

Time & location:

1st part: Monday, October 24, 2022, 1000-1230 CET

2nd part: Friday, December 02, 2022, 0900-1220 CET

AGENDA

Last update: October, 17, 2022

1. Opening (Söhne)**2. Approval of minutes of 89th GB meeting (Kollo, Söhne)**

Action Item to KK: Distribute the latest version of the minutes from GB89 and give one week for the final amendments.

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

- a. EUREF Web-Master with dedicated and protected section at the EUREF web-page – still in progress. Some ideas to have the document section in BKG is not possible (see below)
- b. MoU between EUREF and EPOS -> signed
- c. MoU between BEV and EUREF -> signed
- d. Supporting letter for the EPN processing Centre in Serbia -> finalised
Analysis centre set up, some information sent to AK.
- e. MP draws the attention to the monthly newsletter of IAG with some interesting topics

Action Item to KK: Send both signed MoUs to the GB members.

4. EUREF Symposium 2023 (Johansson – invited guest)

JJ gives an overview on the status. The venue is booked, symposium will be held at the premises of Chalmers University of Technology in Gothenburg at the end of May (24-26 May). Airport is not far from the city and has some connections all around Europe. Different conference rooms are available, for special meetings as well as for poster session or the tutorial. There is the possibility to visit Onsala Space Observatory (~ 45 minutes driving distance), e.g. Friday afternoon (or as icebreaker?). ML proposes a half day tutorial on Tuesday afternoon, and GB meeting lunch to lunch from Monday to Tuesday. Topic for the tutorial is still open. WS asks for the option of a hybrid meeting. ML is in favour of an in-person meeting only to avoid the risk that many participants won't come to Gothenburg. CB agrees to follow only the physical meeting for the time being. Nevertheless, a Plan B should be prepared in case some of the participants, if they cannot travel anymore. CV agrees as well and asks for the option to skip the tutorial to give a bit more time for traveling to Gothenburg. ML agrees because there were not so many direct flights to Gothenburg. The tutorial must have an interesting topic for the community. EB reminds to the financial risk in preparing a physical meeting and then have a virtual meeting instead. WS emphasizes a noon to noon meeting for the governing board as minimum. If there wouldn't be a tutorial, some splinter meetings could replace as they did in the last two years. AK proposes some topics for a tutorial: deformations in future geodesy, i.e. geodetic modelling of geophysics and how it is handled in the everyday practice. How to handle the deformations in the future. Discussion on the session structure, which did not change through the years, and the necessity of the national reports. The web-page should be ready by end of January 2023.

Action Item to ALL: reconsider the structure of the EUREF Symposium (sessions, etc).

5. EUREF Governance (Lidberg, Kollo)

a. Protected GB section for exchange and archiving (Völksen, Söhne)

WS recalls the idea to have dedicated section for authorised users. The possibility was as well investigated in BKG, but this is not possible. So far no news from EUREF Webmaster.

b. EUREF MoUs (Lidberg, Söhne)

EUREF MoUs with EPOS and BEV are finalized (see above).

c. EUREF Newsletter 2022 (Söhne)

WS proposes that EUREF should proceed with the yearly newsletter, it should be finalised around mid of December. AA already provided a web page for it: https://1drv.ms/u/s!ApS4tJf9oLD0krJd6NPc5_l4ouKJ9A?e=m4CkOW.

Action Item to ALL: prepare contributions for the different sections (check last year's newsletter).

d. BKG Data centre status update

Outage for technical reasons, from June data centre is up and running and restored. CB asks for possible changes in the data structure. JL reports on a lot of data missing from 2004-2008, seem to cover complete years. CB emphasizes that we have an archive for reprocessing and that in BEV there is more data, BKG archive seems to be not complete. WS replies that there seems to be a bug in restoring the data in BKG archives.

Action Item to WS: contact BKG GNSS Data Centre concerning (in-)completeness, complete the BKG archives and keep EPN CB informed.

6. EPN

a. EPN guidelines

WS states that the update of the data centre and broadcaster guidelines is still open. Publication by end of this year would be great.

Action Item to WS: send the latest version of the data centre and broadcaster guidelines to CB for discussion.

7. Coordinators

a. ACC report (Araszkiwicz)

AA recalls the decision on the usage of individual antenna calibrations and highlights the coming meetings. Individual calibration with IGS20 type calibrations will be used, and no individual calibrations. Exceptions for few stations in Austria (calibrations for BEVA radomes – stations SBG2 and TRF2) and Sweden (calibrations for OSOD – stations SKE0, SPT0, VILO and OSOS – station VAE6). The ACC will take the responsibility for preparing merged ANTEX file, dissemination method shall be defined. Upcoming meetings are the AC workshop on the 3rd of November and the Repro3 workshop on the 7th of November. A new AC at GFZ for repro3 and operational analysis will be in place soon, the network of stations will be prepared and discussed with GFZ.

Discussion on the specific radomes, if there was the chance to get type mean calibrations for them. ML is not sure for the Swedish radomes because it would need to calibrate them all. CB proposes to use these single individual calibrations as type mean calibration, because no one else is going to use that calibration except these few stations.

b. Troposphere coordination report (Pacione)

RP reports on the status. She is preparing a presentation for the AC workshop. The operational situation is good, important is analysis centre redundancy and checking the metadata in order to avoid that data will be excluded from the combination. She proposes a rapid troposphere combination, but this needs a considerable number of analysis centres willing to deliver individual rapid solutions. Next step is the transition to the new IGS long filenames. Most of the ACs are delivering their solutions in the old format, but the combined solution is delivered both in the old and in new format. WS informs on the improvement of BKG's hourly processing, where some bugs were fixed and some stations added while switching to a new virtual PC. RP is asked to distribute the question on the rapid solutions and to present it at the AC meeting. RP proposes to discuss it at the AC meeting instead and to give to ACs some time to consider.

8. Working Groups

a. WG on "European Dense Velocities" (Brockmann)

EB gives an update from the last Symposium and beyond. He recalls the presentation by Enrico Serpelloni, presenting approx. 3000 stations (surface velocities and strain-rates in the Euro-Mediterranean region from massive GPS data processing). He received an offer from Saudi Arabia – which is a bit outside of our scope area – with campaign data (but no report on the processing). The data includes velocities for 56 sites, for the 26 common stations the agreement is very good – st.dev. 0.25 mm horizontally and 0.46 mm vertically with no outliers detected. The web page for the project changed from http to https: https://pnac.swisstopo.admin.ch/divers/dens_vel/VELF-STANYA1%2B120%2B025%2B6. Feedback page for each contributing dataset, 36 contributions, 7896 sites in Europe, redundancy: 3705 sites in more than 2 solutions. In ITRF2020 there are 394 European sites with velocities, 368 are common sites within the project, the agreement is (st.dev.) 0.25 mm horizontally and 0.35 mm vertically. In ITRF2014 there were only 139 common sites. EB noticed a small but significant bias in north and up, not in east. Two significant outliers – HOLY, differences to ingv22 (LWTG), and near-by stations SONO. EB explains this from the fact that there are no final transformation formulas from ITRF 2020 to ETRF 2000 available yet. He concludes that new contributions to the project mainly improve the redundancy. Currently there is a student work (ETH Zurich) on the data, using collocation methods – main focus is on Switzerland, of course. JL mentions to take the post seismic deformation into account. The post-seismic deformation model has been estimated. EB agrees but emphasizes once again that this project just takes the velocities as they come. AC asks for the difficulty in having unique names for the various stations. Not all stations have DOMES numbers. EB confirms this problem, with 36 contributors there is a risk of duplication. The project keeps the first four letters and the country code as an indicator where the station is located. ML asks for site Ny-Alesund with different closely located stations, but all of them seems to agree quite well with regard to the combination.

9. Activities in UELN (Sacher)

MS gives an update on the UELN database. There are new French levelling data. IGN69 levelling data were measured in the 1960s. These data have a tilt of about 23 cm in NS direction. Only 349 observations between nodal points are available in the database. Since the 1980s new zero-order network NIREF established, with stepwise expansion. EVRF2019 contains NIREF data from 1983 until 2014, but the density of NIREF is too low to replace IGN network. Now there are only the nodal points from IGN available, the combination of both networks is possible only by 37

identical points. In the context of the WG "European Unified Height Reference", France provided an updated levelling dataset. There are 24,000 measurements between 1961 and 2021. After some data cleaning, both networks were adjusted together. There are much more identical points (2500) in this new combination compared to only 37 in EVRF19. Higher accuracy for the reprocessed IGN data, the standard deviation for one km levelling decreased from 2.6 mm to 1.6 mm. Two new border connections have been found, but some previous connections are not part of the IGN data anymore. After including these connections from the old IGN file some outliers were detected. Some new border connections to Switzerland, Germany, Belgium, and Spain will be measured in coming years. Bilateral online meetings between the countries which are involved in this topic. Shortly before the release of EVRF2019, MS got levelling data from Austria, but this data belongs to different epochs between 1932 and 2018. This data could not be fully used because the data cleaning could not be done yet. But parts of the data were used to establish connections between Austria and some new networks of Italy and Slovenia. Connections to all neighbouring countries of Austria have been checked, e.g., to Hungary and to Czech Republic. There are also additional connections to Germany and to Switzerland. But some of them are very old and have to be checked. MS is going to travel to Moldova as part of an expert mission to provide the integration of some levelling data of Moldova. Probably connections to Romania and Ukraine could be established.

10. AOB

a. Past and coming meetings

There was a FAIR webinar in October, held by ROB, following the splinter meeting at the EUREF Symposium. CW43 there will be two meetings of working groups, Unified Height Reference and deformation models. CW 44 and CW45 there will be an the EPN AC workshop and the repro3 workshop, resp. The University of Bern was planning the introduction of Bernese software in October.

b. EPN ACC and repro3 meeting

Presentations by CV, AA, BM, CB are planned for the repro3 workshop. The switch to IGS20 is urgently needed. One could do it in parallel to IGS in GPS week 2238, but to have it in January is more realistic. It depends on how the software will be delivered and is operational for all the ACs.

c. WG Deformation models

The reason for having the meeting is that Rebecca Steffen has completed her model covering Europe and she will present it. Discussions what to do next. How should this model be developed with other models? What would be a good way to make a product of it and how should it be present so it can be useful in the transformations. Other presentations are also welcome.

d. GDPR

In the EPN Central Bureau, CB reports, all the contacts are removed from the sitelogs, which have not agreed to be publicly available. For the future, the primary contact should be a generic contact, which is also something that was requested by the IGS. WS adds that the BKG data centre has to contact all data providers with regard to explicit confirmation. The EUREF webmaster should be contacted to check the content, e.g. on current and former TWG members, etc. An e-mail has to be sent out, the agreement (feedback) has to be archived.

11. Future realization of the ETRS (Lidberg)

ML recalls that ETRS89 is introduced in very many countries in Europe and that it is also stated to be used for practical use under the INSPIRE Directive. But in ITRF 2014 there are differences in the horizontal coordinates of roughly 7 cm compared to ETRF 2000. Since ETRF 2000 is quite

old, EUREF should try to have an ETRF2020 that agrees well to what has already been used in the countries, i.e., to avoid these 7 cm. ZA reminds to the improvements over the past ITRS realizations, in particular in terms of the stability of the translation components between the subsequent realizations and the scale. He emphasizes the need to keep the mathematical relationship between the ITRS and the ETRS. A plate motion model is in progress, expected to be ready by March 2023. He recommends to wait with ETRF2020. AC recalls the original definition of ETRS89 and the never solved discussion on what exactly is the stable Europe, based on our clear picture of the velocity field in Europe. JS emphasizes the perspective of the heights, i.e., the introduction of a geoid model to transform between ETRF and EVRF. CV proposes a possibly new definition for the European reference system maybe for 2030. A dedicated meeting with more time to discuss all these points is agreed by the GB.

Action Item to KK: set up a digital poll for a dedicated meeting for discussion on the future of the ETRS89 realization.

12. Wrap-up of WG meetings

a. WG on “European Unified Height Reference” (Oct 27 - Schwabe)

JS summarizes the meeting of the European Unified Height Reference Working Group. First topic was the interface or exchange formats for transformation parameters on the CRS EU website. The CRS contains a lot of information on transformations, national geoid models etc. but needs some improvement and progress to make the information available to the users, e.g. for online transformations.

The second part was about European high reference surface control points. The WG did a lot of work in preparation of a more homogeneous and more accurate data set, for example in transformation and conversion of the data. JS reminds again the GB that the comparison of the control points is just based on two regional gravimetric quasigeoid models, EGG2015 for Europe and a preliminary model from the FAMOS project for the Baltic Sea area. The data sets to compute the EGG have been collected over decades by Heiner Denker at the University of Hannover, Germany. Continuation of the EGG (also in context of the IAG SC2.4a) as well as the licensing status and availability of these data is unclear once Heiner Denker will retire in about three years.

b. WG on Deformation Models (Oct 28 - Lidberg)

ML summarizes the meeting on the deformation models. A colocation-based methodology is used and the first model is derived by Rebecca Steffen from Lantmateriet. The next step is that Rebecca would like to finalize and publish the paper on this model before release. The idea during the workshop was to get the little bit more feedback on next step. But since the model is not yet available, testing is not so easy. The workshop concluded as next steps to complement the EUREF products eventually with the deformation models (or velocity model), gridded velocities or a strain rate product.

c. EPN AC meeting (Nov 03 - Liwosz)

TL summarizes the EPN Analysis Centers Workshop. The goal of the workshop was to discuss the topics concerning the operational analysis of the EPN data and especially in the light of the upcoming switch to the new reference frame and standards. The WS had four presentations: (1) Presentation by TL on the status on the current products and some necessary steps to be taken, as well the preparations for the switch to IGS20 and the introduction of a new EPN AC at GFZ Potsdam. (2) Presentation by RD on details concerning the construction of IGS20 reference frame and changes in the CODE analysis for reprocessing as well as for

the operational analysis; how to process data according to new standards in both versions (5.2 and new 5.4) of Bernese; information on the new CODE products. (3) Presentation by JL on the comparison of the current EPN cumulative solution with the ITRF 2020 and the IGS20, in terms of positions, velocities and discontinuities. (4) Presentation by RP on the operational troposphere product as well as about providing a rapid troposphere product. Minutes and presentation are already available at the EPN CB web page. New IGS products with three constellations should be used in the future which are presently provided for example by CODE and GFZ. Switch of final solutions to IGS20 can be postponed until the ACs are using Bernese version 5.4. A new antenna model will be used in EPN which will be almost exclusively based on the IGS20 model, plus few exceptions. The new files will be maintained by AA. Another update in the IGS20 standards is the correction of antenna misalignments from true North. Also, the new products of EPN analysis centers will be provided with new long file names. A EUREF mail to ask station managers about possible antenna misalignments had been sent out with a feedback of 8 cases. RP asked analysis centers, which provide rapid coordinate solutions to also provide troposphere products. The possibility of using VMF3 in EPN operational analysis was also discussed. It is refined and more accurate version of VMF1, and VMF3 will be used in CODE operational IGS20 analysis. TL states that there is a need for an update of the EPN analysis guidelines.

d. EPN repro3 meeting (Nov 07 - Völksten)

CV summarizes the EPN repro3 workshop. There were in total 7 presentations: (1) by CV about the tasks and objectives of repro3, (2) by BM about GNSS analysis at GFZ, (3) Presentation by JZ about the EPN Densification, (4) by AA concerning the mixing of GNSS ground antenna calibrations, (5) by RP on repro3 troposphere products, (6) by JL about the historical EPN database, and (7) by TL about the AC's network design and coordinate products. There is a need to redesign the network for the reprocessing because not all EPN ACs are participating in the reprocessing activity. The analysis strategy to be used in EPN repro3 shall be orientated to the new operational analysis. For the EPN repro3, it is proposed the use of VMF1, while in the operation it would be possible to use the VMF3. Discussion on if a benchmark test is necessary. The schedule for EPN repro3 has not yet been defined. The repro3 will not start before everyone successfully switched to the IGS20 of the operational analysis. Some ACs represented in the GB, e.g. AK and JZ, report on their progress with new BSW5.4 but also RP and AA with the other software packages used in the EPN.

Action Item to TL and CV: set up a digital poll for a follow-up meeting of the EPN Analysis Centres

13. EPN

a. Introduction of RINEX 4 (Bruyninx)

CB informs that the IGS decided that from February 1st, 2023 on the RINEX4 data can appear in the data centers in the same directory as RINEX3 data. And in fact, the file naming is exactly the same between RINEX3 and RINEX4 for the observation files. There is no significant difference in the observation files except the header. Although some software might not be able to recognize the header lines that are foreseen by RINEX4, she recommends to follow the IGS and do the same in the EPN. Since it needs some changes for the data centres, CB recommends that BKG and BEV exchange information on the practice.

Action Item to WS: BKG to check with BEV if a EUREF mail regarding RINEX v4 files should be sent out.

14. EUREF**a. EUREF Newsletter (Söhne)**

WS reminds to the planned newsletter to be finalized close to Christmas as last years. Reminder will be sent out asap.

Action Item to ALL: continue and complete your respective section for the 2023 EUREF newsletter

15. AOB**a. IAG Commission 1 (Lidberg)**

ML: Message from C. Kotsiakis that there will be an IGS Executive Committee meeting and they would like to have an update to IAG Commission 1 related activities. So, EUREF is asked to send a brief info of the activities and results.

Action Item to ML: send a short summary on most recent EUREF GB activities to C. Kotsiakis.

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

Action Item to KK, ML and WS: check whether an in-person meeting is possible in February 2023.

PARTICIPANTS

Z. Altamimi
 E. Brockmann excused for 2nd part
 C. Bruyninx
 A. Caporali
 R. Dach excused for 1st part
 A. Kenyeres
 K. Kollo
 J. Legrand
 M. Lidberg
 T. Liwosz excused for 1st part
 B. Männel excused for 1st part
 R. Pacione
 M. Poutanen
 M. Sacher excused for 2nd part
 J. Schwabe
 W. Söhne
 J. Torres excused for 2nd part
 C. Völksen
 J. Zurutuza

A. Araszkievicz
 J. Johansson excused for 2nd part