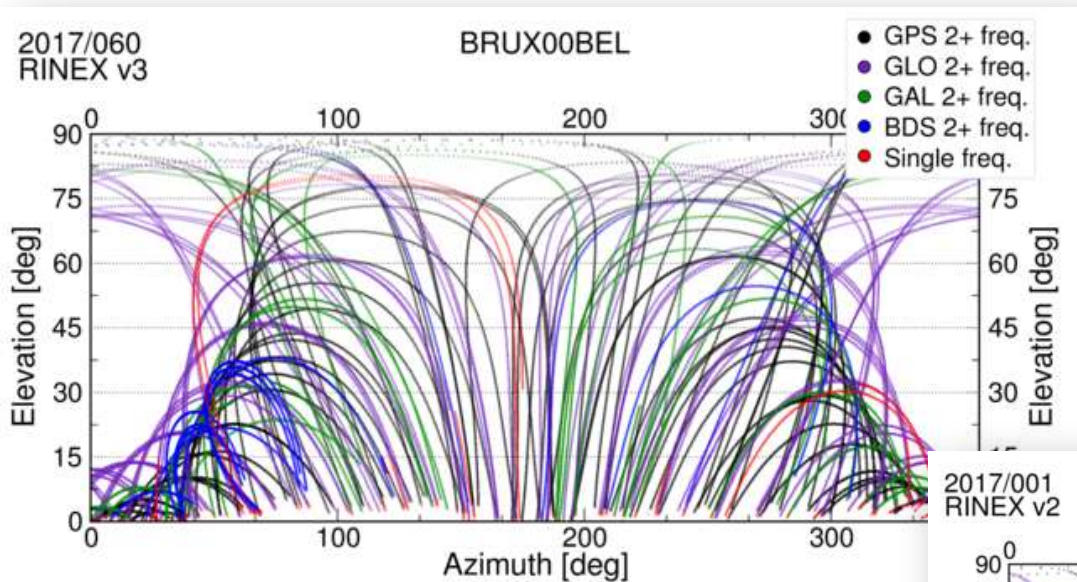
1. Site Identification of the GNSS Monument

Site Name : Brussels
Four Character ID : BRUX
Monument Inscription :
IERS DOMES Number : 13101M010
CDP Number : (A4)
Monument Description : STEEL MAST
Height of the Monument : 8 m
Monument Foundation : CONCRETE BLOCK
Foundation Depth : 3 m
Marker Description : CENTER OF HOLE IN STEEL PLATE
Date Installed : 2006-07-07
Geologic Characteristic : SAND
Bedrock Type : SEDIMENTARY
Bedrock Condition : FRESH
Fracture Spacing : 0 cm

Long-Term Monitoring Center

to be maintained by ROB - Belgium

Observed phase data for all constellations. Input are the station daily RINEX 2/3 observation files. The graphs give a snapshot of the station tracking for a specific date.



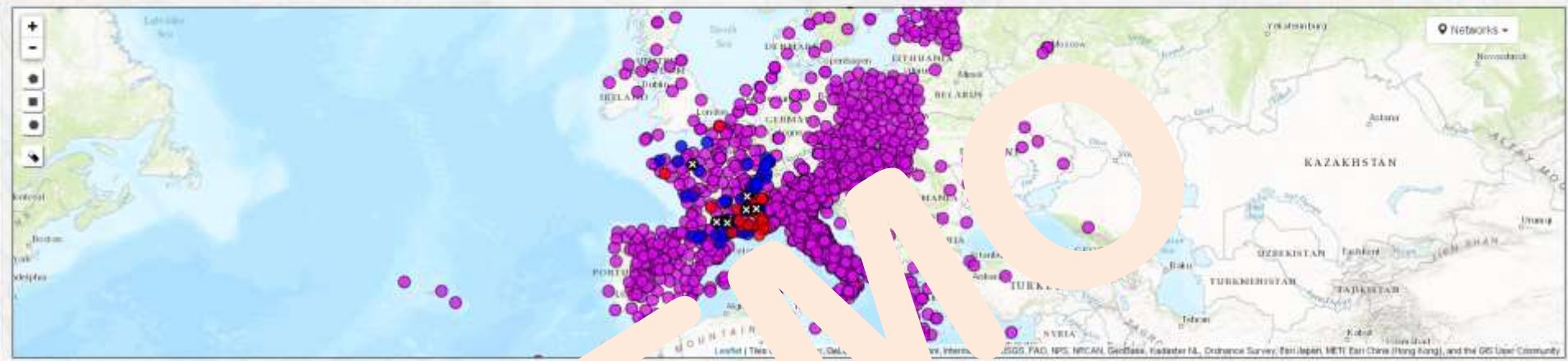
Data Portal

to be maintained by CNRS - France

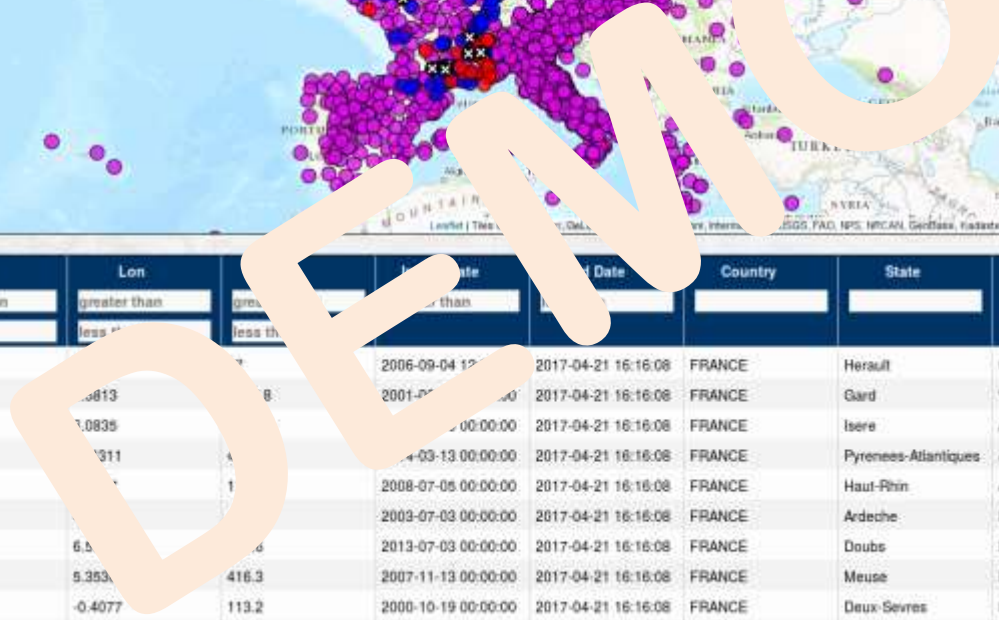


Download - Show spatial selection Show advanced search

Find Search Clear Run Search



4 Char ID	Site Name	Lat	Lon	Installation Date	First Date	Country	State	City	Agency	Network
AGDE	Cap d'Agde purifcat...	43.2964	3.1111	2006-09-04 12:00:00	2017-04-21 16:16:08	FRANCE	Herauld	CAP D'AGDE - AGDE	GM	RENAG RGP
AIGL	Mont Agoual	44.1214	3.0813	2001-09-04 00:00:00	2017-04-21 16:16:08	FRANCE	Gard	WALLERAUGUE	GM	RENAG RGP
ALPE	Alpe d'Huez	45.0866	6.0835	2000-00-00 00:00:00	2017-04-21 16:16:08	FRANCE	Isere	ALPE D'HUEZ	ISTerre	RENAG RGP
ARUF	ARUDY	43.0996	10.311	2004-03-13 00:00:00	2017-04-21 16:16:08	FRANCE	Pyrenees-Atlantiques	ARUDY	OMP-GET-CNES	RENAG RGP
AUBU	Aubure	48.2168	6.1111	2008-07-06 00:00:00	2017-04-21 16:16:08	FRANCE	Haut-Rhin	AUBURE	EOST	RENAG RGP
BANN	Fort de Banne	44.3692	3.1111	2003-07-03 00:00:00	2017-04-21 16:16:08	FRANCE	Ardeche	BANNE	ISTerre	RENAG RGP
BLVR	Belvoir	47.3235	6.5111	2013-07-03 00:00:00	2017-04-21 16:16:08	FRANCE	Doubs	BELVOIR / LES CH...	DSUTHETA	RENAG RGP
BUAN	Bure-Andra	48.4862	5.353	2007-11-13 00:00:00	2017-04-21 16:16:08	FRANCE	Meuse	BURE	EOST	RENAG RGP
CHIZ	CHIZE	46.1335	-0.4077	2000-10-19 00:00:00	2017-04-21 16:16:08	FRANCE	Deux-Sevres	CHIZE	LIENSs	RENAG RGP
CHTG	Cherbourg	49.6512	-1.6355	2015-02-20 00:00:00	2017-04-21 16:16:08	FRANCE	Manche	CHERBOURG	LIENSs	RENAG RGP
CHTL	Le Chatel	45.3042	6.3588	1997-10-14 00:00:00	2017-04-21 16:16:08	FRANCE	Savoie	LE CHATEL	ISTerre	RENAG RGP
CLFD	Clermont-Ferrand	45.761	3.1111	2006-10-17 00:00:00	2017-04-21 16:16:08	FRANCE	Puy-de-Dome	CLERMONT-FERR...	OPOC	RENAG RGP



Data Portal

Spatial selection

Rectangle

Lat-Lon Bounding Box

45.089036
3.010254 7.734375
42.927639

Circle

Latitude Longitude
Radius (Km)

Monumentation / Equipment

Receiver Type

- TRIMBLE NETRS
- TRIMBLE NETR8
- TRIMBLE NETR9**
- TRIMBLE NETRS
- TRIMBLE R10

Antenna Type

- 3S-02-1AERO-CR
- 3S-02-1AERO-CR
- 3S-02-2AERO-CR
- 3S-02-2AERO-GP

File info:

T3 Info

4 Char I D	Site Name	Lat	Lon	Alt	Install Date	End Date	Country	State	Agency	Network	
AGDE	Cap d'Agde purificat...	43.299	3.4664	67	2017-04-21 12:00:00	2017-04-21 16:16:08	FRANCE	Heraut	CAP D'AGDE - AGUDE	GM	RENAG RGP
AIGL	Mont Aigoual	44.12	3.5813	1618.8	2017-05-01 00:00:00	2017-04-21 16:16:08	FRANCE	Gard	VALLERAUGUE	GM	RENAG RGP
ALPE	Alpe d'Huez	45.0866	6.0835	1892.2	2006-10-30 00:00:00	2017-04-21 16:16:08	FRANCE	Isere	ALPE D'HUEZ	ISTerre	RENAG RGP
BANN	Fort de Banne	44.3692	4.1563	116	2003-07-03 00:00:00	2017-04-21 16:16:08	FRANCE	Ardeche	BANNE	ISTerre	RENAG RGP
GINA	Cadarache - Ginas...	43.6755	5.7871	322.8	1998-02-25 18:00:00	2017-04-21 16:16:08	FRANCE	Bouches-du-Rhone	Ginasservis	IRSN	RENAG RGP
JANU	Fort du Janus	44.9104	7.1563	2597.1	2005-10-14 00:00:00	2017-04-21 16:16:08	FRANCE	Hautes-Alpes	MONTGENEVRE	ISTerre	RENAG RGP
LAJA	La Jasse - L'Hospit...	43.9697	7.1563	761.8	2014-03-07 00:00:00	2017-04-21 16:16:08	FRANCE	Aveyron	Hospitalet du Larzac	GM	RENAG RGP
MARS	Marseille	43.2788	5.0910	61.5	1998-07-16 15:00:00	2017-04-21 16:16:08	FRANCE	Bouches-du-Rhone	MARSEILLE	IGN	RENAG RGP
MICH	Saint Michel l'Obser...	43.9241	5.7176	652.9	1998-07-15 14:00:00	2017-04-21 16:16:08	FRANCE	Alpes-de-Haute-Pro...	Saint Michel l'Obser...	IRSN	RENAG RGP
MTP2	Montpellier 2nd site ...	43.6388	3.8641	130	2013-08-12 12:00:00	2017-04-21 16:16:08	FRANCE	Heraut	MONTPELLIER	GM	RENAG RGP
MTPL	Montpellier (CNRS)	43.6374	3.8648	120	1999-04-01 12:00:00	2013-11-26 00:00:00	FRANCE	Heraut	MONTPELLIER	GM	RENAG RGP
PALI	Domaine de la pale...	43.3757	4.8105	107.7	2007-12-08 00:00:00	2017-04-21 16:16:08	FRANCE	Bouches-du-Rhone	SALINS DE GIRAUD	GM	RENAG RGP

EPOS-GNSS Products

Current status: Prototype Products already generated

Daily solutions + metadata

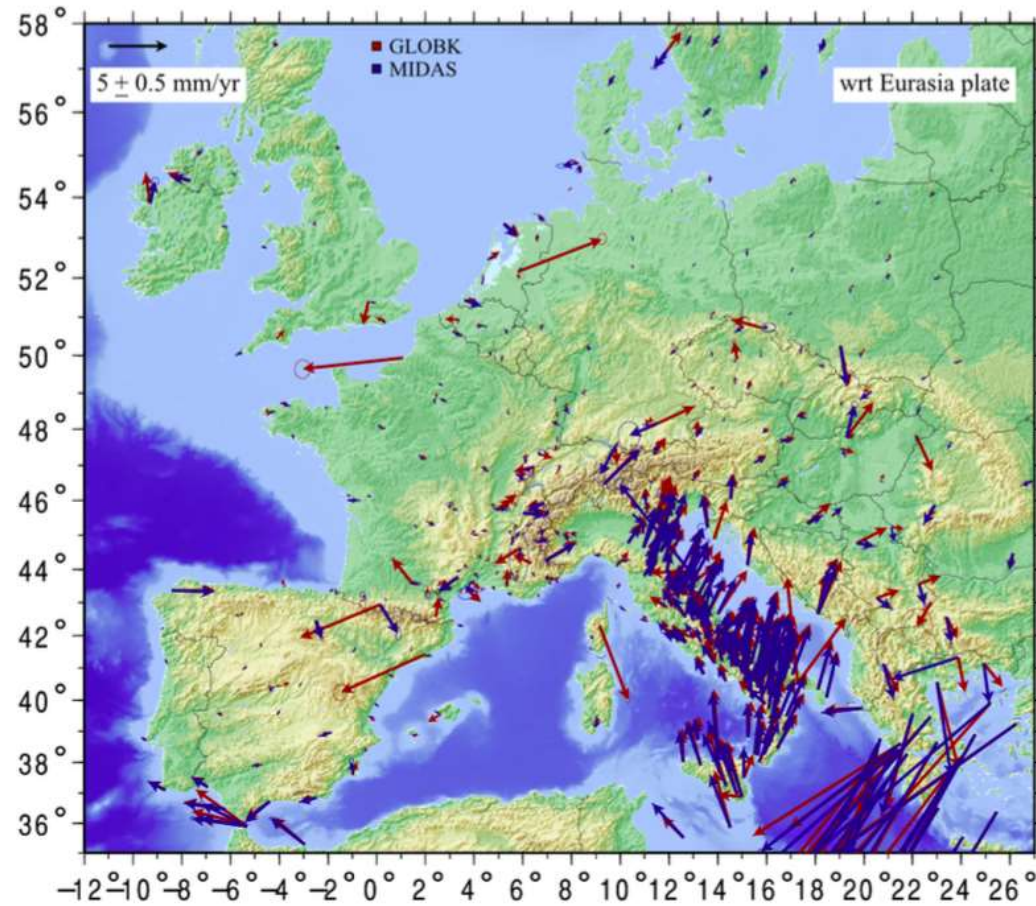
- run by 2 Pan-European processing centers (INGV, UGA-CNRS)
- densified solution EUREF (BFKH)

Daily time-series & velocity fields + metadata

- Individual Solutions (INGV, UGA-CNRS)
- Combined Solution (BFKH)

Strain Rate maps + metadata

- Global + Regionals (LM)



Products Portal

to be maintained by UBI/C4G – Portugal

EPoS GNSS Data and Products

Filters Download

Combined DD PPP EUREF

Select a station
Products will be shown here

Stations Availability

Station	Availability (Timespan)
ULRK	2009 - 2010
YTUY	2004 - 2017
AQUI	2002 - 2017
EWDS	2003 - 2008
NFCS	2004 - 2007
NLWF	2005 - 2008

Timespan


Velocities

Select a station
Products will be shown here

Highcharts.com

Products Portal

EPoS GNSS Data and Products Filters Download



Stations Availability

Show 10 entries

4-Char ID	Site Name	Lat	Lon	Altitude	Country	City	Agency	Network
ABAS	ABAS 19581M001	39.7672	11.174	23	Italy	Ales Corso Umberto	GEOTOP S.R.L.	AAAA
ACCA	ACCA 18850M001	41.1586	12.7		Italy	ACCADIA	Innovapuglia s.p.a.	AAAA
ACCE	ACCE 19525M001	44.4762	6.3	21.7	Italy	Acceglio	A.R.P.A. PIEMONTE	AAAA

Search:

Download: PNG PDF XML JSON CSV

Velocities

Select a station

Products will be shown here

Products Portal

EPoS GNSS Data and Products Filters Download

Combined **DD** PPP EUREF

site AQU1

4-Char ID	Site Name	Lat	Lon	Country	City	Agency	Network
AQRA	AQRA 12757M002	42.3659	13.37	N/A	Italy	Regione Abruzzo	AAAA
AQU1	L'Aquila	42.3682	13.3502	Italy	L'Aquila	Agenzia Spaziale Italiana e-geos S.p.A. - una società ASI/Telespazio	AAAA
AQUM	AQUM 10077M001	42.3276	13.4672	N/A	Italy	L'Aquila	LEICA GEOSYSTEMS S.P.A.

Showing 1 to 5 of 5 entries (filtered from 1,476 total entries) Previous 1 Next

Velocities

AQU1

Trend

N: 16.5 +/- 0.2 mm/year
E: 21.4 +/- 0.2 mm/year
U: -0.6 +/- 0.2 mm/year

Offset
2009-04-09

N: -49.7 +/- 0.9 mm
E: 9.3 +/- 0.8 mm
U: -80.5 +/- 1.8 mm

Added value of EPOS for GNSS community

- Sustainability within EPOS:
 - Countries that join EPOS-ERIC commit to maintain their GNSS infrastructure integrated in EPOS (stations, operation).
 - Data and Product Gateways chosen based on the commitment of France and Portugal 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

There are clearly synergies between EPOS-GNSS and FIG goals concerning the maintenance of the reference frames by continuously inspecting their materialization (CORS network) and evaluating internal deformations.

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Thank you for attention



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