The benefits of TCS GNSS Data and Products for non-geodesists

Anne Socquet, Rui Fernandes, Machiel Bos, Paul Crocker and Lílian Féres*

The mission of Thematic Core Service (TCS) EPOS GNSS is to provide access to GNSS data, metadata, and products (i.e. positions, time-series, velocity fields and strain rate maps). GNSS data and products can be used for a wide range of applications in Solid Earth Sciences and beyond (see figure GNSS for WHOM) and spans domains as diverse as reference frame issues, tectonics, seismology, volcanology, hydrology, surface loading, among others.

What is GNSS - The term Global Navigation Satellite System (GNSS) refers to a constellation of satellites providing signals transmitting positioning and timing data. It is the general name for various navigation satellite systems and Global Positioning System (GPS), the one most people use in their cars and mobiles, is just one of them. It was the first, developed by the United States government and is the most widely used system which is why we hear this term a lot. However, the Russians have GLONASS, China has BeiDou and Europe has Galileo. The last two systems should be ready by 2020.

The first GNSS systems were developed for military purposes. However, with the passing of the years and as the result of many technological developments means that GNSS applications have become pervasive in civil, industrial and scientific areas well beyond the initial military uses.

Relation to other TCSs - The Near-Fault Observatory and Volcanology TCSs use GNSS data in their research. To store and disseminate these data, it is planned that they will use the GLASS software package that was developed by the TCS GNSS Data and Products. This will ensure that the same interface and formats are used among all three TCS’s. The GLASS package also comes with various quality control procedures and algorithms which in addition will guarantee the quality of the disseminated data.

Currently GNSS data are uploaded by the providers each hour or once a day. In the coming years we are planning to add near-real time streaming of GNSS data which will be of interest for the
Seismology TCS since high rate variation in position after an earthquake provides information about the size of the earthquake. This is especially important for large earthquakes for which conventional seismometers go out of range.

Finally, GNSS positions can be used to validate the displacement field measured by SAR interferometry available through TCS Satellite Data.

**TCS GNSS Data and Products** - Considering GNSS stands for Global Navigation Satellite System, EPOS TCS GNSS Data and Products is about positions of stations measured using satellite observations, i.e., GNSS observations. So, the products are derived from these observations and are positions, velocities (representing the motion of the tectonic plates) and strain rate maps (showing regions where the tectonic plates are diverging or colliding).

Currently there are a few thousand GNSS stations operating in Europe. A lot of them are part of EUREF which is already providing these data but there are many more. There is no uniform and consistent way of finding these data. Our goal is to harmonise these data and products, validate them, and make them all available at two gateways.

**EPOS GNSS Data and Products Portals** - These are e-infrastructures to store and disseminate GNSS data and products from existing Research Infrastructures. The portals store the EPOS stations metadata and enables access to the GNSS observations and products. Graphical interfaces enable station visualization and multiple queries over stations and associated metadata allowing users to retrieve the desired information. A documented Application Protocol Interface also exists for accessing the data and products.

GLASS or Geodetic Linking Advanced Software System aims to integrate data and products at two main portals as well as the EPOS main portal. GLASS is, in fact, the set of software, tools, procedures for storing, quality control to make available data and derived products.

**Services and products target** - Two types of people. Data providers are those that want to use these services and products to store and make available GNSS data and metadata. The other type of people, the users, are scientists and others who want to discover, access and use the data and products.

The access is free for data users although some identification may be required. On the other hand, access for data providers requires that they agree to follow a set of guidelines and provide minimum service levels of data availability and quality check (see Why the need to sign the supplier letter @ https://www.slideshare.net/EPOS_GNSS/why-the-need-to-sign-the-supplier-letter).
**Metadata used for scientific purpose** - When the equipment at a station changes, such information is fundamental to not cause errors in the computed parameters. To avoid such errors, it is important that the person who analyses the GNSS data from the station, has access to the station metadata. Station Metadata is the up to date description of the equipment at a GNSS station. Each data supplier must make sure that the metadata of its GNSS station are properly maintained. The GNSS TCS is developing dedicated tools for that (M3G).

**What is M3G** - M3G is the portal where operational centres (which operate the GNSS stations) can upload information about the type of instrument and antenna they are using, when it was installed, which type of receiver, contact information, name of station and network etc.

**Links in a blink:**
- Product Portal
- Data Gateway Portal
- EPOS GLASS Web Service
- M3G

*Authors*

**Anne Socquet** is professor at Univ. Grenoble Alpes, ISTerre laboratory. She studies the seismic cycle of great faults using space geodesy, tectonics and seismology. In EPOS, she is responsible of the coordination of the GNSS Products Task of WP10, and in charge of the EPOS GNSS processing center hosted at CNRS-OSUG.

**Machiel Simon Bos** is a post-doc at SEGAL (UBI/IDL), Portugal. Machiel does research in geodesy and surveying, specialising in GNSS time series analysis and ocean tide loading. Within EPOS, he is coordinating the development of the GNSS product portal.

**Rui Fernandes** is lecturer at UBI. His main research topics are the processing and analysis of space geodetic data, in particular, GNSS observations, for high-accurate applications. He is the chair of the Interim Consortium Board of the EPOS Thematic Core Service (TCS) GNSS Data and Products.

**Paul Crocker** is lecturer at UBI, specialised in computer science and engineering. Crocker is also the software coordinator of EPOS TCS GNSS.

**Lilian Féres** is a journalist, MSc in Science of Communication (Sao Paulo University, ECA-USP) and specialised in PR and Corporate Communications. In EPOS, she is responsible for TCS GNSS outreach and dissemination.

[Back to newsletter](#)