

Royal Observatory of Belgium

IMPROVED MONITORING OF GNSS STATION PERFORMANCE AT THE EPN CENTRAL BUREAU

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In response to the evolving GNSS landscape, the EUREF Permanent Network (EPN) Central Bureau (CB) went through a major upgrade end of 2016. The frontend of the web site (http://www.epncb.eu) was completely redesigned and the majority of the backend software was rewritten. As a result, the new web site of the EPN CB has now e.g.

- o A more intuitive menu structure to navigate through the web site,
- o Improved GNSS data availability and latency checks on both RINEX 2 and 3,
- o Extended monitoring of real-time data streams, now also including RTCM3.2 and all 3 regional EPN broadcasters,
- o Improved GNSS data quality checks (multi-GNSS) on both RINEX 2 and 3,
- o Improved station position time series,
- Full implementation of long RINEX 3 station names.

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ROYAL OBSERVATORY OF BELGIUM					
HOME ORGANISATION *	NETWORK & DATA * PRODUCTS & SERVICES *	DOCUMENTATION - NEWS, E	VENTS & LINKS -		
Welcome					
EUREE Permane	nt GNSS Network		Quick Station Links		
			Information Coordinates Time Seri	Information Coordinates Time Series Data Quality	
The EUREF Permanent GNSS Network consists of • a network of continuously operating GNSS (Global Navigation Satellite Systems, such as GPS, GLONASS, Galileo, Beidou,) reference stations,			(select a station) ASS,		
 data centres providing access to the station data, analysis centres that routinely analyze the GNSS data, 			Next Meetings		
 product centres or coordinators that generate the EPN products, and a Central Bureau that is responsible for the daily monitoring and management of the EPN. 			2017-06-22 / 2017-06-25 : Baltic Geodetic Congress 2017 (Gdañsk, F	Poland)	
The network is operated un	der the umbrella of the IAG		2017-07-03 / 2017-07-07 : IGS Workshop 2017 (Paris, France)		
Frame sub-commission for Euro	ppe, EUREF.		2017-07-10 / 2017-07-12 : IAG/GGOS/IER5 Unified Analysis Worksho	op (UAW) (Paris, Fran	
All contributions to the EPN an with more than 100 Europea	e provided on a voluntary basis,	the State M.	More		
The EPN operates under well and guidelines which are subs	defined international standards cribed by its contributors. These		Job Opportunities		
guidelines guarantee the long-t	erm quality of the EPN products.	A State of the second sec	2017-06-13 :		

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Data Availability & Latency

- Scans of hourly/daily RINEX 2/3 content at regional EPN data centers BEV (replacing OLG from 07/2017 on), BKG and historical data center ROB to monitor data availability and latency for each data center → Database and dynamic plots (see Fig. 2); 13% of stations providing RINEX 2&3, provide less RINEX 3 data files than RINEX 2.
- Added in the database a new functionality to FLAG files, e.g. Invalid RINEX 3 (No GPS L1/L2), Isolated RINEX 3 (tests), RINEX 3 converted from RINEX 2, uncompressing problems, RINEX 3 data in RINEX 2 directory, incorrect filename, etc. → In support for future reprocessing activities.







Figure 3: Comparison of the availability of daily RINEX data for the stations SMNEOOFRA in the different EPN data centers (BEV, OLG – obsolete now, BKGE/BKGI, and the historical data center at ROB – which does never contain the last 3 months of data). SMNEOOFRA was providing RINEX 3 data using the short file names, but switched to long filenames at the beginning of 2016. The historical data center at ROB contains more data than the other DC as it collected also data from before the station was integrated in the EPN. BEV is still missing some data compared to the other DCs.

Data Quality

Ratio observed/expected observations

Ratio observed/expected observations WTZR00DEU - RINEX 3

WTZR00DEU - RINEX 2

Focus on daily RINEX 2 & 3 data (full EPN history, since 1996)

- Daily: G-nut/Anubis (Václavovic P, Dousa J, 2016) run
 - ✓ Once with navigation messages
 - ✓ Rerun, when MGEX orbits become available
 - ightarrow Database and dynamics plots (see Fig. 4)
- Once a month: G-nut/Anubis run with higher verbosity
 → Monthly snapshots (skyplots, see Fig. 4)
- Storage of key metrics in database for all EPN data since 1996 on
- Monitoring of problematic EPN stations based on variations of available 2+ freq. observations (Fig. 5)









Figure 5: Top: Schema of detection of tracking degradation. Bottom: Example of application to station LEIJ00DEU where righter plot shows details of multi-freq. tracking on all constellations. Reduced number of dual+ observations is caused by missing dual frequency obs. For BeiDou. This happened after a firmware update (JAVAD TRE_G3TH DELTA receiver with 3.6.6 APR,27,2016 \rightarrow 3.7.1 APR,04,2017).

Summary

In order to provide multi-constellation RINEX 3 support, the EPN CB updated its monitoring tools. The largest efforts consisted in

- 1) Monitoring RINEX 2 and RINEX 3 data availability at the EPN data centers \rightarrow RINEX 3 data submission still needs to be improved (more stations, but also better availability for stations already providing RINEX 3)
- 2) Generating new multi-GNSS data quality information for the full history of the EPN and identifying key metrics to detect stations problems (% 2+ freq. obs.) → Galileo tracking in RINEX 3 can be degraded when e.g. also BeiDou is tracked.

Next steps will consist in further improving the key metrics to reduce manual inspections and correlating all info in our database (position time series, QC metrics, station equipment, firmware, etc...



References

Ratio observed/expected observations

LEIJ00DEU - RINEX 3

Václavovic P, Dousa J (2016), G-Nut/Anubis - open-source tool for multi-GNSS data monitoring, In: IAG 150 Years, Rizos Ch. and Willis P. (eds), IAG Symposia, Springer, Vol. 143, pp. 775-782, doi:10.1007/1345_2015_97)

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