

**Time & location:**

Wednesday, March 01, 2023, 1300-1800 CET

Thursday, March 02, 2023, 0830-1200 CET

**MINUTES****1. Opening (Söhne)**

*WS welcomes eight GB members in person at BKG's main place in Richard-Strauss-Allee in Frankfurt and the other colleagues via Webex conference.*

**2. Approval of minutes of 90<sup>th</sup> GB meeting (Kollo, Söhne)**

*There was one request for a small correction. Following this update to be done by KK the minutes are approved.*

**Action Item to KK: finalize the minutes of GB90 and submit to the EUREF webmaster**

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

*Review of the action items from the last meetings. Most of them were done, some on the agenda GB91: Guidelines for data centre and broadcaster, structure of EUREF Symposium and sessions, Digital poll for dedicated meeting for future ETRS89.*

**4. EUREF Symposium 2023 (Johansson, Lidberg)**

*JJ summarizes the status of the preparation for the 2023 symposium in Gothenburg. There will be smaller rooms available for the GB meeting and the tutorial. A half-day tutorial is planned for Tuesday afternoon, on artificial intelligence and machine learning. Some introductions in the topic, followed by some examples. The GB meeting is planned to take place Monday and Tuesday from noon to noon. The icebreaker is planned to be on Wednesday at the Onsala Space Observatory, around 45 minutes away from Gothenburg. Traditional EUREF dinner Thursday evening in the central of Gothenburg, house of the founder of the Chalmers University. The first version of the web page should be published next week, with abstract submission page and registration page. There should be only one fee including the tutorial. Payment methods are discussed, pros and cons of bank transfer, credit card, invoice. Session convenors and chairs almost identical to the last symposium. A list of recommended hotels will also be included. Organizers are Chalmers University, Lantmäteriet (LM) and Swedish Research Institute (RISE).*

*Few keynote speakers. Invited speakers shall be invited by chairs, or if you have ideas contact the chairs. JJ: Invited speakers – shall they pay for themselves for the travel/hotel and not participation fee. ML Handling of the abstracts -> may indicate the session while submitting. Deadline end April 21. Draft program early in May.*

*Session chairs (ML):*

*Opening Session: Chair: Martin Lidberg*

*Session 1 - Systems: ETRS89, EVRS, Geoid and Related Models: Chairs: Zuheir Altamimi, Markku Poutanen*

*Session 2 - Networks: EPN, UELN, Densification: Chairs: Joaquin Zurutuza, Carine Bruyninx*

*Session 3 - Techniques: GNSS, Levelling, Combination: Chairs: Martina Sacher, Rolf Dach*

*Session 4 - National Reports: Chairs: Karin Kollo, Christina Kempe*

*Session 5 - Applications: Earth Sciences, Geo-Information: Chairs: Alessandro Caporali, Christof Völksen*

*Closing Session: Chair: Martin Lidberg*

**Action Item to JJ: publish the web page for the EUREF 2023 Annual Symposium**

**5. ETRS89****a. Status of ITRF2020 Plate Motion Model and consequences for ETRF2020**

**(Altamimi)**

*ZA explains the derivation of the ITRF2020 plate motion model. Only stations 200 km away from plate boundaries and stations without PSD are used, data from GIA and deformation regions excluded, normalised residuals shall be less than 3 mm/yr and raw residuals less than 1 mm/yr. There are some new plates introduced, but not all plates can be determined because of lack of ITRF stations.*

*Nest steps: Finalise ITRF2020 plate motion model, after finalisation, ETRF 2020 will be derived. Update EUREF Technical Note No1, to be ready by EUREF 2023 symposium.*

**b. Discussion on the next realization of the ETRS89, ETRF2020 (Lidberg)**

*ML sent out a discussion paper prior to the meeting, with comments added by AC. GB discusses the pros and cons of a new ETRF2020 or a continuation of the ETRF2000. ETRS89 has widely used throughout Europe, INSPIRE directive has adopted it. GB agrees to install a small group of colleagues who should discuss on a new definition of the ETRS, with ML, ZA, AC, JL. Experts from outside the GB shall be added as well. ZA emphasises that EUREF shall continue to provide new realizations for the reference system, but not be offended if NMAs will not use them.*

**Action Item to ML, AC, ZA, JL: form a group of experts to discuss the future of ETRS89.**

**6. EPN****a. Data Centres and Broadcasters Guidelines (Söhne, Bruyninx, Legrand)**

*WS shows the updates done for the Guidelines for Data Centres and Broadcasters. Discussion on the new section 4.1 on File Provenance. CB points out that we would like to have fair data management, so users can find the original data centre and understand data flow. Discussion on the content of figures 1 and 2 concerning the data flow between the RDCs.*

**Action Item to WS: contact the EPN RDCs and confirm the data flow between both RDCs in case of an RDC outage. Organize a meeting with both RDCs, the Historical DC and the EPN CB to discuss open questions with regard to the data flow etc.**

**b. Handling of “dormant” EPN stations (Bruyninx)**

*CB displays a list of five EPN stations, which for different reasons don't have GNSS data submitted since one or two years. In some cases, the station operator doesn't react on emails. Should these stations receive the status “former”? At least for one of the stations GNSS data seems to be available but not at the EPN RDCs.*

**7. Coordinators****a. ACC report (Liwosz, Araszkiwicz)**

*TL reports on the progress of the GNSS processing. Most of the ACs are going to adapt the changes to IGS20. Most of the ACs using the BSW are in the process of switching to V5.4, except SUT, which indicated delay, and IGN, which did not respond at all. Some unresolved issue – missing antenna calibrations – agreed to follow IGS approach. Usage of VMF3 in EPN operational analysis, VMF1 in REPRO3. EPN guidelines need to be updated. AC forum is maintained by EPN CB.*

**b. Status of the troposphere combination (Pacione)**

*RP shows the first test results of the troposphere combination with the new AC from GFZ for two weeks, results agree in mm level. SINEX format check needs some more*

*input. RP continues with the tests and GFZ will reprocess these two weeks. Operational solutions stopped to GPS week 2138. Call for rapid troposphere product: 7 ACs (over 11 providing rapid coordinate solution) replied positively; data are not yet available at BKG/BEV for testing.*

## 8. Working Groups

### a. Update on the WG “EPN Densification” (Kenyeres)

*AK summarizes the status of the EPN Densification. Latest published solution is D2200. Next solution will contain weekly solutions up to GPS week 2237 due to the switch to IGS20 from GPS week 2238 on. EPOS solutions will be included to the next combination.*

### b. On the usage of IGS20 for EPND (Zurutuza)

*JZ discusses several questions for the EPN densification in the context of the changes and updates with IGS20. One particular topic is the use of ground antenna calibrations. It is very likely, that the DACs are using additional antennas not included in the IGS and EPN ANTEX files. The GB is in favour to maintain a separate ANTEX file for EPND rather than to merge it with AA’s extension to the EPN ANTEX file. For EPND there is two possibilities: either to reprocess all data or to compute IGS-style antenna-wise latitude dependent PCO corrections and correct the coordinates in the SINEX files (like 2008-> 2014). Only way to have the harmonised solution is the reprocessing.*

*ML: Type mean values for all antennas, for some antennas there were no type mean values included, as well some error values in the IGS20.atx files. There is no willingness to change type mean values from IGS. ML asks from JZ and Ak if they would like to have a resolution about repro for EPND? JZ: maybe email would be enough. AK: resolution may be optional; we will see that later. ML: what antenna files EPOS going to use? AK: they use type mean antenna calibration file (they use GYPSY/GAMIT). ML: easier to use type mean antenna calibration in order to have consistency within EPOS solution. AK: EPOS is planning as well reprocessing activities.*

## 9. Height Reference

### a. Status of UELN and EHRS\_CP (Sacher)

*MS reports on her visit to Moldova in November 2022. It was agreed to integrate the levelling network of Moldova into UELN. The measured height differences have already been made available to EUREF. First test adjustment of the measured height differences resulted in standard deviation of 1.3mm/km. For computation of geopotential differences, coordinates and gravity values are necessary. The delivery of coordinates and gravity values is scheduled for middle of 2023.*

*MS shows the status of EHRS\_CP as of 02/2023. Since the last GB meeting, additional EHRS control points have been delivered by Spain and Italy. Reminders were sent to the remaining countries, that had announced to send data in 2022. MS compares the differences of ellipsoidal and EVRF heights and the gravimetric quasigeoid of EUVN\_DA project (2009) to EHRS control points delivered in 2022. The results of Italy, Great Britain and Spain have been considerably improved. For specific countries, like GB the differences from the latter solution have decreased to half (now std 5.9 cm and average -22.3 cm); for Italy and Spain the differences have decreased to 1/3. For France the std have decreased, but for the average the sign has become from -7.0 cm to +2.9 cm. For France there is visible systematic tilt, internal French problem affects Spain and Portugal.*

## b. Short note on BSCD2000 and EAlpG (Schwabe)

*JS summarizes two projects, which may support the goals of the WG on “Unified Height Reference”. The first one is the Baltic Sea Chart Datum (BSCD2000, INTERREG BalMarGrav), planned as new reference level in the Baltic Sea, which is going into the final stage. The second one is the European Alps Geoid (EAlpG), which has the goal to provide a pan-national geoid for the whole Alpine region, not only for Germany, Austria and Switzerland (the former D-A-CH geoid cooperation). Abstract submitted to IUGG.*

## 10. EUREF Governance

### a. GB membership 2023 (Söhne)

*The first term of the EUREF chair, the EUREF secretary and the EUREF GB chair will be finished at the 2023 symposium. All three of them declare their willingness to continue for another four years term. An email to all GB members shall be send out to explain their agreement or disagreement with the candidates directly to RP and CV.*

*EB works since March 1, 2023 at University of Bern. He proposed to resign from EUREF GB, as he no longer represents the mapping agency Swisstopo. Furthermore, the University is already best possible involved with Rolf Dach. Three duties were discussed by EB: a) official national ETRF coordinates: the country files are already operationally sent to EPNCB and therefore the coordination part can easily be stopped. b) WG EU Dense velocities: This activity needs to be stopped. The Web Site is already indicating this fact. The WG followed an alternative and quite successful approach. Nevertheless, the other 2 WGs can continue working on the same topic. c) WG of Multi-GNSS: Most efforts have been done with the operational use of Galileo. If the WG should be closed off or taken over by another EUREF-GB member, may be decided later.*

**Action Item to KK: Send a mail to the GB members asking for agreement or disagreement to the proposal, that the EUREF chair ML, the EUREF secretary KK and the UREF GB chair WS declare their willingness to continue for another four years term until 2027. Feedback to be send to RP and CV by the end of March.**

## 11. Divers

### a. Galileo HAS (Caporali)

*AC shows the investigations and test he and his colleagues did with the Galileo High Accuracy Service (HAS) data. ESA has announced that HAS is being operational. Concepts of tests being introduced, HAS data have been reviewed. There is no indication on the accuracy of the HAS data nor how the algorithm to compute these corrections. Tests performed, for positioning with PPP + HAS: RMS in north 0.01 m, in east 0.03 m and in up 0.04 m. Some open questions: (1) HAS corrections are available at irregularly spaced epochs with gaps of several tens of seconds. (2) Novatel and Septentrio receivers yield HAS data with mismatched epochs: decoder issue? (3) Uncertainty of HAS corrections and algorithm to compute them is not known. (4) Code biases and phase biases are given only for the epochs of orbit corrections, unclear what should be done for observations at intermediate epochs e.g., to be used in precision navigation.*

*ML: Galileo HAS is important, update in time for clock information? AC: same as for the update time for orbits. Update every second. Update rate is regular. ML: Update rate for the clock is more critical. AC: for Septentrio the clock update rate is 1/10 sec.*

*WS shortly informs that GALILEO HAS data distribution via Internet is now available, a registration is needed. BKG has made some tests on the internet distribution version, see <https://igs.bkg.bund.de/ntrip/ppp#pppGalHAS>.*

**b. GGCE inauguration (Söhne, Altamimi)**

*Global Geodetic Centre of Excellence (GGCE) will be officially inaugurated on March 29 at the UN Campus in Bonn, Germany. ZA as IAG president will participate. Two open positions for the GGCE – head and manager – are just published. ZA specifies, that GGCE will interact with IAG, the centre role is to find the mechanism to improve the geodetic infrastructure, not to do science.*

**c. On the ‘Committee of Interest on the Geodetic Reference Frame’ under UN-GGIM: Europe**

*A committee (or community?) of interest (Col) will be established within the UN-GGIM:Europe, covering the period of the next two years. It seems that this Col is replacing the GRF WG with the UN-GGIM:Europe. Colleagues from NGI, Belgium, are asked to take the lead of the Col.*

**12. AOB**

**a. Action Items (Kollo, Söhne)**

*EUREF Symposium web page to be launched asap.*

**b. Next GB meeting(s) (Kollo, Söhne)**

- c.** *Next GB meeting planned as in-person meeting prior to the annual symposium in Gothenburg (Monday to Tuesday, noon to noon). If more physical meetings between the symposia shall take place – in particular the fall meeting – this shall be discussed case by case.*

**PARTICIPANTS**

A. Araszkievicz	in person
Z. Altamimi	digital
E. Brockmann	digital
C. Bruyninx	digital
A. Caporali	digital
R. Dach	digital
A. Kenyeres	digital
K. Kollo	in person
J. Legrand	in person
M. Lidberg	in person
T. Liwosz	in person
B. Männel	in person
R. Pacione	digital
M. Poutanen	digital
M. Sacher	in person
J. Schwabe	digital
W. Söhne	in person
J. Torres	digital
C. Völksen	in person
J. Zurutuza	digital
J. Johansson	(digital, 1 <sup>st</sup> day)