

# The contribution of EPOS to disseminate GNSS data & products in Europe

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1. UBI/C4G, Covilhã, Portugal
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

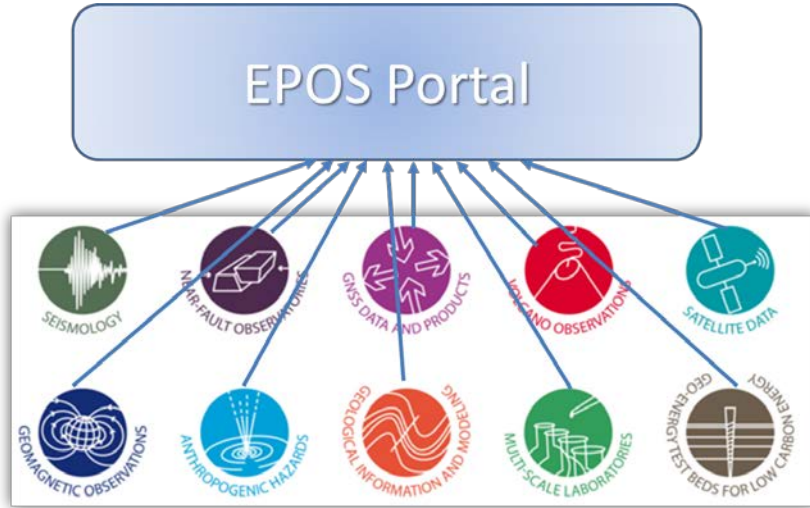
2. ROB, Brussels, Belgium
4. CNRS-UGA, Grenoble, France
6. NOA, Athens, Greece
8. BFKH, Budapest, Hungary
10. KOERI, Istanbul, Turkey
12. LM, Gävle, Sweden
14. BKG, Frankfurt-am-Main, Germany

[wp10@epos-ip.eu](mailto:wp10@epos-ip.eu)

# EPOS-IP Goals

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**

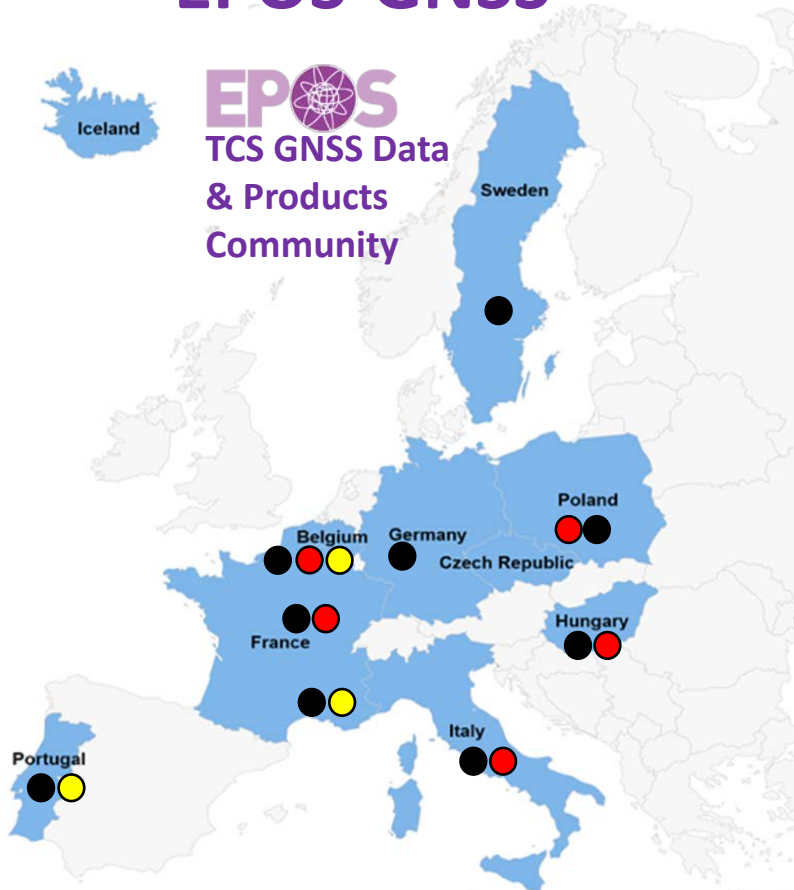
**Easy-to-find data and data products (open access) as well as tools for visualization, processing and analysis through the EPOS portal**

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

# EPOS-GNSS



**EPOS**  
TCS GNSS Data  
& Products  
Community



## GNSS TCS (EPOS-OP) Partners

### 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

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

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

**LM** Lantmäteriet, SW

**ROB** Royal Observatory of Belgium, BE

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

**WUT** Warsaw University of Technology, PL



5 Analysis Center's

3 Portals (M3G, Data, Products)

11 DDSS\* Providers

**DDSS\* - Data, Data Products, Services & Software**

# Added value of EPOS TCS GNSS Data & Products for GNSS community

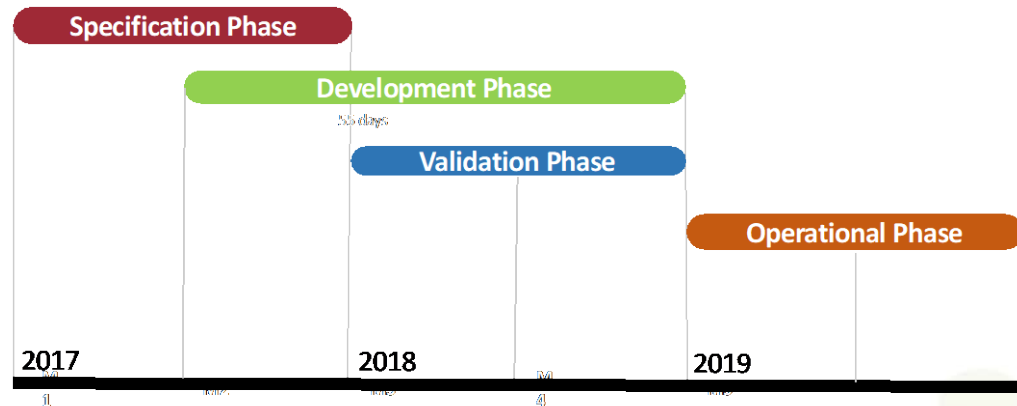
- **Sustainability within EPOS:**
  - Countries that join EPOS-ERIC commit to maintain their GNSS infrastructure integrated in EPOS (stations, operation).
  - DDSS Providers chosen based on the commitment of the countries to sustain them on long-term (EPOS-ERIC operation).
- **Provision of software tools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

# GLASS – What and Why?

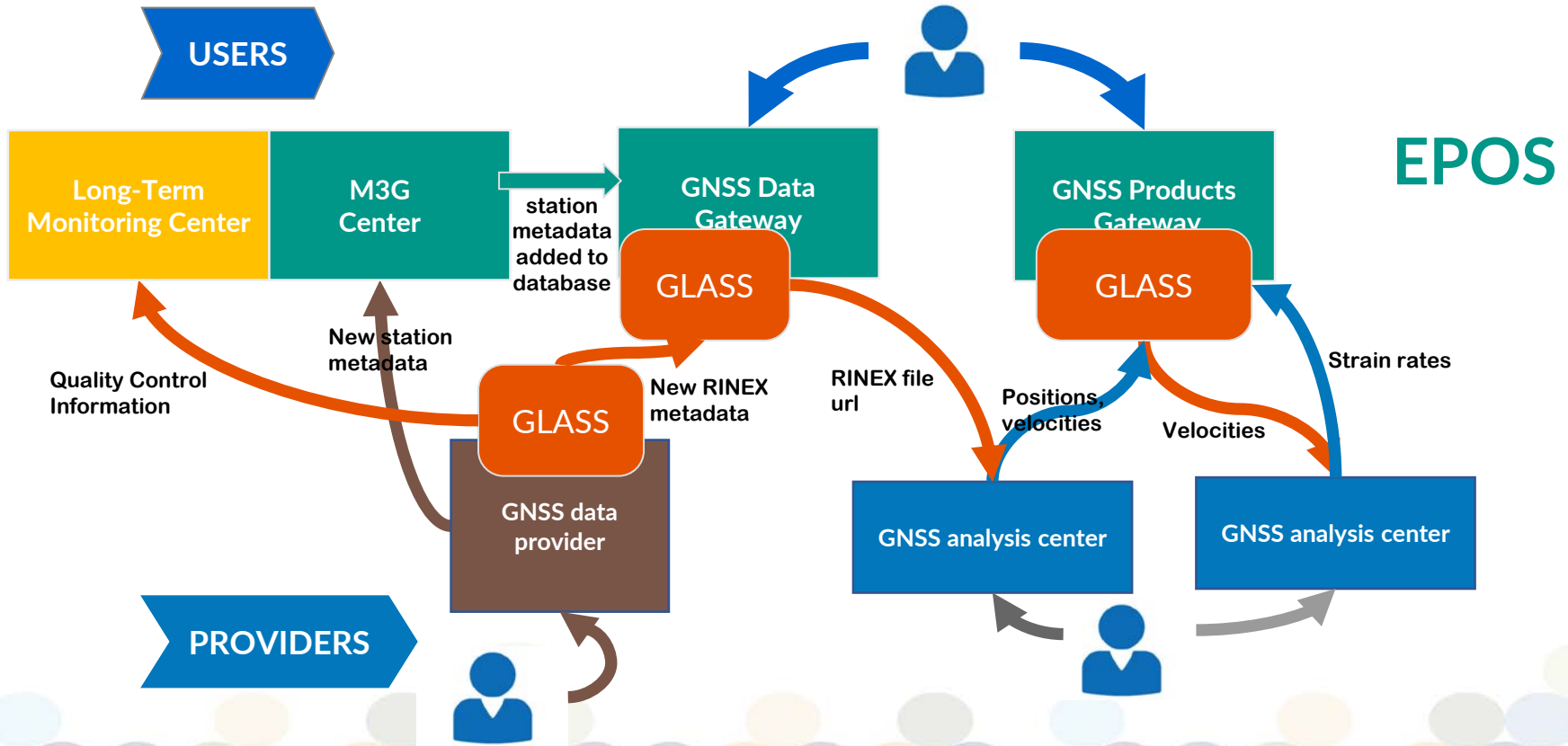
GNSS Linkage Advanced Software System

**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



# GLASS work flow

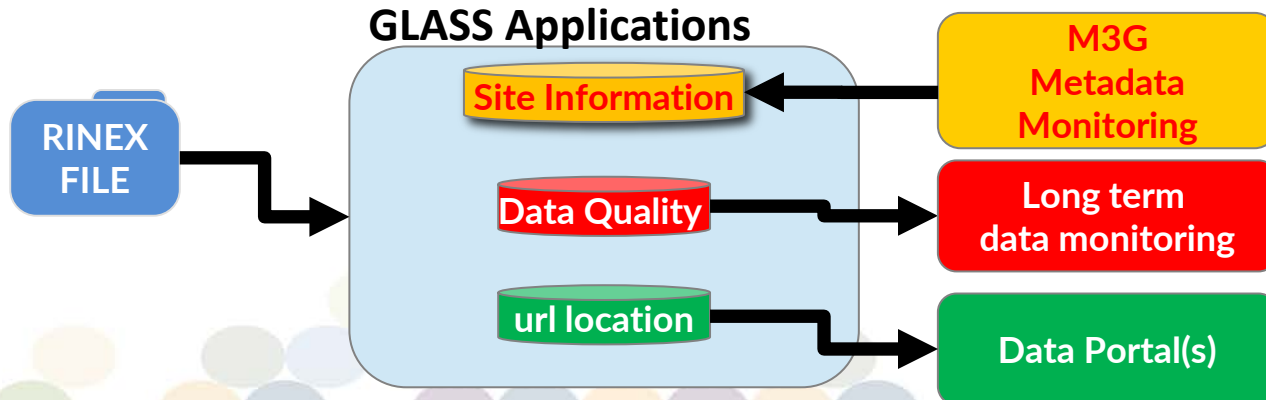


# RINEX Repositories / Data Centers



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



# M3G CENTER

## **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.



# M3G CENTER

SITE LOG SUBMISSION DEMO



Agency Name

Password

Remember Me

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

# M3G CENTER

## SITE LOG SUBMISSION DEMO



### Sitelog BRUX

NETWORKS & STATIONS

- Stations 5
- BRUX00BEL
- > Site log
- DENT00BEL
- DOUR00BEL
- 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/sitelog\\_instr.txt](ftp://igs.cb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt)

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

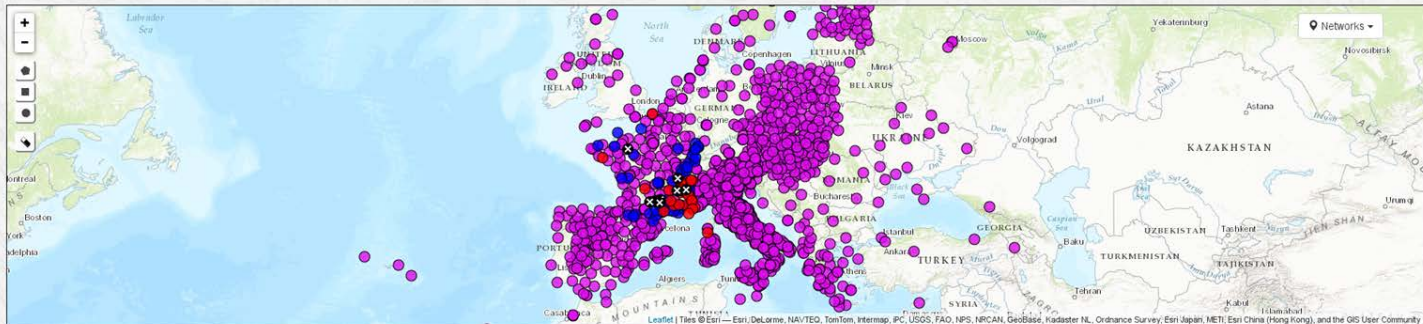
<https://gnss-metadata.eu/>

# DATA PORTAL



Download - Show spatial selection Show advanced search

Files Search Clear Run Search



| 4 Char ID | Site Name             | Lat                       | Lon                       | Alt                       | Install Date              | End Date            | Country | State                | City                | Agency       | Network   |
|-----------|-----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------|---------|----------------------|---------------------|--------------|-----------|
|           |                       | greater than<br>less than | greater than<br>less than | greater than<br>less than | greater than<br>less than |                     |         |                      |                     |              |           |
| ✓ AGDE    | Cap d'Agde purific... | 43.2964                   | 3.4664                    | 67                        | 2006-09-04 12:00:00       | 2017-04-21 16:16:08 | FRANCE  | Herauld              | CAP D'AGDE - AGDE   | GM           | RENAG RGP |
| ✓ AIGL    | Mont Aigoual          | 44.1214                   | 3.5813                    | 1618.8                    | 2001-06-01 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'HEUZ         | ISTerre      | RENAG RGP |
| ✓ ARUF    | ARUDY                 | 43.0996                   | -0.4311                   | 482                       | 2014-03-13 00:00:00       | 2017-04-21 16:16:08 | FRANCE  | Pyrenees-Atlantiques | ARUDY               | OMP-GET-CNES | RENAG RGP |
| ✓ AUBU    | Aubure                | 48.2168                   | 7.1967                    | 1151.8                    | 2008-07-05 00:00:00       | 2017-04-21 16:16:08 | FRANCE  | Haut-Rhin            | AUBURE              | EOST         | RENAG RGP |
| ✓ BANN    | Fort de Banne         | 44.3692                   | 4.1563                    | 416                       | 2003-07-03 00:00:00       | 2017-04-21 16:16:08 | FRANCE  | Ardeche              | BANNE               | ISTerre      | RENAG RGP |
| ✓ BLVR    | Belvoir               | 47.3235                   | 6.5668                    | 714.6                     | 2013-07-03 00:00:00       | 2017-04-21 16:16:08 | FRANCE  | Doubs                | BELVOIR / LES CH... | OSUTHETA     | RENAG RGP |
| ✓ BUAN    | Bure-Andra            | 48.4862                   | 5.3536                    | 416.3                     | 2007-11-13 00:00:00       | 2017-04-21 16:16:08 | FRANCE  | Meuse                | BURE                | EOST         | RENAG RGP |
| ✓ CHIZ    | CHIZE                 | 46.1335                   | -0.4077                   | 113.2                     | 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                   | 54.93                     | 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                    | 838.8                     | 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                    | 474                       | 2006-10-17 00:00:00       | 2017-04-21 16:16:08 | FRANCE  | Puy-de-Dome          | CLERMONT-FERR...    | OPGC         | RENAG RGP |

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# DATA PORTAL

**EPOS**  
EUROPEAN PLATE OBSERVING SYSTEM

Download Show spatial selection Hide advanced search

Files Search Clear Run Search

**Spatial selection**

**Rectangle**  
Lat-Lon Bounding Box  
45.089036  
3.010254 7.734375  
42.827639

**Circle**  
Latitude Longitude  
Radius (Km)

**Monumentation / Equipment**

Receiver Type  
TRIMBLE NETR5  
TRIMBLE NETR8  
TRIMBLE NETR9  
TRIMBLE NETR10  
TRIMBLE R10

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

Radome Type  
AUST  
BEVA  
CAFG  
CONE

Satellite System  
GPS  
GLONASS  
GALILEO  
BEIDOU

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...  | 43.2964 | 3.4664 | 67     | 2006-09-04 12:00:00 | 2017-04-21 16:16:08 | FRANCE  | Herauld               | CAP D'AGDE - AGDE       | GM      | RENAG RGP |
| AGL        | Mont Aligoual            | 44.1214 | 3.5813 | 1618.8 | 2001-06-01 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  | Iserre                | ALPE D'HUEZ             | ISTerre | RENAG RGP |
| BANN       | Fort de Banne            | 44.3692 | 4.1563 | 416    | 2003-07-03 00:00:00 | 2017-04-21 16:16:08 | FRANCE  | Ardeche               | BANNE                   | ISTerre | RENAG RGP |
| GINA       | Cadarache - Ginass...    | 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 | 6.71   | 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 | 3.1854 | 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 | 5.3538 | 61.8   | 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  | Herauld               | MONTPELLIER             | GM      | RENAG RGP |
| MTP1       | Montpellier (CNRS ...    | 43.6374 | 3.8648 | 120    | 1999-04-01 12:00:00 | 2013-11-26 00:00:00 | FRANCE  | Herauld               | MONTPELLIER             | GM      | RENAG RGP |
| PALI       | Domaine de la palis...   | 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 |

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# DEVELOPED PRODUCTS STATUS

**Current status:** Prototype Products already generated

- **Daily solutions + metadata**

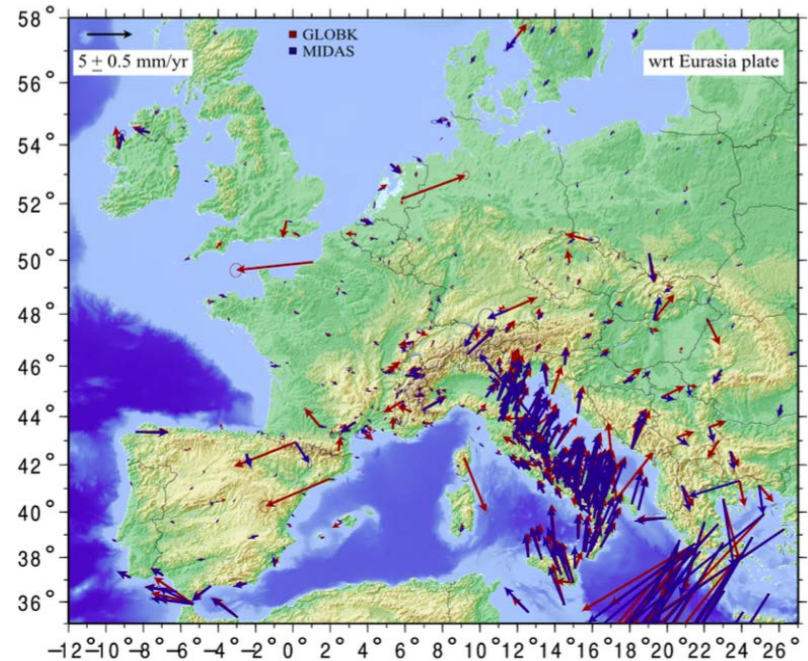
- 2 Pan-European processing centers (INGV, UGA-CNRS)
- EUREF solutions (WUT)
- Densified solution EPOS/EUREF (BFKH)

- **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)



# PRODUCTS PORTAL

**GNSS Data and Products**

Filters Download

Combined DD PPP EUREF

Select a station  
Products will be shown here

Stations Availability

Velocities

Select a station  
Products will be shown here

| Station | Start Year | End Year |
|---------|------------|----------|
| ULRK    | 2008       | 2010     |
| YTUY    | 2004       | 2017     |
| AQUI    | 2002       | 2017     |
| EWDS    | 2003       | 2008     |
| NFCS    | 2004       | 2007     |
| NLWF    | 2005       | 2009     |

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

# PRODUCTS PORTAL

EPoS GNSS Data and Products

Filters Download

Combined DD PPP EUREF

Select a station

Products will be shown here

Download: PNG PDF XML JSON CSV

Velocities

Select a station

Products will be shown here

Stations Availability

Show 10 entries Search:

| 4-Char ID | Site Name      | Lat     | Lon     | Altitude | Country | City               | Agency              | Network |
|-----------|----------------|---------|---------|----------|---------|--------------------|---------------------|---------|
| ABAS      | ABAS 19581M001 | 39.7672 | 8.8174  | 232.1    | Italy   | Ales Corso Umberto | GEOTOP S.R.L.       | AAAA    |
| ACCA      | ACCA 18850M001 | 41.1586 | 15.3312 | 718.4    | Italy   | ACCADIA            | Innovapuglia s.p.a. | AAAA    |
| ACCE      | ACCE 19525M001 | 44.4762 | 6.9882  | 1321.7   | Italy   | Acciglio           | A.R.P.A. PIEMONTE   | AAAA    |

Istituto Nazionale di Geofisica e

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

# PRODUCTS PORTAL

**EPoS** GNSS Data and Products
Filters ▾ Download

Combined DD PPP EUREF

site AQUI

Stations Availability

Show 10 entries Search: AQUI

| 4-Char ID | Site Name      | Lat     | Lon     | Altitude | Country | City     | Agency   | Network |
|-----------|----------------|---------|---------|----------|---------|----------|--|---------|
| AQRA      | AQRA 12757M002 | 42.3659 | 13.3743 | N/A      | Italy   | L'AQUILA | Regione Abruzzo  | AAAA    |
| AQUI      | L'Aquila       | 42.3682 | 13.3502 | N/A      | Italy   | L'Aquila | Agenzia Spaziale Italiana e-geos S.p.A. - una società ASI/Telespazio | AAAA    |
| AQUM      | AQUM           | 42.3276 | 13.4672 | N/A      | Italy   | L'Aquila | LEICA GEOSYSTEMS S.P.A.  | AAAA    |

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

Velocities

**AQUI**

|                   |   |
|-------------------|---|
| Trend             | N: 16.5 +/- 0.2 mm/year<br>E: 21.4 +/- 0.2 mm/year<br>U: -0.6 +/- 0.2 mm/year |
| Offset 2009-04-09 | N: -49.7 +/- 0.9 mm<br>E: 9.3 +/- 0.8 mm<br>U: -80.5 +/- 1.8 mm               |

<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 is being currently tested in several TCS10 repositories – interested? Please contact us: [wp10@epos-ip.eu](mailto:wp10@epos-ip.eu)
- To be used in the Operational Phase, after 2019 as GNSS component of EPOS.
- We have shown the 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.

## DOCUMENTATION:

**GNSS TCS**      <https://www.epos-ip.org/tcs/gnss-data-and-products>

## PORTALS:

**M3G**              <https://gnss-metadata.eu/>  
**DATA**             [http://glass.unice.fr:8080/epos\\_validation/#/site](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=f54nIliid5U>  
<https://www.youtube.com/watch?v=NqInMhkCgMI>