EUREF AC Workshop, October 16-17, 2019, Warsaw, Poland

Recommendations and conclusions

The EUREF Analysis Centres workshop was held October 16-17, 2019 in Warsaw, Poland. The following recommendations and conclusions were formulated:

1) Since GPS week 2044, 11 EPN analysis centres (AC) have started using Galileo observations for the generation of final products based on CODE MGEX products (GNSS orbits, clock corrections, EOP).
The CODE MGEX product is subject of frequent model updates because MGEX is intended as an experimental environment. A planned change is to apply a new antenna model for the CODE MGEX product generation in near future (but not before November 2019) – the same as it was prepared for IGS repro3 campaign. After this change, the CODE MGEX products will not be consistent with the IGS14 reference frame and should no longer be used by EPN ACs for the generation of official EUREF products.
On September 23, 2019, CODE IGS AC has extended its rapid and ultra-rapid products from a two-system to a three-system processing (GPS, GLONASS, Galileo), see EUREF LAC Mail No. 2492. Since the new rapid product is consistent with the IGS14 antenna model, it is recommended to be used for the generation of EUREF final products for ACs processing Galileo observations.
Therefore, it was decided that EPN ACs should switch from the CODE MGEX product to the new CODE rapid product before the end of November, 2019. Although, the CODE rapid products are available on the next day after the observation session, the EPN ACs should generate the final solutions with a delay of at least one week, so that more observation files would be available and potential inconsistencies in station log files could be corrected (e.g., due to equipment changes).

The CODE rapid products are available as a long-term archive at: http://ftp.aiub.unibe.ch/CODE/yyyy_M/ (where yyyy represents the four digit year).

With the availability of the new CODE rapid and ultra-rapid products EPN ACs are asked to include Galileo observations also in rapid and ultra-rapid products. Study the CODE AFTP readme file (http://www.aiub.unibe.ch/download/AIUB_AFTP.TXT) on where the files are located and how they are named.

Please be reminded to the presentation that describes the principle of the rapid products generation at CODE: Dach, R., S. Schaer, D.Arnold, E. Orliac, L. Prange, A. Sušnik, A. Villiger, A. Jäggi; 2015: **CODE Contributions to the IGS.** EUREF 2015 AC Workshop, Bern, Switzerland, 14 - 15 October, 2015. (PDF). It is recommended to use the „final rapid solution" when ever possible.

2) A new ANTEX file has been prepared by the EPN Central Bureau (CB). The new file contains multiple individual calibrations for antennas with the same serial number. With the new file, it is possible to use different calibration for the same antenna during different time windows which is important for, e.g., backward compatibility, reprocessing.
The new file can be handled conveniently by Bernese GNSS Software 5.2 (necessary update of the software; improvement B_96). Also, a special station information file (STA file) has to be used in Bernese software to correctly handle the new ANTEX file. In the new STA file, the time windows for the antennas with individual calibrations have to be consistent with time windows present in the new ANTEX file, and internal antenna numbers for antennas with multiple calibrations have to be different. The new ANTEX and STA files are available at the EPN Central Bureau (CB) ftp server:

ftp://ftp.epncb.oma.be/pub/station/general/epnc_14_recalib.atx

ftp://ftp.epncb.oma.be/pub/station/general/epn_14_WWWW_recalib.atx
ftp://ftp.epncb.oma.be/pub/station/general/EUREF_recalib.STA

On May 1, 2020, the new files will replace the following official files:

ftp://ftp.epncb.oma.be/pub/station/general/epnc_14.atx
ftp://ftp.epncb.oma.be/pub/station/general/epn_14_WWWW.atx
ftp://ftp.epncb.oma.be/pub/station/general/EUREF.STA

The EPN ACs should be prepared for this change and should start using the new ANTEX and STA files as soon as possible.

3) It has been demonstrated by the CODE AC that using transmitter Galileo E5 calibrations provided by GSA for Galileo E5 observations affects the scale as it is realized by the GPS and GLONASS satellite antenna offsets based on the IGS14 reference frame. This inconsistency produces biases in station heights when using Galileo measurements. At the same time, the usage of receiver GPS L2 antenna corrections for Galileo E5 signal causes also a bias in the obtained station height. Fortunately both effects compensate each other.
In order not to downgrade the obtained station velocities, it is recommended to use the IGS14 antenna model as it is and not include Galileo E5 chamber calibrations. At the same time, the existing EPN14 antenna model should not be changed for antennas that are currently used in the network.
It was therefore decided, that for new individual calibrations for receiver-antennas provided to EPN, the EPN CB will include in the official ANTEX files (epnc_14.atx and epn_14.atx) only corrections for GPS L1/L2 and GLONASS L1/L2 observations.

4) The Reference Frame Coordinator (RFC) proposed a new approach for EPN station classification to replace the presently used classification (division into class A and class B stations). The new classification divides EPN stations into 8 classes depending on station position time series scattering, present annual signals, reliability of velocity estimation, and the stability of stations over time. A tool to support the selection of reference stations was also developed: http://epncb.oma.be/_productsservices/RFC/. The tool should be tested and feedback provided to the RFC.

5) The chairman of the EPN Densification Working group presented preparatory work for the generation of solution D2050. Starting with solution D2075, three solutions per year will be regularly created based on operational solutions of several EPN densification analysis centres. The plan to declare the densification solution as one of the official EUREF products was announced.

6) The comparison of EPN daily combined solutions with EPN combined solutions extended with global stations were presented by the Analysis Centres Coordinator. No recommendations on how to proceed were yet given. It was proposed that instead of computing an independent EPN global solutions, the IGS combined solution of global and regional solutions (including EUREF solution) could be used.

7) Since week 2036, the EPN troposphere combined product has been published in the new SINEX_TRO v2.0 format. The Troposphere Coordinator encouraged EPN ACs to also use the new format, if possible, for troposphere submissions to EPN.

8) All EPN ACs were asked to be active in adding new EPN stations to their subnetworks. EPN CB regularly has problems to find at least 3 ACs to process a new EPN station.

9) The future reprocessing of EPN data was initially discussed. It was proposed that all EPN ACs should contribute to EPN repro3. However, since reprocessing is a big effort, it was noted that not all ACs may want to contribute. Also, the contributing ACs may be interested in processing different subnetworks than in case of operational analysis. Nevertheless, ideally the reprocessed combined solutions should be highly consistent with the operational solutions to minimize discontinuities in station position time series. The initial IGS repro3 products are expected not before the beginning of 2021 (based on these results, the IGS may decide to do the reprocessing for a second time). An EPN AC meeting devoted to EPN repro3 should be organized in 2021 to discuss the details before starting the reprocessing activities. Already at the next EUREF Symposium, a splinter meeting on EPN Repro3 should be organized.

9) The future of the AC workshops has been discussed. The difficulty in finding enough presentations was noted. It was proposed to stop the biennial AC workshops and to organize, e.g., annual AC splinter meetings at EUREF Symposiums instead. Another proposal was to organize AC workshops every two years before EUREF Symposiums, interchangeable with EUREF Tutorials. The form of the AC workshop could be also changed, e.g., to round table discussions with presentations.