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## Abstract

GFZ operates an active IGS Analysis Center. This poster presents recent activities regarding important modelling changes of the routine products, the quality and consistency of the GFZ products, improvements in our processing software EPOS, and the plans for future developments.

## Operational Data Processing and Recent Modelling Changes

EPOS-8 is following the IERS Conventions 2010 (Petit and Luzum, 2010). The global station network used in the processing is shown in Fig. 1. For the IGS Final, Rapid and Ultra Rapid about 200, 110, and 95 sites are used, respectively. Some processing related information are given in Tab. 1. With a larger number of sites providing also GLONASS data, estimated GLONASS orbit and clock products have been provided routinely since 2010 (Fig. 2). Latest changes in the routine processing are listed in Tab. 2. Corresponding effects on the final clock and orbit scale difference are shown in Fig. 3.

Tab. 1 Number of stations and processing time for different GFZ products.

IGS Product	#Sites	#Sites GLO	Duration [h]
Ultra	95	65	~ 1
Rapid	110	80	~ 2
Final	200	115	~ 4

Tab. 2 Recent processing changes

Date	IGS week	Change
2012-03-16	1679	Deactivation of albedo and antenna thrust modelling
2012-08-19	1702	Switch from 7-day to 1-day SINEX files
2013-05-12	1740	Generation of 30-sec clock products (Final only)
2013-09-26	1758	Activation of albedo and antenna thrust modelling

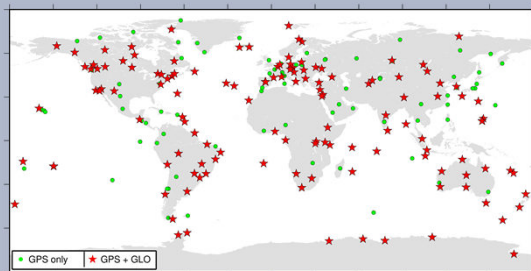


Fig. 1 Global network of IGS stations used for combined GPS+GLONASS data processing.

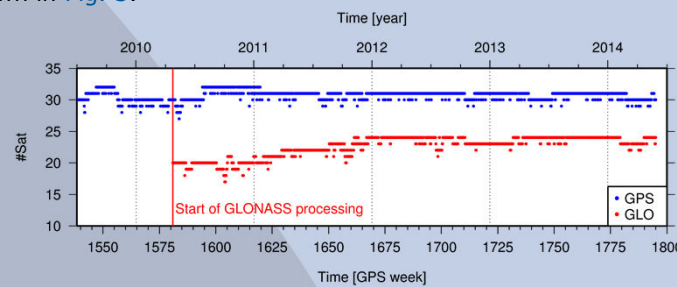


Fig. 2 Number of GPS and GLONASS satellites since 2010 as considered for the final GFZ analysis.

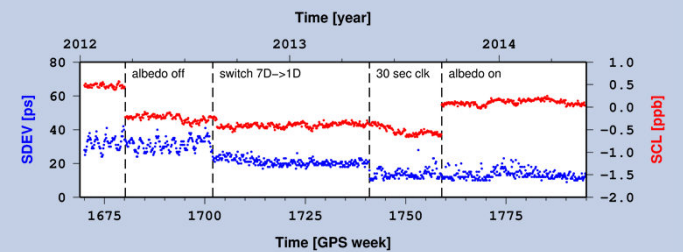


Fig. 3 Effect of processing changes on estimated satellite orbits and clocks. Comparison of GFZ final orbits and clocks w.r.t. IGS combined solution. Processing changes are reported in Tab. 2.

## IGS and TIGA Reprocessing Activities

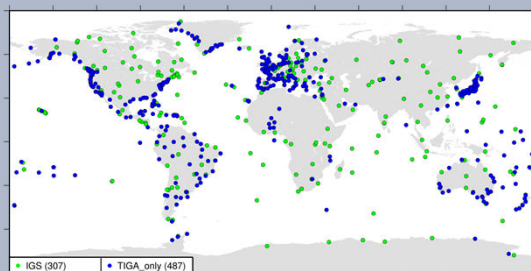


Fig. 4 Global distribution of tracking stations used for GFZ's contribution to the IGS-repro2 and TIGA-repro2 campaigns.

GFZ is contributing to the second Data Reprocessing Campaign of the IGS and, in addition, also to the TIGA project. Following the first IGS reprocessing finished in 2010 the following recommended features were implemented into the latest GFZ software version EPOS.P8: IGB08 reference frame (aligned to ITRF2008), updated igs08.atx antenna calibrations, geopotential field (EGM2008), higher-order ionospheric corrections, new a priori meteorological model (GPT2), VMF mapping function, and other minor improvements. The global station distribution is shown in Fig. 4. The temporal evolution of the total number of sites and number of GPS satellites contained in the daily network solutions is given in Fig. 5.

More details about the processing efforts and results are presented here:

- second IGS reprocessing campaign see Deng et al. (PS13)
- second TIGA reprocessing campaign see Deng et al. (PS14)

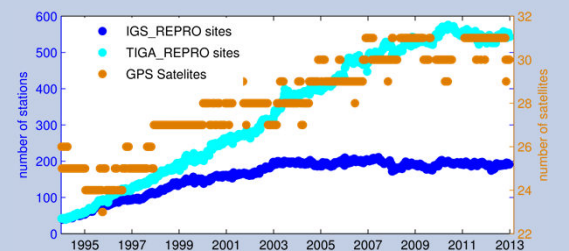


Fig. 5 Total number of stations available from GFZ's contributions to the IGS-repro2 and TIGA-repro2 campaigns. Total number GPS satellites used for the analyses.

## SEMISYS

GFZ developed a system for the management of all station and satellite metadata (SEMISYS - Sensor Meta Information System) needed for the analysis of GNSS observation data. All necessary information are stored format independent. Only validated information is stored in a central relational database without restrictions associated to a file based metadata management.

The implemented system provides an automated daily monitoring of metadata files from external sources (e.g. IGS site logs). Files required for the routine analysis are also generated automatically. An interactive web interface allows to display and edit station and satellite information. The basic design is shown in Fig. 6.

More details about SEMISYS are presented in Bradke et al. (PS08).

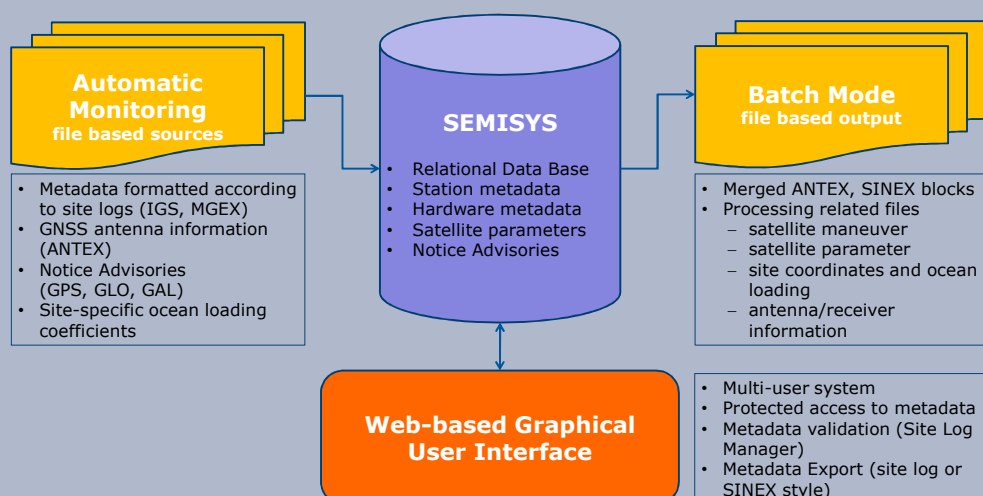


Fig. 6 Basic system design of SEMISYS, data storage, data flow and input/output interfaces.

## MGEX

In 2012 the IGS started the MGEX campaign where Multi-GNSS station data from a global ground tracking network are collected and made public to the community in RINEX 3 format. GFZ is also one of the station operators providing the necessary infrastructure. The stations receive the data from all available GNSS including the new systems, such as Galileo, BeiDou, and QZSS. More than 100 Multi-GNSS tracking stations are currently available to the project. Based on these MGEX data the GFZ AC provides precise satellite orbit and clock solutions from a simultaneous processing of GPS+Galileo or GPS+BeiDou observation data.

More details about MGEX processing efforts and results are presented here:

- for Galileo see Uhlemann et al. (PS11)
- for BeiDou see Deng et al. (PS11)

## Outlook

- Operational GFZ products will be updated to follow Repro2 features and settings to have a continuous time series. Repro2 products will be extended to ensure an uninterrupted transition to operational products.
- In near future it is envisaged to provide precise orbit and clock products from GPS, GLONASS, Galileo and BeiDou on an operational basis.
- In addition to the Sensor Meta Information System (SEMISYS) an Observation Data Base will be set up. This will allow:
  - unambiguous observation data storage (RINEX 3)
  - observation type mapping for RINEX 2
  - validity check with respect to the content of SEMISYS
  - user interface to query actual observation statistics and selected observation output