

Current Status of EPOS GNSS Working Group

**Rui Fernandes
on behalf of WG4 members**

Current Status

WG4 COMPOSITION

| First Name ▼ | Last Name ▼ | Official ROLE within WG4 ▼ | Country ▼ | Institution ▼ |
|--------------|---------------|-------------------------------------|----------------|-----------------------------------|
| Rui | Fernandes | WG Chair | PORTUGAL | SEGAL (UBI/IDL) |
| Luisa | Bastos | WG co-Chair | PORTUGAL | FC UP |
| Carine | Bruyninx | WG co-Chair | BELGIUM | ROB |
| Nicola | D'Agostino | WG co-Chair | ITALY | INGV |
| Jan | Dousa | WG co-Chair | CZECH REPUBLIC | Geodetic Observatory Pecny |
| Athanassios | Ganas | WG co-Chair | GREECE | NOA |
| Martin | Lidberg | WG co-Chair | SWEDEN | LM |
| Andrzej | Araszkiewicz | WG Member (National Representative) | POLAND | Military University of Technology |
| Matthias | Becker | WG Member (National Representative) | GERMANY | TU Darmstadt |
| Richard | Bingley | WG Member (National Representative) | UNITED KINGDOM | University of Nottingham |
| Rahsan | Cakmak | WG Member (National Representative) | TURKEY | TUBITAK MAM |
| Mary | Carter | WG Member (National Representative) | IRELAND | GSI |
| Mariusz | Figurski | WG Member (National Representative) | POLAND | Military University of Technology |
| Jorge | Gárate | WG Member (National Representative) | SPAIN | ROA |
| Ivan | Georgiev | WG Member (National Representative) | BULGARIA | BAS |
| Pasi | Hakli | WG Member (National Representative) | FINLAND | FGI |
| Nicolas | Houlie | WG Member (National Representative) | SWITZERLAND | ETH |
| Ambrus | Kenyeres | WG Member (National Representative) | HUNGARY | FOMI |
| Halfdan | Kierulf | WG Member (National Representative) | NORWAY | STATKART |
| Shfaqat | Khan | WG Member (National Representative) | DENMARK | DTU-Space |
| Alexandra | Muntean | WG Member (National Representative) | ROMANIA | NIEP |
| Markku | Poutanen | WG Member (National Representative) | FINLAND | FGI |
| Benedikt | Ofeigsson | WG Member (National Representative) | ICELAND | VEDUR |
| Giulio | Selvaggi | WG Member (National Representative) | ITALY | INGV |
| Gunter | Stangl | WG Member (National Representative) | AUSTRIA | IWF |
| Bojan | Stopar | WG Member (National Representative) | SLOVENIA | University of Ljubljana |
| Hans | van der Marel | WG Member (National Representative) | NETHERLANDS | Delft University of Technology |
| Andrea | Waldersdorf | WG Member (National Representative) | FRANCE | University of Grenoble |
| Caporali | Alessandro | WG Member (GNSS) | ITALY | Univ. Of Padova |
| David | Zuliani | WG Member (GNSS) | ITALY | INOGS |
| Olivier | Francis | WG Member (Gravity) | LUXEMBOURG | UNILU |
| Sylvian | Bonvalot | WG Member (Gravity) | FRANCE | BGI |
| Jonathan | Jones | WG Member (Meteo) | UNITED KINGDOM | Meteo UK |
| Artur | Rocha | WG Member (WG7) | PORTUGAL | INESC-P |

EPOS a long term integration plan of research infrastructures for solid Earth Science in Europe

Preparatory Phase Project

www.epos-eu.org



Massimo Cocco

epos@ingv.it

What is EPOS?

- It is an ESFRI project (Preparatory Phase)
 - (European Strategic Forum on Research Infrastructures)
- It aims at integrating existing RIs for solid Earth
 - Supporting construction/implementation of community data centers
 - Building core services for different stakeholders
- It aims at creating the governance structure to manage this distributed RI and its services to users
- It aims at building a legal body to secure funds for maintaining RIs for solid Earth science

EPOS PP Mission

- The European Plate Observing System (EPOS) is a **long-term integrated research infrastructure plan** to promote innovative approaches for a better understanding of the physical processes controlling earthquakes, volcanic eruptions, unrest episodes and tsunamis as well as those driving tectonics and Earth surface dynamics
- The EPOS plan aims at integrating the currently scattered, but highly advanced European facilities into one, distributed, but coherent multidisciplinary Research Infrastructure (RI) taking full advantage of new e-science opportunities

EPOS PP Timeline

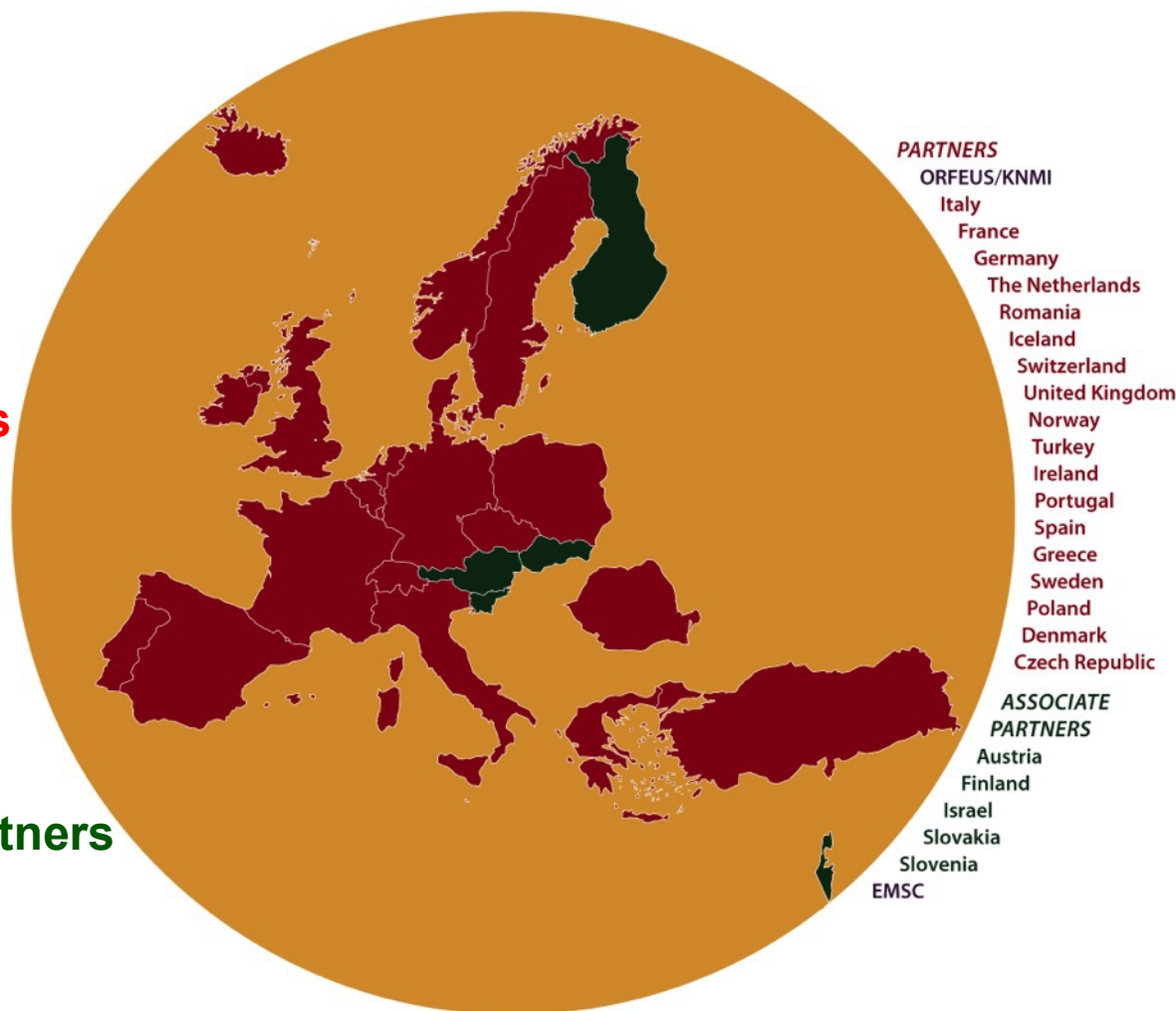


EPOS: the Partnership

Who?

**20 partners
for 18 countries**

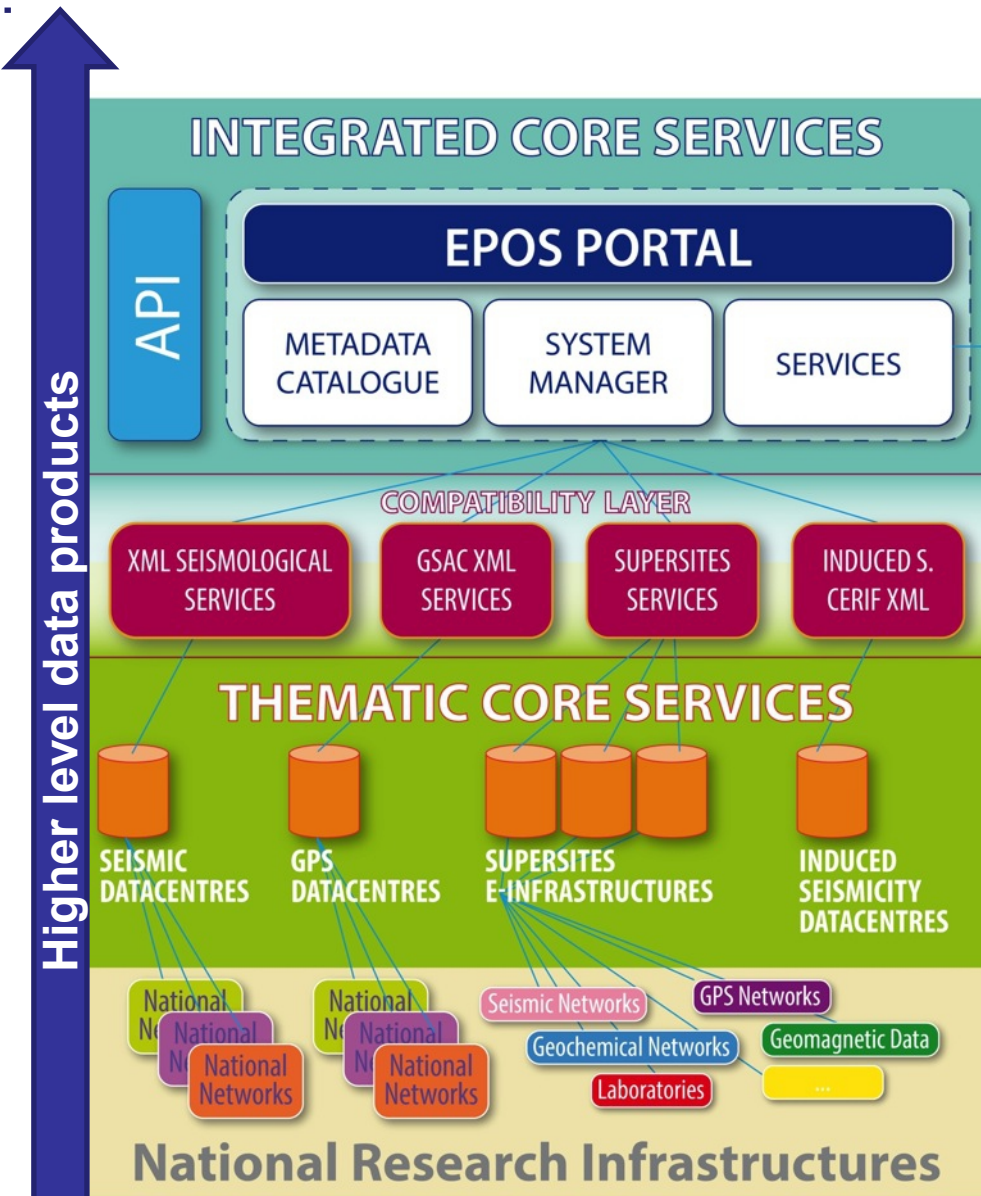
**6 associate partners
for 5 countries**



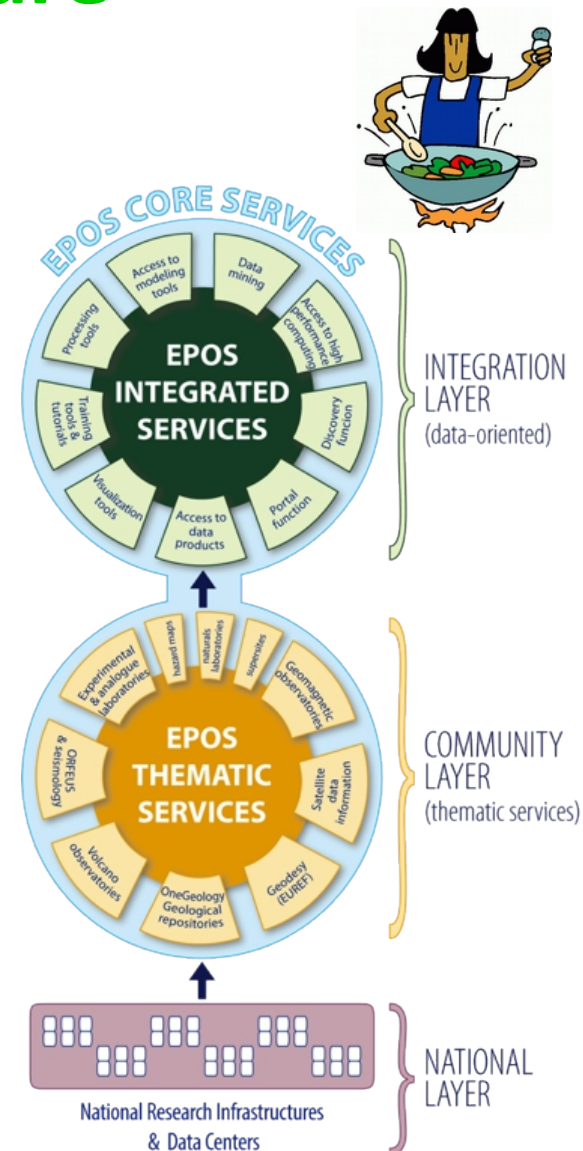
**On going initiatives for integrating the partnership:
Bulgaria, Belgium, Russia,**

Erice September 2011

Functional Architecture



Compatibility Layer is the TCS-ICS Interface and it guarantees integration & interoperability



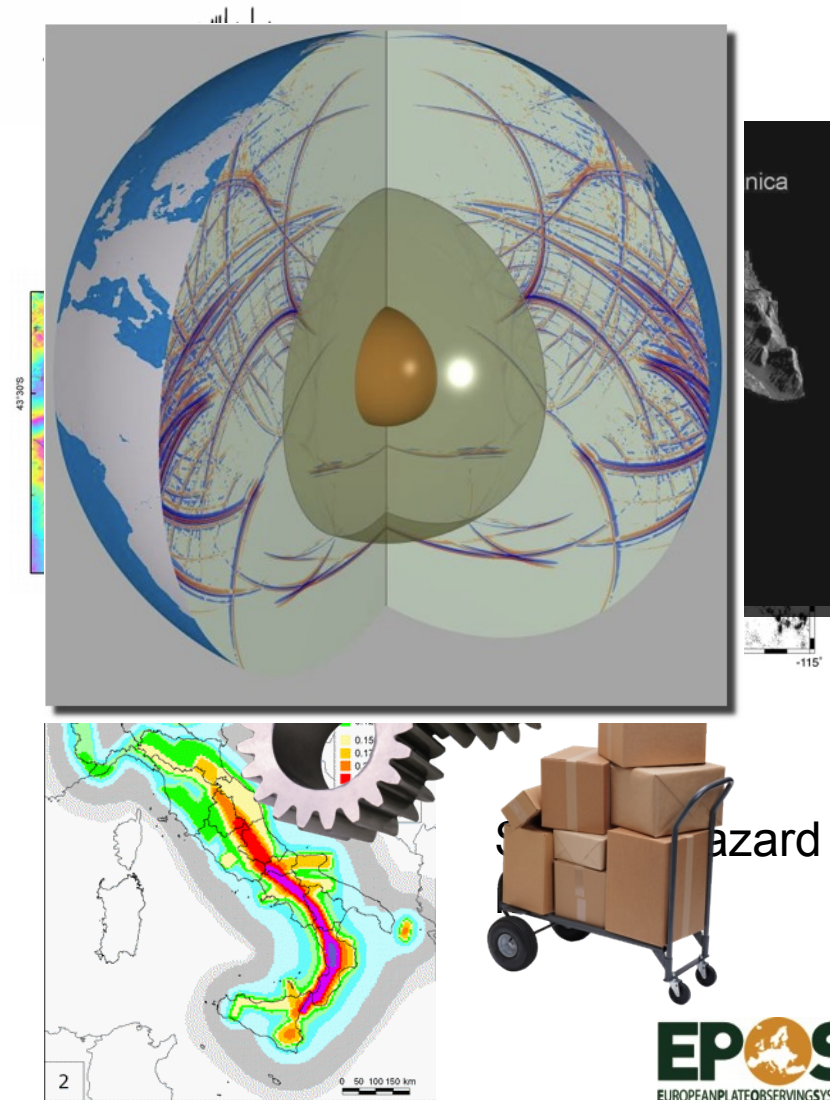
Background to Geodesy in EPOS

WG4 – “GNSS Data and Other Geodetic Data” is the Working Group of the EPOS project in charge of defining and preparing the integration of the existing Pan-European Geodetic Infrastructures that will support the European Geosciences. It is open to the entire geodetic community. In fact, WG4 also includes members from countries that formally are not part of the current phase of EPOS.

Focus on cGNSS (continuous GNSS) as a start but open to include other geodetic data in the future (there are current efforts focused on gravity data).

Access to Data Products (Taxonomy)

- Level 0: raw data, or basic data
- Level 1: data products coming from nearly automated procedures
- Level 2: data products resulting by scientists' investigations
- Level 3: integrated data products coming from complex analyses or community shared products
- Level 4. Software, IT tools



EPOS Database (RIDE)

MAP OF:

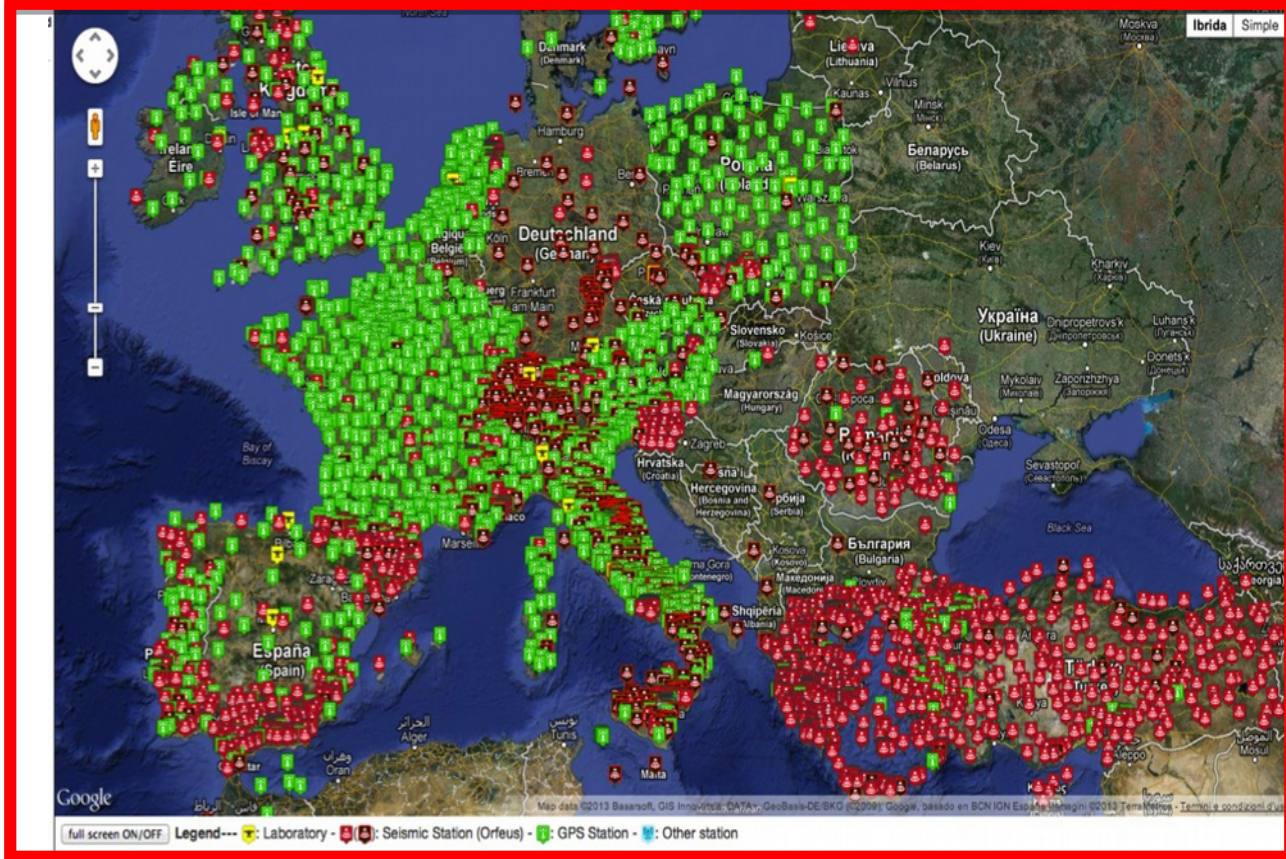
- Seismic/GPS stations
- Laboratories
- etc....

Diversity in data type and formats

<http://www.epos-eu.org/ride/>

Research Infrastructure List

- 244 Research Infrastructures
- 138 Institutions
- 22 countries
- 2272 GPS receivers
- 4939 seismic stations
- 464 TB Seismic data
- **1.095 PB Storage capacity**
- 828 instruments in 118 Laboratories



EPOS Database

Firefox | Research Infrastructure Database for EPO... | www.epos-eu.org/ride/ | ride epos | Bookmarks

Most Visited | Getting Started | Latest Headlines | Publico | Loading... | Problem loading page | MNDB - 2012-01-12T1... | mosh - 2012-02-11T01...

RIDE RESEARCH INFRASTRUCTURE DATABASE for EPOS

What's RIDE? | What's EPOS? | Contacts | Help | Login

EPOS is: 7067 Seismic and GPS Stations/Benchmarks

Working Group: 4 | Filter RIs List | Reset | Search | Help

Order by: name | 50 Research Infrastructures listed

click on a row to show info

1. University of Jaen - Geodesy equipment - WG 4
2. University of Alicante - Spatial Geodesy Laboratory - WG 4,8
3. UBI - Space Earth Geodetic Analysis Laboratory - WG 4
4. TUBITAK - Turkey Regional GPS Network - WG 4
5. TOPOIBERIA - Seismic, GPS, MT - WG 1,4,5
6. Swisstopo AGNES - WG 4
7. SWEPOS - WG 4
8. SmartNet Poland - WG 4
9. Sistema de Estações de Referência VIRTuais - WG 4
10. RIGTC - VESOG GNSS network - WG 4
11. RIGTC - Gravimetric observatory - WG 4
12. RESIF - WG 1,4,2

Map | Statistics | Hybrid | Simple

About 2200 cGNSS stations, managed by 49 research infrastructures (RI), potentially available for EPOS

Scientific applications of GNSS data for the EPOS community

| <u>Application</u> | Data need | Existing projects | EPOS added value |
|------------------------------|--|--------------------------|--|
| Tectonics | 30s, daily | ... | Dense velocity field |
| GNSS-seismology | 1Hz, sub-hourly ≥ 1 Hz, real-time (GNSS seismometer) | | > 1 Hz real-time processing, Collocation with seismometers |
| GIA | 30s, daily | | Densification |
| Sea-level change | 30s, daily | IGS TIGA, SONEL | Collocation with tide gauges, |
| Loadings | 30s, daily (global) 1Hz, sub-hourly (storm surge) ≥ 1 Hz, real-time (storm surge) | | Densification |
| Early warning systems | ≥ 1 Hz, real-time | | > 1 Hz real-time processing |

Scientific application of GNSS data for other communities

| <u>Application</u> | Data need | Existing projects | EPOS added value |
|---------------------------|--|--------------------------|--|
| Reference frame | 30s, daily | EUREF | National level |
| Meteorology | 30s, hourly (forecasting) 1Hz, sub-hourly (now-casting) >=1Hz, real-time (now-casting) | E-GVAP, COST | Unique access to a common dataset, additional collocations with met sensors, ... |
| Climate change | 30s, daily | | Data density, homogeneity in long-term processing, collocations |
| Space weather | 30s, hourly (forecasting) 1Hz, sub-hourly (scintillations) >=1Hz, real-time (scintillations) | | Densification |

GNSS-related European projects

EUREF – European Reference Frame

EUREF Permanent GNSS Network

www.epncb.oma.be/_networkdata/stationmaps.php

HOME

EUREF Permanent Network

ROB *****
GNSS Research Group

EUREF

| ORGANISATION | NETWORK & DATA | PRODUCTS & SERVICES | DOCUMENTATION | NEWS, EVENTS & LINKS |
|---|--|---|---|--|
| Creation, Management, Relation to IGS, Projects | Structure, Station list, Maps, Tracking status, Data access, Proposed stations, Station log submission, Station picture submission | Data analysis, Weekly EPN solutions, Coordinates, Position time series, Tropospheric delays, ETRS89/ITRS transformation, Satellite Orbit & Clock Correction Streams | Formats, Guidelines, Equipment & calibration, Papers, FAQ | News, Mails, Calendar, Workshops, FTP server, Site map, Web history, Links |

[NETWORK & DATA](#) > **MAPS**

Interactive map

Legend

Station status (active, inactive, former) ▾

Active Inactive Former

Locate station on map

- Select a station - ▾

Station criteria selection

Receiver manufacturer:

AOA ASHTECH JAVAD LEICA

Antenna manufacturer:

3S NAVIGATION AOA ASHTECH JAVAD

Satellite system:

GPS GLONASS GALILEO

Status:

ACTIVE INACTIVE FORMER

Data:

DAILY HOURLY REAL-TIME

hold down CTRL for multiple selection

Update map

Map

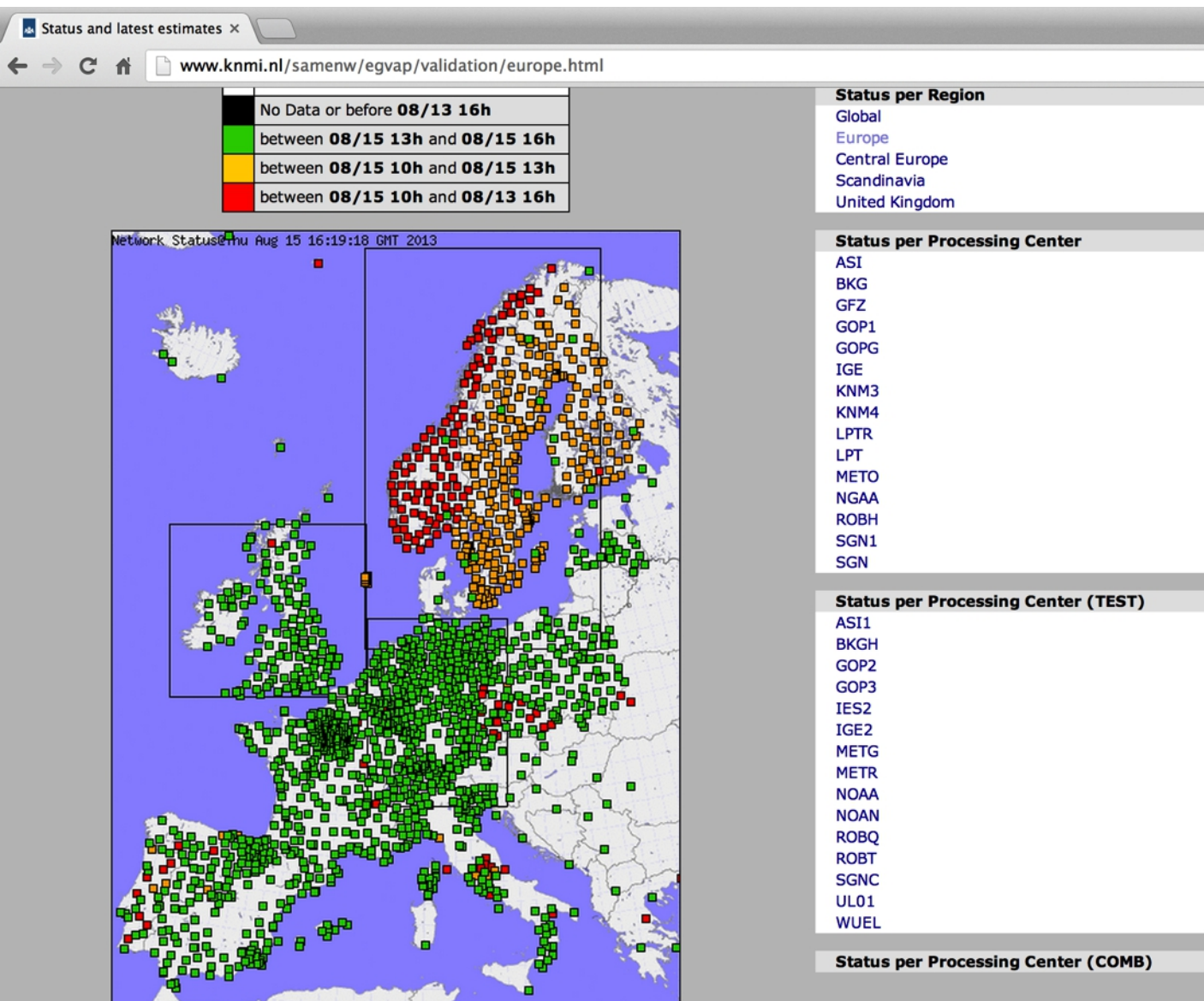
Google

Map data ©2013 Google, INEGI, MapLink, 1 000 km Terms of Use

EPOS aims to deeply cooperate with EUREF in order to benefit from the experience constructed in the last decades

Other GNSS-related European projects

E-GVAP - EUMETNET EIG GNSS water vapour programme



Use of many
networks
installed for
surveying at
national and
regional level.

GNSS-related European projects – Solid Earth National Level

RETE INTEGRATA NAZIONALE GPS

<http://ring.gm.ingv.it>

december, 2011



And many other national projects
dedicated to geodynamics:
-Greece, Turkey, Portugal, etc...

Unfortunately, most of them without
public data access.

European GNSS projects

| <u>Project</u> | Value to EPOS | Notes |
|----------------------------------|---|---|
| Networks for Solid Earth | <ul style="list-style-type: none"> - Natural candidates to contribute to EPOS - Use of highest standards for monument setup and data quality control (although no uniform and coordinated effort). | <ul style="list-style-type: none"> - Many of these networks are not public available - Most are project based (time limited). |
| EUREF | <ul style="list-style-type: none"> - Established as top European forum concerning reference frames. Support of national mapping agencies (main GNSS providers in Europe) and also academia. - Dissemination of high standards (close to geodynamics) for monument setup and data quality control. | <ul style="list-style-type: none"> - Volunteer basis. |
| TIGA SONEL | <ul style="list-style-type: none"> - Definition of vertical data and variations on sea and land by linking both the tide gauge and the GNSS databases | <ul style="list-style-type: none"> - Superposition with EPN sites. |
| E-GVAP Surveying Networks | <ul style="list-style-type: none"> - Very dense networks in most of Europe. - Access to much more RTK data | <ul style="list-style-type: none"> - Many stations with unknown quality and difficulties to manage their metadata. |

Thematic Services (TCS)

WG1 - Seismology

WG2 - Volcanology

WG3 - Geological Data

WG4 - GNSS Data

WG6 - Analytical and Experimental Laboratories

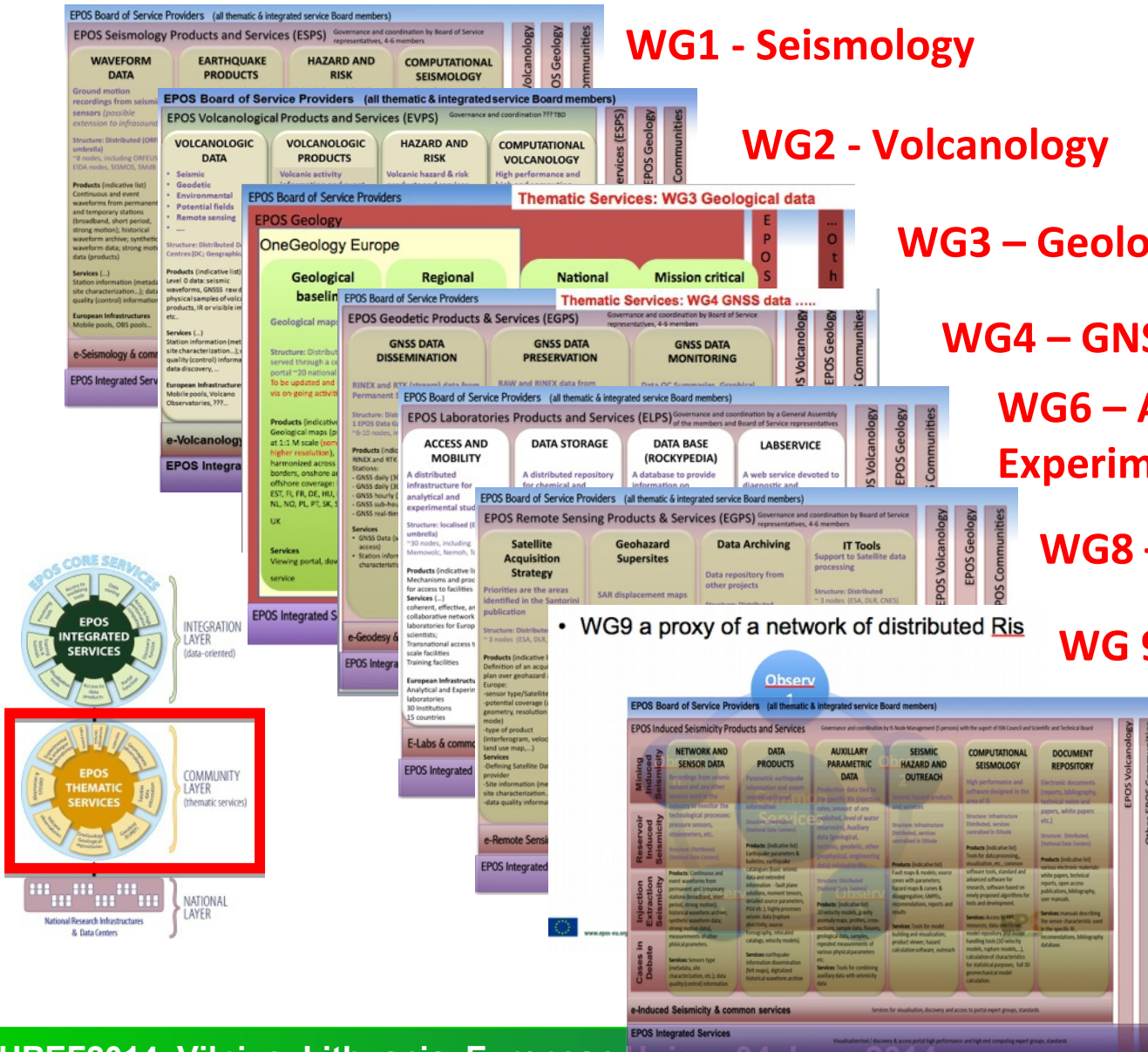
WG8 - Satellite Data

WG9 - Geomagnetic Observ.

WG10 - Infrastructures for Georesources

- Governance
- Data Products
- Services

WG5
Near Fault
Observatories



EPOS Geodetic Products & Services (EGPS)

Steering Committee and Executive Committee

COORDINATION
(see next slide)

GNSS DATA DISSEMINATION & PRESERVATION

LEVEL 0
GNSS Observation and Meta-data from Permanent
(and Campaign) Stations

Structure: Distributed (GSAC-like)
1 EPOS Data Gateway
National and Regional nodes.

- Products:**
- Observation data (streams and files).
 - Meta-data (site logs, access conditions, QC, etc..) for all archived data.
- Services:**
- Seamless and redundant access to Level 0 data through GSAC derived web-services.
 - Seamless storage and upload of Level 0 data.
 - Conversion from RAW into international standard format (RINEX x.x).
 - Checking of essential meta-data.

GNSS PRODUCTS

LEVEL 1,2,3
GNSS Data Analysis and Derived Products

Structure:
1 EPOS Product Gateway
National and Regional nodes.

- Products:**
- Real-time to post-processed positions
 - Velocity Fields
 - Secular Motions
 - Periodical and no-periodical signals.
 - Strain Fields
- Services**
- Seamless and redundant access to Level 1,2,3 data through GSAC derived web-services
 - Web-services for online GNSS data processing
 - Repository of existing Level 1,2,3 data.

USER COMMUNITY SUPPORT

Support to GNSS activities for Solid Earth research

Structure: Centralized
1 node (EPOS-GNSS Center)

- Products:**
- Services**
- Diffusion of best practices and tools.
 - Support to Research projects (e.g., pool of instruments, installation support, data management)
 - Realization of Scientific and Technical Courses.

DEVELOPMENT OF STANDARD TOOLS
(see next slide)

e-Geodesy & common services

Geodetic services for visualisation, discovery and access to portal
expert groups, standards

EPOS Integrated Services

Visualisation tool / discovery & access portal
high performance and high end computing
expert groups, standards

EPOS Geodetic Products & Services (EGPS)

Steering Committee and Executive Committee

COORDINATION**Coordination**

(based on EUREF experience)

Structure: Centralized

1 node (EPOS-GNSS Center)

Products:

- EPOS Geodetic Web Portal:
 - gateway providing access to the geodetic data/products
 - gateway interacting with the EPOS ICS
- Guidelines & Standards

Services

- Day-to-Day Network Management & Coordination of Pillars.

DEVELOPMENT OF STANDARD TOOLS

Development and Maintenance of software tools in support of other pillars

Structure: Distributed**Products:**

- Further Development of GSAC
- Further Development of online GNSS processing services
- Further Development of meta-data management tools
- Development of Interfaces between Pillars (e.g., QC tools)
- Development of Interfaces between Pillar 5 and ICS
- Development of Interfaces with existing services (e.g., EUREF)
- Visualization tools

Services

- Installation support

EPOS Volcanology

EPOS Geology

... Other EPOS Communities

Interaction with other Solid Earth Sciences

Collaboration with other working groups, namely:

Seismology (WG1)

- Data Standardization
- GNSS Seismology

Volcanology (WG2)

- Volcano Instrumentation

Satellite Data (WG8)

- Co-localization with SAR

e-Geodesy & common services

Geodetic services for visualisation, discovery and access to portal expert groups, standards

EPOS Integrated Services

Visualisation tool / discovery & access portal high performance and high end computing expert groups, standards

Benefits of EPOS (for the Geodetic Community)

Formal organization of EPOS will be through “European Research Infrastructure Consortium, ERIC”.

Usually countries are members, and *RIs* and *services* are included into EPOS through the contribution from each country

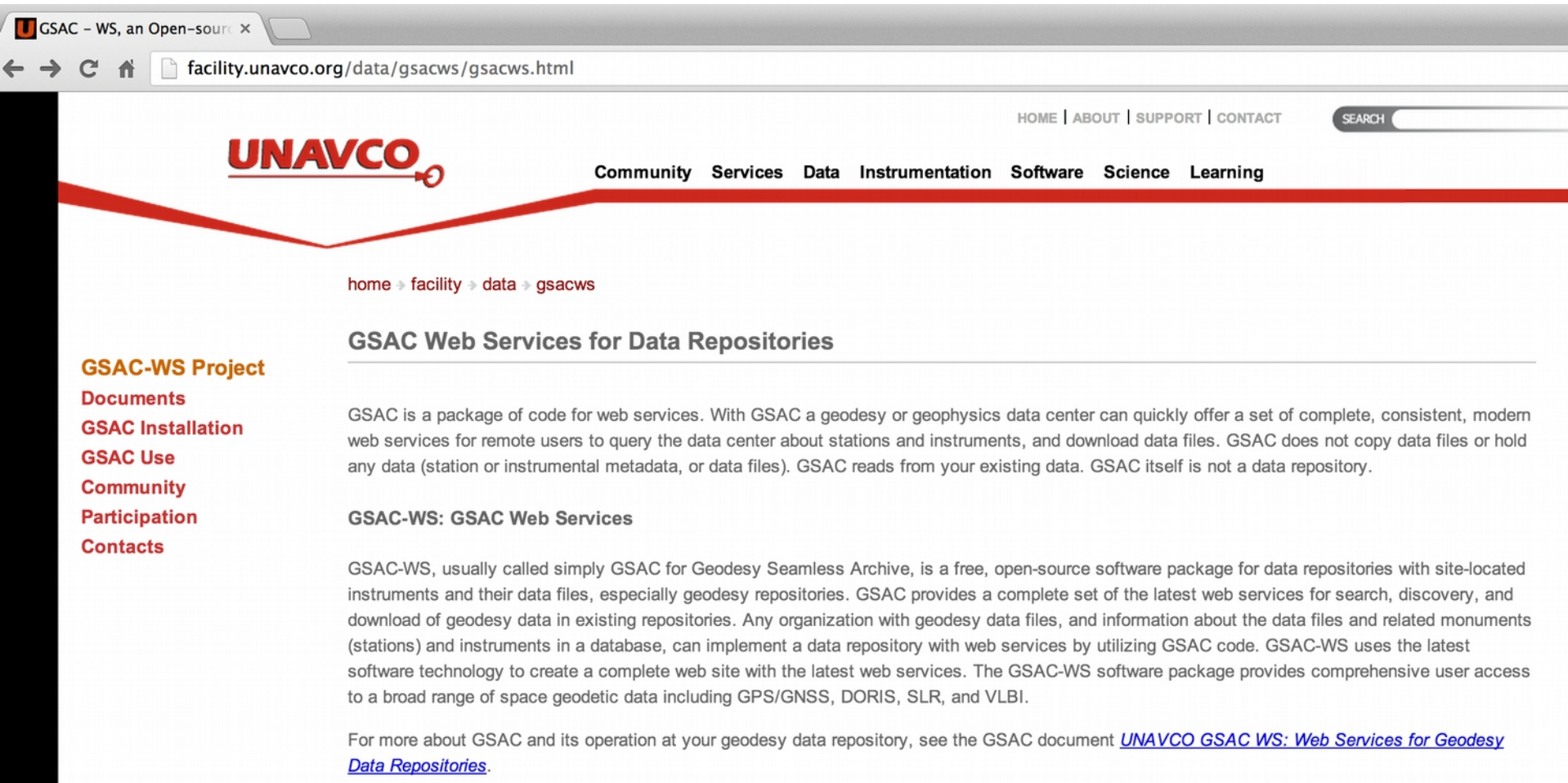
When included in EPOS, there will be a firm commitment from the countries for long term support (and financing!)

EPOS strive to collect, preserve, and utilize all observations that potentially may contribute to scientific progress

Therefore much more stations and raw (RINEX) data are welcomed and asked for

Data preservation, quality control, archiving and dissemination are priority services to be made available by EPOS WG4 in the near future.

GSAC – Geodetic Seamless ArChive Data Dissemination



The screenshot shows a web browser window with the URL `facility.unavco.org/data/gsacws/gsacws.html`. The page features the UNAVCO logo and a navigation menu with links: HOME, ABOUT, SUPPORT, CONTACT, SEARCH, Community, Services, Data, Instrumentation, Software, Science, and Learning. A breadcrumb trail reads: home > facility > data > gsacws. The main heading is "GSAC Web Services for Data Repositories". The text describes GSAC as a package of code for web services that allows geodesy or geophysics data centers to offer complete, consistent, modern web services for remote users to query data centers about stations and instruments, and download data files. It states that GSAC does not copy data files or hold any data (station or instrumental metadata, or data files). GSAC reads from your existing data. GSAC itself is not a data repository. A sub-heading "GSAC-WS: GSAC Web Services" is followed by a paragraph explaining that GSAC-WS, usually called simply GSAC for Geodesy Seamless Archive, is a free, open-source software package for data repositories with site-located instruments and their data files, especially geodesy repositories. GSAC provides a complete set of the latest web services for search, discovery, and download of geodesy data in existing repositories. Any organization with geodesy data files, and information about the data files and related monuments (stations) and instruments in a database, can implement a data repository with web services by utilizing GSAC code. GSAC-WS uses the latest software technology to create a complete web site with the latest web services. The GSAC-WS software package provides comprehensive user access to a broad range of space geodetic data including GPS/GNSS, DORIS, SLR, and VLBI. A link is provided for more information: [UNAVCO GSAC WS: Web Services for Geodesy Data Repositories](#).

GSAC-WS Project
Documents
GSAC Installation
GSAC Use
Community
Participation
Contacts

home > facility > data > gsacws

GSAC Web Services for Data Repositories

GSAC is a package of code for web services. With GSAC a geodesy or geophysics data center can quickly offer a set of complete, consistent, modern web services for remote users to query the data center about stations and instruments, and download data files. GSAC does not copy data files or hold any data (station or instrumental metadata, or data files). GSAC reads from your existing data. GSAC itself is not a data repository.

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For more about GSAC and its operation at your geodesy data repository, see the GSAC document [UNAVCO GSAC WS: Web Services for Geodesy Data Repositories](#).

Currently, several WG4 members are already implementing GSAC services in cooperation with UNAVCO:

- Italy, Portugal, Greece, Iceland, France, Belgium

Latest news (03 June 2014)

http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=home

The screenshot shows the homepage of the EC Research Infrastructures portal. The sidebar on the left contains a 'Research Infrastructures' header and a list of navigation links: HOME, WHAT ARE RIs?, MAP of RIs, THE EUROPEAN LANDSCAPE, EU FINANCIAL SUPPORT, ERIC-LEGAL FRAMEWORK, SYNERGIES - EU INITIATIVES, INTERNATIONAL COOPERATION, SOCIO-ECONOMIC IMPACT, INNOVATION, ESFRI, and CONSULTATION ON RI. Below these links are icons for Press corner, Events, Funded projects, Success Stories, and Publications. The main content area features a 'HIGHLIGHTS' section with a red arrow icon. The first highlight is titled 'The Council acknowledges the prioritisation process for the implementation of the ESFRI roadmap'. The text below this title states that in its conclusions of 26th May 2014, the Council acknowledges the work done by ESFRI to identify priority projects which are mature enough to be under implementation in 2015-2016 and whose timely implementation is considered essential to extend the frontiers of knowledge in the fields concerned. The text continues that the Council confirms the Member States' commitment to focus their available national resources on the respective prioritised projects they are financially participating in and invites the Commission, under Horizon 2020, to complement the Member States' own financial commitments through a one-time financial contribution for the priority projects, and to financially support the other projects (preparation and implementation) identified by ESFRI and listed in the Annex. Below this text are two links: 'Council Conclusions of 26 May 2014' and 'Prioritisation of Support to ESFRI Projects for Implementation, ESFRI report, 7 April 2014' (670 KB). The second highlight is titled 'Prioritisation of Support to ESFRI Projects for Implementation (ANNEX to Council Conclusion of 26 May 2014)'. It lists three priority projects for implementation: EPOS (European Plate Observing System), ELIXIR (The European Life-Science Infrastructure for Biological Information), and ESS (The European Spallation Source). The EPOS, ELIXIR, and ESS items are circled in red. The bottom right corner of the page features the EPOS logo and the text 'EUROPEAN PLATE OBSERVING SYSTEM'.

Homepage - Research Infr. x

ec.europa.eu/research/infrastructures/index_en.cfm?pg=home

Research Infrastructures

HOME

WHAT ARE RIs ?

MAP of RIs

THE EUROPEAN LANDSCAPE

EU FINANCIAL SUPPORT

ERIC-LEGAL FRAMEWORK

SYNERGIES - EU INITIATIVES

INTERNATIONAL COOPERATION

SOCIO-ECONOMIC IMPACT

INNOVATION

ESFRI

CONSULTATION ON RI

Press corner

Events

Funded projects

Success Stories

Publications

HIGHLIGHTS

The Council acknowledges the prioritisation process for the implementation of the ESFRI roadmap

In its conclusions of 26th May 2014, the Council acknowledges the work done by ESFRI to identify priority projects which are mature enough to be under implementation in 2015-2016 and whose timely implementation is considered essential to extend the frontiers of knowledge in the fields concerned.

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- [Council Conclusions of 26 May 2014](#)
- [Prioritisation of Support to ESFRI Projects for Implementation, ESFRI report, 7 April 2014](#) 670 KB

The Commission is now in capacity to further define how the priority projects (listed below) will be supported in the framework of Horizon 2020 to develop new world-class research infrastructures. The first support action will be implemented under the call INFRADEV-3-2015: Individual implementation and operation of ESFRI projects, see [work programme on Research infrastructures](#), page 9. A total budget of about 90 million € will be allocated to this action.

Prioritisation of Support to ESFRI Projects for Implementation (ANNEX to Council Conclusion of 26 May 2014)

- Three Priority Projects for implementation
 - [EPOS](#): European Plate Observing System
 - [ELIXIR](#): The European Life-Science Infrastructure for Biological Information
 - [ESS](#): The European Spallation Source

EPOS
EUROPEAN PLATE OBSERVING SYSTEM

http://www.epos-eu.org/



The screenshot shows the homepage of the EPOS (European Plate Observing System) website. At the top, there's a browser window with the address bar showing 'www.epos-eu.org'. The main header features the EPOS logo, which consists of the letters 'EPOS' in a bold, green font, with a stylized orange and white map of Europe integrated into the letter 'O'. Below the logo, the text 'EUROPEAN PLATE OBSERVING SYSTEM' is written in a smaller, green, sans-serif font. To the right of the logo is a rectangular image showing a close-up of a circuit board with various electronic components. Below the header, there's a navigation bar with a dark green background and white text. The navigation bar includes links for 'Why EPOS', 'Our Community', 'Preparatory Phase', 'Data & Services', and 'Updates'. Below the navigation bar, there's a search bar with a 'SEARCH' button. The main content area has a heading 'EPOS: European Plate Observing System' followed by a paragraph describing the system as 'Research Infrastructure and E-Science for Data and Observatories on Earthquakes, Volcanoes, Surface Dynamics and Tectonics'. To the left of this text is a video player showing a video titled 'EPOS - European Plate Observing System' with a play button and a progress bar. To the right of the video player is a section titled 'What' with a paragraph explaining that EPOS is the integrated solid Earth Sciences research infrastructure approved by the European Strategy Forum on Research Infrastructures (ESFRI) and included in the ESFRI Roadmap in December 2008. On the far right, there's a sidebar with the 'RIDE' logo (Research Infrastructure Database for EPOS) and a list of links: 'Newsletter', 'Calendar', 'Meetings', and 'News'. Below these links is a thumbnail image of the EPOS newsletter.

EPOS
EUROPEAN PLATE OBSERVING SYSTEM

Research Infrastructure and E-Science for Data and Observatories on Earthquakes, Volcanoes, Surface Dynamics and Tectonics

Why EPOS Our Community Preparatory Phase Data & Services Updates

European Research Infrastructure on Earthquakes, Volcanoes, Surface Dynamics and Tectonics

EPOS: European Plate Observing System

EPOS - European Plate Observing Syst...

What

The European Plate Observing System (EPOS) is the integrated solid Earth Sciences research infrastructure approved by the **European Strategy Forum on Research Infrastructures** (ESFRI) and included in the **ESFRI Roadmap** in December 2008. EPOS is a long-term integration plan of national existing RIs.

Newsletter Calendar Meetings News

Thank You