

Time & location:

Tuesday, February 06, 2024, 1300-1800 CET

Wednesday, February 07, 2024, 0900-1200 CET

In person: Royal Observatory of Belgium, Avenue Circulaire 3, 1180 Brussels, Belgium

Online: via zoom

MINUTES**1. Opening (Söhne)**

The EUREF GB chair WS welcomes the GB members and guests either in person or via zoom and thanks ROB for the kind invitation.

2. Approval of minutes of 93th GB meeting (Kollo)

CV ask for some more explanations of abbreviations, in particular of names.

Action Item to KK: distribute minutes of GB93 once more to the GB members for final corrections

3. Review of**a. Action Items from previous GB meetings (Söhne)**

WS goes through the short list of Action Items of last GB meeting. All are done or in progress.

b. Resolutions from 2023 Symposium (Söhne)

WS recalls the four technical resolutions from last year's symposium. Resolutions no. 1, 3 and 4 are done or in progress.

Steps forward on resolution no. 2 (Lidberg)

ML presents initial steps to proceed with resolution no. 2. To have initial ideas ready for presentation on this year's symposium it needs to speed up, in finding volunteers from the community. JS asks for the vertical component, INSPIRE directive uses ETRS89 for horizontal component and EVRF for vertical component. RD asks for the "scientific user community" of ETRS89. MP proposes to have roadmap for the future. JS suggests considering proper transformations.

Action Item for ML: write a EUREF mail calling for volunteers to work with on resolution no. 2

4. EUREF Governance**a. EUREF Symposium 2024 (Grau Bellet, Gomez)**

J. Grau Bellet gives an overview on the status of the preparation of the symposium. Conference hall should be big enough for the expected number of participants. Two rooms for splinter meetings or GB meetings available. Foyer should be large enough for breaks and poster walls (currently 24 places, format portrait, size to be determined). He presents the content of the tutorial planned for Tuesday afternoon which is almost complete. WS mentions the keynote speaker(s) which could come from a Galileo-related facility located in Spain. The web page is going to be finalized soon and distributed to the GB members for checking. The GB emphasizes the need of the URL of the symposium's web page for announcement (EUREF web-page and IAG newsletter).

Discussion on the final session structure and the session conveners / chairs.

Session 0: Carine, Joaquin

Session 1: Karin and David

Session 2: Juliette, Joachim

Session Poster: Andrzej, Joel

WS recommends starting with session numbering 1 instead of 0.

Discussion on the deadlines, for registration, for abstract submission.

Action Item to KK: provide a template for the abstracts to the local organisers

Action Item to the proposed session chairs: compile the description of the sessions, send to GB members and to the local host at ICPC for inclusion onto the web page.

Action Item to local organizers: send out EUREF mail on the EUREF symposium 2024

Action Item to WS: communicate the EUREF symposium to, e.g., IUGG and IAG newsletters

b. EUREF Symposium 2025 and forward (Lidberg)

ML recalls the idea of having a symposium only every second year. Optimally in the years with IAG and IUGG General Assembly, in order to have the Symposia with the elections synchronized. In the other years one could hold an extended Analysis Centre Workshop or have a digital symposium. He emphasizes to hold an in-person meeting in 2027 when major elections will take place. Currently there are no invitations for 2025. Discussion on a potential EPN AC and DAC workshop instead which does not need to take place in May or June. JS asks for the height which usually is not part of such a workshop. Since a workshop is easier to prepare in shorter time, the GB recommends to wait until beginning of summer vacation period (or even longer) to decide on symposium or workshop for 2025. Conclusion is that we are aiming for a full symposium in 2025. But if we fail, we will organize a smaller workshop. Decision needs to be taken at or possibly just before the GB fall meeting.

c. EUREF GB Membership (Söhne)

One GB member left the GB in 2023 and there could be the opportunity to go for another person into the GB. WS, ML and KK had got the Action Item to describe the positions for a new GB member after the 2023 symposium, but this has not been finalised so far nor distributed among the GB members. ML mentions that the GB should think also on the medium-term. In 2027 (at the latest) EUREF needs a new EUREF chair and a new GB chair, and also other GB members may leave the EUREF GB for retirement. WS recommends to not go for an election of a new GB member during this year's symposium.

5. EPN

JL informs that there have been additional data made available to the Historical Data Centre following resolution no. 4 of the 2023 symposium. Manual work necessary, e.g. header correction. Discussion on if and how the regional DCs should align to the HDC. JL recommends to not harmonize to avoid an infinite loop of corrections, except if both Data Centers can provide the provenance of the files in an API. JZ reports that possible stations as proposed stations could come from Bulgaria and Romania.

CB mentions the EPN CB data quality checks are done on RINEX 2 and RINEX 3/4 files in parallel. She proposes to stop providing QC for RINEX 2 when RINEX 3 files are also available. The GB agrees. JL informs that the HDC has renamed RINEX 3 short names to RINEX 3 long names. The HDC contains RINEX 2 files with Galileo observations and questions whether the HDC should remove Galileo from RINEX 2 files. CV suggests leaving data as they are as it is the responsibility of each AC to remove this Galileo data from the processing. RD points out that any data cleaning for data provided to them is not the job of the data centres.

Discussion on providing information on the data cleaning done by each AC: information should be provided in machine-readable format through a summary file.

6. Coordinators

a. Status Report of the Analysis Centre Coordinator (Liwosz)

TL gives a report on the status and progress with the combination of the AC results. Combinations for GPS weeks 2238-2276 are finished, solutions are provided to reference frame coordinator. Present combined solutions are based on 15 (out of 17) AC solutions. Plots are published at the ACC website. The combination procedure was extended, and new step added (before a combination of AC solution, each AC daily solution is stacked into long-term solutions with CATREF). Some stations - SART00ITA or ARJ600SWE - with larger residuals were excluded from the combination. There is a discussion on such exclusion of positions with the RFC. Some Italian stations in particular show a strange behaviour that is obviously associated with rainfall. Some of these stations may need to be equipped with radomes. ASI is investigating this problem intensively and is looking for a solution. Some ACs mention that they also exclude stations from the processing for various reasons. There is no common list of the exclusions and reasons for the exclusion.

b. Status Report of the Troposphere Coordinator (Pacione)

GPS weeks 2238-2286 final combined solutions have been submitted in December (EUREF mail no 11610). Final combined products are available at BKG and BEV data centres and EPN CB webpage with AC bias/std was updated. 9 ACs are delivering rapid troposphere estimates obtained as a by-product of the site coordinate processing. These

rapid solutions are the input of a rapid combined product. RP discusses some outliers in the combined solution for some ACs. For the rapid combinations with less ACs MUT has larger std for some period. Since the final combinations are clearly better, the approach used for the final tropo estimation should be used in the repro3. CB: difference is that in the rapids the ACs are doing no cleaning, but they do in the finals. RP argues that data cleaning is also done at the combination level and in the same way for the rapid and final. For “good” stations, e.g. BRUX or MATE, small differences between rapid and final below 0.6 mm ZTD. CB asks for renaming some final product names for some older solutions to have the complete time series with the same naming convention.

Action Item to WS: ask BKG and BEV regional DCs to rename AC and combined troposphere products to the finally agreed file naming convention.

c. Report of the Reference Frame Coordinator (Legrand)

Last official cumulative solution is C2235 aligned wrt IGB14. JL explains the preliminary cumulative solution, named C2280 (491 stations 1996-01-01 to 2023-09-16, aligned in origin, scale and orientation wrt IGS20 using 56 reference stations). It is based on daily solutions (final daily combined SINEX in IGB14 until Nov 2022 and final daily combined SINEX in IGS20 after Nov 2022, and it is aligned wrt IGS20. Comparisons with IGS cumulative solutions shows good agreement. Discussion on if and how C2280 should be published. Using “TST” for example, but not “MIX”. JS proposed “EXP” – “EX1” etc. for other releases possible. The GB agrees. JZ asks for the discontinuities of the reference stations. Some are on the cm level. ML asks for the time this “experimental” mixed solution may exist. Discussion on the EPN Densification Guidelines where the usage of the EPN cumulative solution is required for the reference stations. GB not in favour to change the guidelines but to temporarily put a remark on top of the guidelines. ML asks for a possible connection to the new yearly IGB updates.

Action Item to JL: proceed with the experimental cumulative solution C2280 and provide it to the EUREF Governing Board members for testing.

7. Working Groups

a. EPN Reprocessing WG (Völksen)

CV presents the feedback and status of the ACs. Many of them are making good progress, but some are still well behind with their work. BKG is the one of few with the largest delay in starting. SUT cannot do it in time because of not having enough processing power. Presentation of the final repro3 results at the symposium is not realistic. CB asks for the potential of the PPP approach since the network approach is time consuming. CV points out that the Bernese program RNXGRA is slowing down the processing. JZ asks for the uploading directories of the EPN-Repro3 products. CV replies that the same subdirectories as for the operational results at both DCs should be used. JZ asks for possible gaps in the data between 2237 (end of repro3) and today. Discussion on the file naming which differs between the benchmark test and the “operational repro3”. GB agrees on the new version but not to resend benchmark results (unless improved). Both regional DCs should do renaming instead. CV picks up again the question on AC workshop in Q3 this year. CB proposes that each EPN-Repro3 AC should finalise one year first instead of all the years and upload asap to Tomasz for first checks. 2021 and 2022 first for those ACs who did not yet start. The AR bug in Bernese have effected the operational EPN solutions from November 2022 until the bug fix was implemented at the different ACs. The bug is a reason to be worried. We would like to have one year completed by all ACs and provided to Tomaz in order to catch possible troubles/mistakes in individual solution.

Action Item to CV: send a LAC mail to the EPN ACs on the file naming and on the preferred first years. Request a file renaming by both regional DCs.

b. WG on EPN Densification (Kenyeres)

AK reports not much progress in EPND, he calls it a “silent year”. But he is going to include EPOS solutions from UCA and possibly INGV into EPND. WS reports on a new initiative of BKG to get a multi-year solution from Germany to the EPND. It would be helpful to have some more arguments on the added value for the contributors. Some GB members list arguments, e.g. on the ETRS89 coordinates or velocity fields and point to some papers on this topic, e.g. EPND paper in “GPS Solutions” available, but AK agrees to

write down some arguments. In this content, CB adds the request for sitelog files.

Action Item to AK: compile some points and arguments on the added-value for potential contributors.

c. European Unified Height Reference (Schwabe)

BSCD2000: published in November 2023, release note in the International Hydrographic Review.

FAMOS/BSCD2000: first meeting in Helsinki 26/27 March 2024, potential update of BSHC geoid and coordinated with new NKG geoid. European Alps Geoid: pooling of gravity data completed, currently working on DEM, HELIGRAV campaigns, Oct 2024 deflection of vertical measurements with zenith camera system CODIAC, 2025-26 geoid computations. CV asks on the effect of the glaciers in the Alps. JS: as glaciers are small in Europe, they do not matter.

Vertical reference and geoid for CRS-EU: in December 2021 questionnaire about integrated spatial reference (ETRS89 realization, heights, geoid etc) – feedback from almost all countries in mainland Europe, data inserted into draft CRS-EUV2 database; next step is to redesign of CRS-EU application.

EHRS_CP GNSS/levelling data: December 2021 call for GNSS/levelling data, consistency checks and test computations, still waiting for some data (reminders sent), dataset from Slovenia received, for the next steps some inconsistencies need to be resolved.

EUREF WG: research, implementation, and validation of NKG transformations 2008 and 2020, application to existing and updated FAMOS/BSCD2000 GNSS/levelling data. Next step will include application to EHRS_CP data for Nordic countries and comparisons with EUREF transformations, check use of velocity model (EuVe2022) for GNSS coordinates and UELN/EVRF computation as well to improve UELN/EVRF using hydrodynamic models.

d. WG on Deformation Models (Lidberg)

The European Velocity Model 2022, EuVeM2022, was presented as a poster at the EUREF Symposia 2023 and is available at (<https://doi.org/10.23701/euvem2022>). The related paper is however unfortunately delayed in publication.

e. Real-Time Activities (Söhne)

Still delay in standardisation of SSR within RTCM SC104. Work is in progress on the different methods for distributing SSR corrections, terrestrial versus satellite. ML adds the 3GPP (standards for 4G, 5G, where support for precise GNSS has been included) which has been tested in Sweden.

8. Height Reference (Sacher)

The data transfer from Moldova to BKG was delayed due to some misunderstanding.

a. The new Finnish Geoid (Poutanen)

MP announces the new Finnish geoid, new geoid model 30% improvement, accuracy 1.4 cm, heights in N2000. Improved global gravity model, better digital elevation model, new terrestrial gravity data, coincides with BSCD model at the sea area. JS: should be in line with the BSCD2000 also on land, not only on the sea. At the shorelines BSCD and Finnish geoid are same.

9. EUREF collaboration / external interfaces

a. Status of EPOS TCS “GNSS” (Bruyninx)

CB gives overview of EPOS ERIC membership, EPOS-GNSS data dissemination concept, present EPOS-GNSS network and products. Available is GNSS data quality information. Operational GNSS e-infrastructure provides distributed access to data and data products of 1000 GNSS stations, available are 4 TCS GNSS community portals (data gateway, product gateway, M³G, DQMS), E-infrastructure is operational, but not yet finished.

EPOS-ERIC and EUREF MoU – Workplan 2024/2025 (Lidberg)

A workplan for the period 2024 / 2025 to be presented to EPOS and signed by both partners is presented by CB. There is a Horizon Call for Quantum Gravimeter expected within the next month's where Sebastien Merlet (Observatoire de Paris) from France seems to be the coordinator. CV asks for tide gauges data, which TCS is responsible – not totally clear.

Action item for CB: make a proposal for the EUREF-EPOS workplan and send it to GB members.

b. News from the IGS (Dach)

RD reports on various topics discussed or in progress within the IGS: new Terms of Reference – new structure with Committees instead of Working Groups; ITRF2020 yearly updates will reflect into IGB20 (expected September 2024), IGC20, IGd20 etc; plans for update of antenna calibration file, series of global calibration solutions to compute consistent satellite antenna pattern and offsets for BDS (B1C/B2a) and QZSS (L1/L5), no BDS2 support. IGS is searching for a new ACC, the call will include requirement for multi-GNSS combination. IGS workshop will be held in Bern Switzerland to celebrate 30 years of IGS. CV asks for the communication to the community on the yearly updates.

Action Item to RD: give a presentation at the EUREF2024 about IGS activities.

10. Divers

a. UN-GGIM: Europe and UN-GGCE virtual meeting, 16-FEB-2024, 1400 CET

Discussing the questions from GGCE to the partners of the meeting.

Discussion on merging activities with UN-GGIM: Europe. GB chair should invite Jeffrey to the next symposium and the next GB meeting.

Action Item to WS: contact the chair of the Working Group on Geodetic Reference Frames Europe of UN-GGIM: Europe, Jeffrey Verbeurgt, and invite him to one of the next EUREF GB meetings and the next EUREF Symposium

11. AOB

a. Action Items (Kollo, Söhne)

b. Next GB meeting(s) (Kollo, Söhne)

There should be a virtual GB meeting one or better two weeks prior to the symposium. During the symposium, one could have a shorter, half day, GB meeting on Tuesday morning.

Action Item to KK: prepare a doodle for a virtual GB meeting to take place around mid of May.