The EUREF Permanent Network: Status and Strategy

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Abstract. The EUREF Permanent GNSS Network (EPN) is permanently evolving. This paper describes the activities related to the EPN between June 2012 and May 2013.

Keywords. EUREF, GNSS, EPN

1 Introduction and Network Status

The EUREF Permanent Network (EPN) is a network of continuously operating GNSS reference stations maintained on a voluntary basis by EUREF members. The primary purpose of the EPN is to provide access to the European Terrestrial Reference System (ETRS89) by making publicly available the GNSS tracking data as well as the precise coordinates of all the EPN stations.



Fig. 1 : EUREF permanent GNSS tracking network (status June 2012); green dots: the stations added to the network since June 2010; red dots: stations that were withdrawn from the EPN.

Today, the EPN network consists of 246 continuously operating GPS or GPS+GLONASS reference stations. Four stations have been added

to the network since June 2012 (see Figure 1). As can be seen from Table 1, all of these new stations are equipped with GPS/GLONASS/Galileo receivers. Thanks to, in addition the upgrade of existing EPN stations, the number of EPN stations observing GLONASS is increasing to 70% (Figure 2).

 Table 1. Tracking stations added to the EPN since June 2012,

 RT: stations streaming real-time data, GLO: stations equipped with GPS+GLONASS receivers, Type: antenna/radome with absolute type calibrations; Indiv: antenna/radome with individual absolute calibrations.

Name	Location	Function	Calib.	From
BRON	Bron, France	GLO GAL	Туре	12/05/13
ILDX	lle d'Aix, France	GLO GAL	Туре	12/05/13
MELI	Melilla, Spain	GLO GAL RT	Indiv.	12/08/12
RI01	Logrono, Spain	GLO GLA RT	Indiv.	12/08/12



Fig. 2 : Evolution of the percentage of EPN stations providing hourly, real-time and GLONASS data.

2 Proposed EPN Stations

Several new stations are today proposed to the EPN (see Figure 3): Croatia (5), Germany (1), Greece (1), Hungary (1), Ireland (2), Portugal (1), and Serbia (2).



Fig. 3: Map of proposed EPN stations (indicated in green).

Station managers of proposed stations are invited to regularly check the progress of their station in the EPN inclusion procedure at : http://epncb.oma.be/_networkdata/proposed.php.

This web page gives also an overview of the actions required for a proposed station to fulfil EPN guidelines.

3 Antenna Replacements and Calibrations

All 24 new antennas/radomes (at new stations or replacements at existing stations) introduced in the EPN since June 2012 are capable to track multiple GPS and GLONASS. The majority (22) is in fact already designed to observe GPS+GLONASS+ Galileo. This clearly demonstrates that the EPN is becoming a real multi-GNSS tracking network.

Even if the IGS (International GNSS Service) and EPN make serious efforts to improve antenna calibrations models for their stations, Figure 4 shows that antenna changes are still frequently associated with significant jumps in the estimated positions, even if individual calibrations are used. Consequently, the recommendation to not replace/touch an antenna, unless really necessary for operational requirements, remains very valid.

4 EPN LAC Workshop

On May 15-16, 2013, the 8th EPN Local Analysis Centres Workshop was organised in Brussels by the Royal Observatory of Belgium. The workshop was preceded by a half-day tutorial on the new Bernese GNSS software V5.2. In total, 37 participants representing 17 Local Analysis Centres joined the workshop and discussed to introduction of new analysis standards (e.g. IERS conventions 2010), the future EPN reprocessing (EPN-REPRO2) and the need to analyse GLONASS observations in addition to GPS.

A copy of the workshop presentations and conclusions is available from the EPN Central Bureau at

http://epncb.oma.be/_newseventslinks/workshops/ EPNLACWS 2013/.



Fig. 4 : Examples of positions jumps caused by an antenna replacement:

(a) AXPV: LEIAT504GG/LEIS \rightarrow TRM57971.00/ NONE (both type mean robot calibrations);

(b) BBYS: TRM41249.00/NONE \rightarrow TRM59800.00/NONE (both type mean robot calibrations);

(c) TRM41249.00/NONE \rightarrow LEIAR10/NONE (both individual calibrations, Trimble from robot, Leica from anechoic chamber).

5 EPN Guidelines

At its meeting of May 29, 2013, the EUREF Technical Working Group endorsed an update of the "Guidelines for EPN Stations and Operational Centres" and restated that EPN stations should be top rated in all the technical specifications. All station managers should carefully review the new guidelines and act accordingly.

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