IMPROVED MONITORING OF GNSS STATION PERFORMANCE AT THE EPN CENTRAL BUREAU

Carine Bruyninx, Juliette Legrand, Andras Fabian

epncb@oma.be - http://www.epncb.eu/ - ftp://epncb.eu/

Royal Observatory of Belgium

IGS INTERNATIONAL GNSS SERVICE

IGS Workshop, Paris, 2017

Introduction

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,
o Full implementation of long RINEX 3 station names.

In addition, station metrics were defined in order to quickly identify GNSS stations that need more attention.
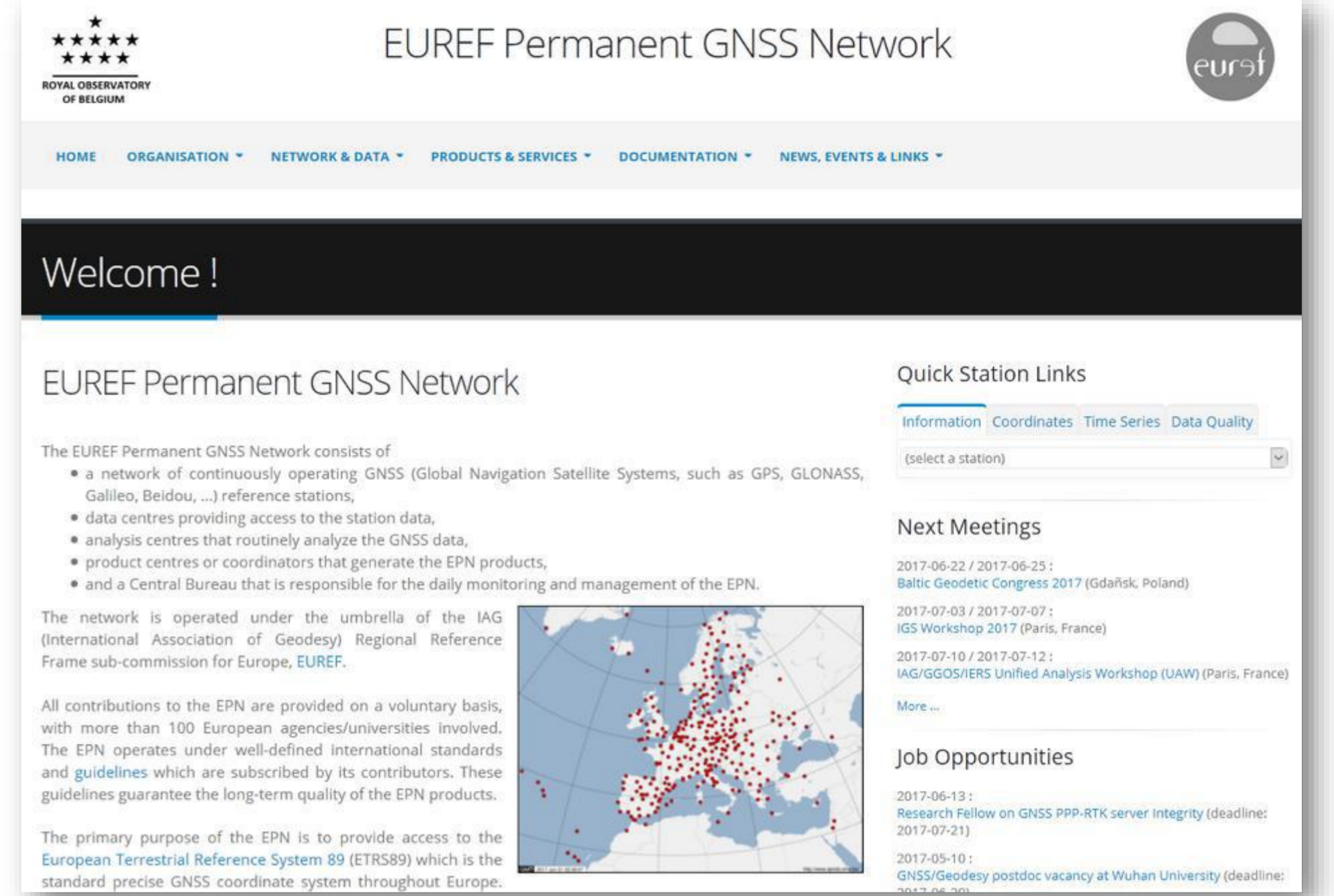
Data Availability & Latency

o 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.

o 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.
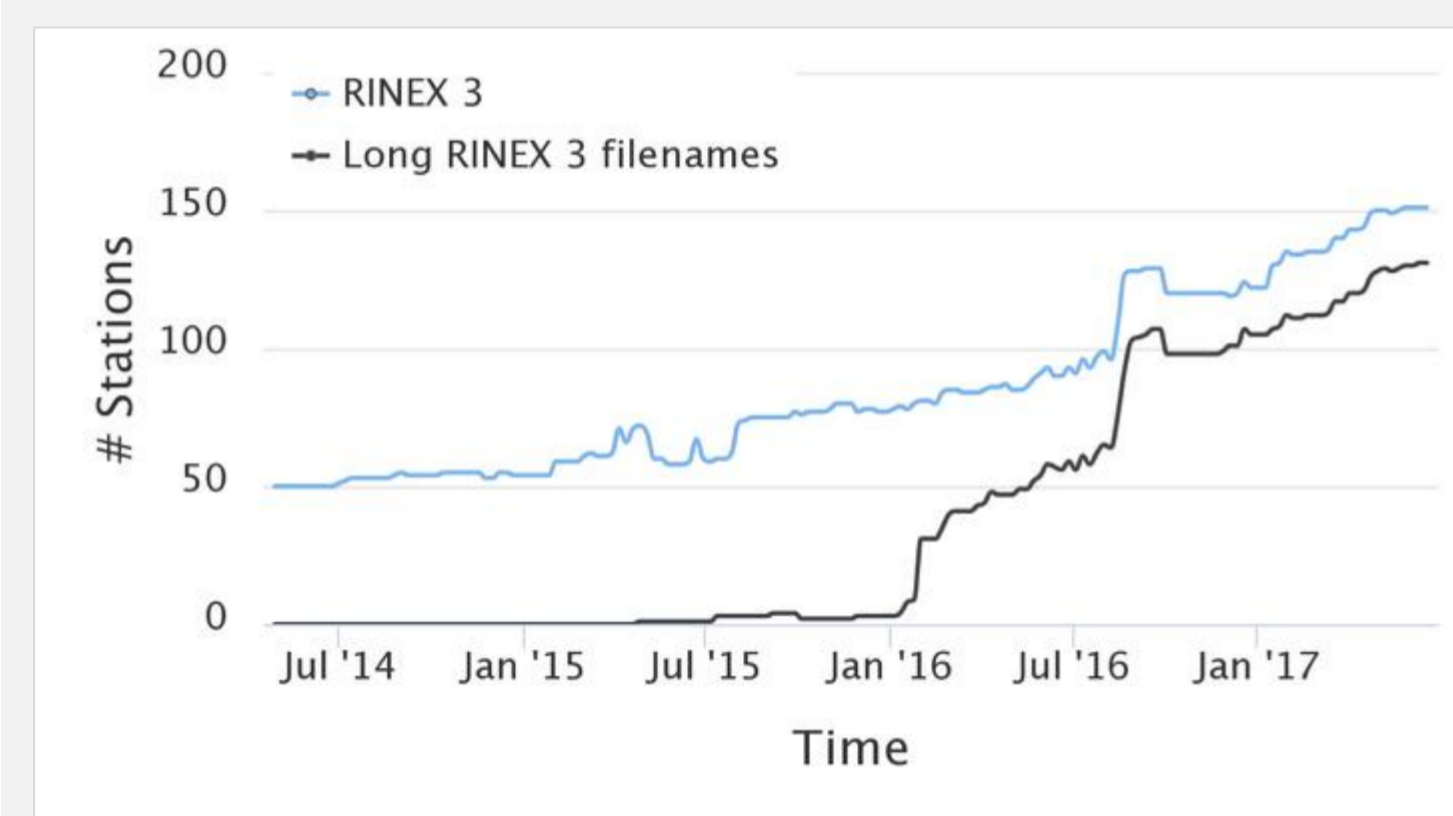

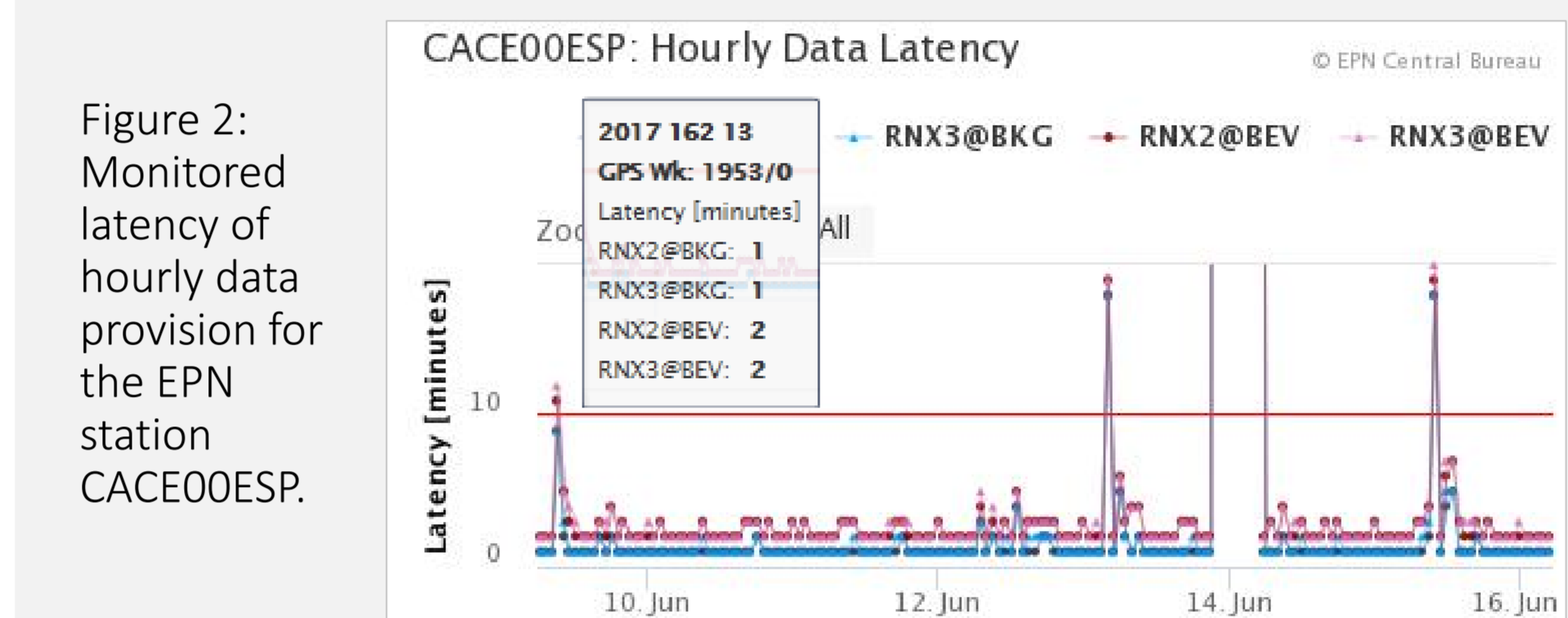Figure 1: Number of EPN stations providing RINEX 3.

Figure 2: Monitored latency of hourly data provision for the EPN station CACE00ESP.
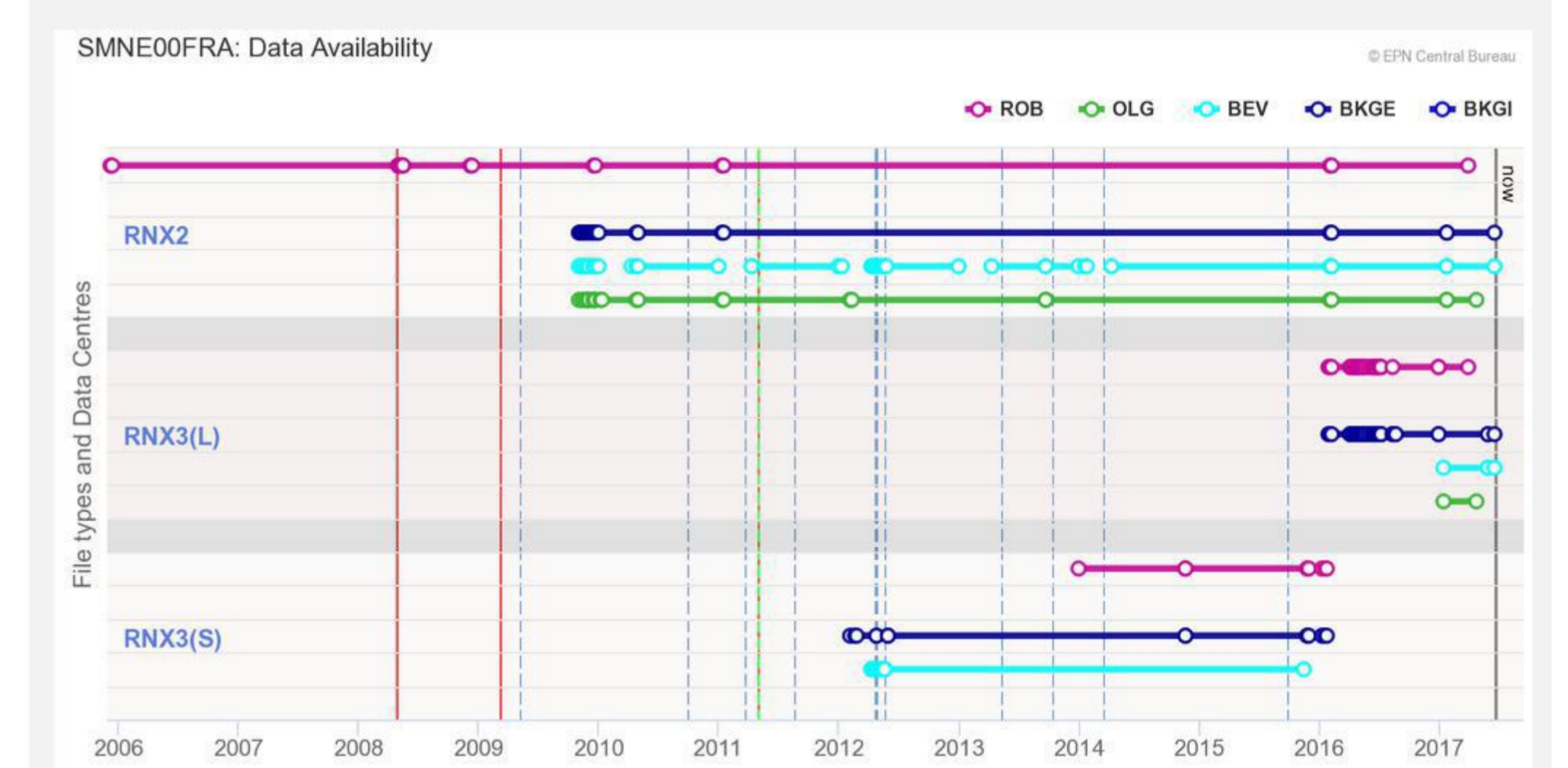

Figure 3: Comparison of the availability of daily RINEX data for the stations SMNE00FRA in the different EPN data centers (BEV, OLG – obsolete now, BKGE/BKGI, and the historical data center at ROB – which does never contain the last 3 months of data). SMNE00FRA was providing RINEX 3 data using the short 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

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

o Daily: G-nut/Anubis *(Václavovic P, Dousa J, 2016)* run
  ✓ Once with navigation messages
  ✓ Rerun, when MGEX orbits become available
  → Database and dynamics plots (see Fig. 4)

o Once a month: G-nut/Anubis run with higher verbosity
  → Monthly snapshots (skyplots, see Fig. 4)

o Storage of key metrics in database for all EPN data since 1996 on

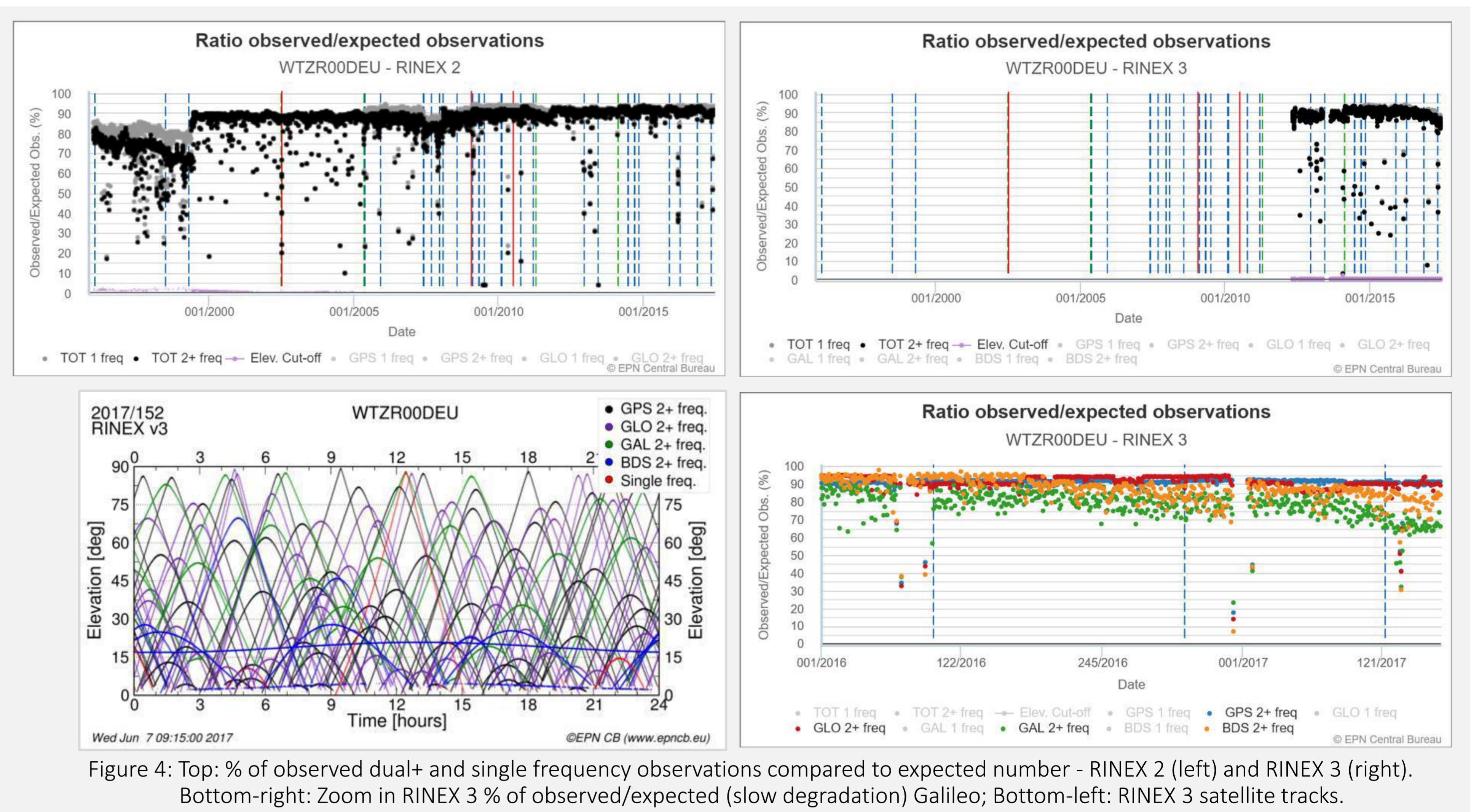o Monitoring of problematic EPN stations based on variations of available 2+ freq. observations (Fig. 5)

Figure 4: Top: % of observed dual+ and single frequency observations compared to expected number - RINEX 2 (left) and RINEX 3 (right). Bottom-right: Zoom in RINEX 3 % of observed/expected (slow degradation) Galileo; Bottom-left: RINEX 3 satellite tracks.

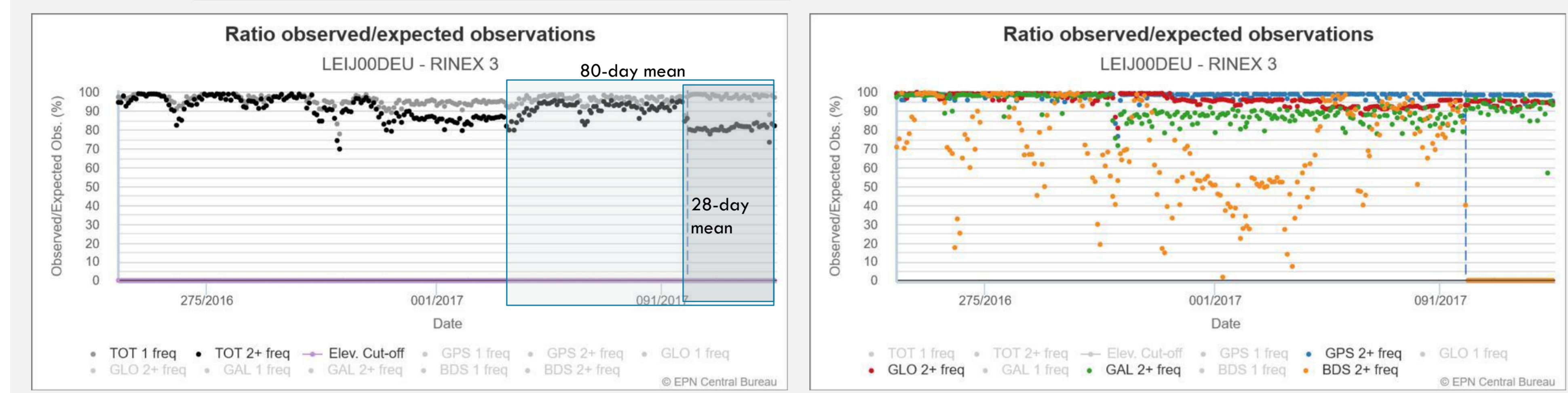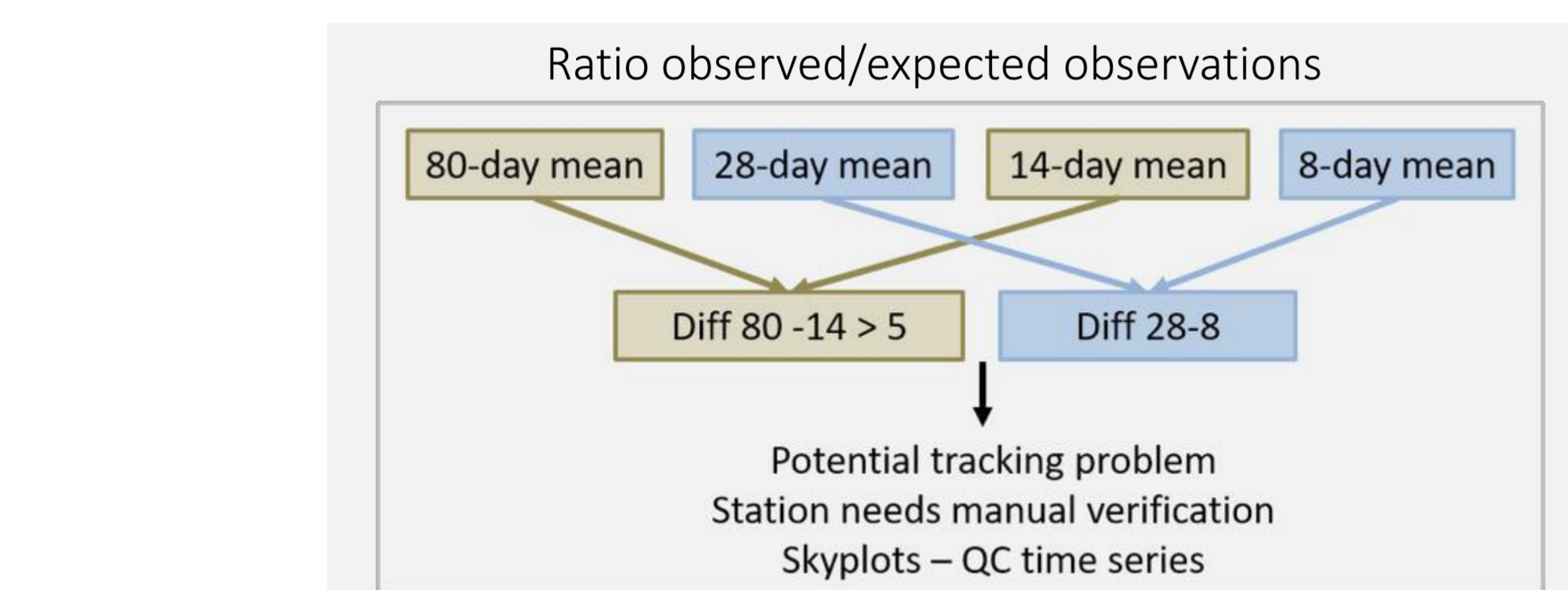Too many interesting things to show.... See http://www.epncb.eu/_networkdata/data_quality

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 → 3.7.1 APR,04,2017).
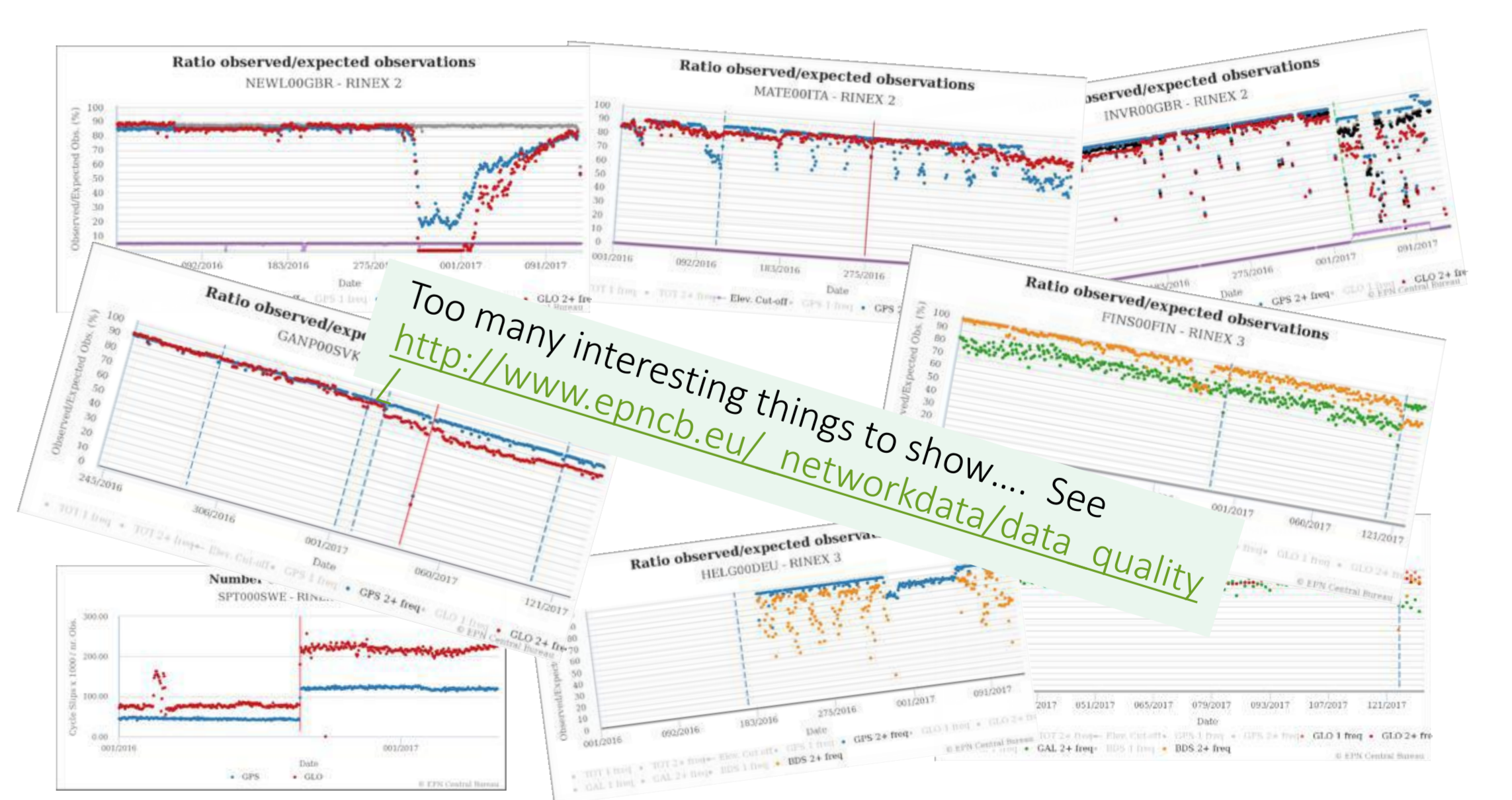
Summary

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 → 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

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)

EPOS EUROPEAN PLATE OBSERVING SYSTEM

euref

Solar-Terrestrial Centre of Excellence