**Time & location:**
28-29 October 2025 (full days) 0900-1700 CET (Lantmäteriet, Gävle)
Online: "skype for business"

***MINUTES***

1. **Opening**

   *The EUREF chair ML welcomes members and guests to the Governing Board meeting at Lantmäteriet in Gävle as well as the ones remotely connected. Visit to the SWEPOS centre will be this afternoon.*

2. **Approval of minutes of 98th GB meeting**

   *KK did not receive any additional comments, so the minutes of GB98 could be published.*

   ***Action Item to KK: send the final minutes of GB98 to the EUREF webmaster for publication on the EUREF web page***

3. **Review of Action Items from previous GB meetings**

   *All Action Items of GB97 are done. Action items from GB98 are done or in progress.*

   ***Action Item to KK: send to GB members the username/pwd for the restricted area on the EUEF web page***

4. **Coordinators**

   a. **Report of the Analysis Centre Coordinator**

      *Repro 3 have 12 analysis centres. For August 2025 all available solutions were accepted for combinations. UPA solution is bit noisier and have some issues with combinations. Main product will be EPN daily combined solutions, aligned to IGS20. Daily coordinates delivered to RFC in mid-august. Weekly solutions delivered to BKG in October. Recombination 2238-2313. For consistency these solutions were reanalysed, its ready and will be delivered after GB meeting. New stations used in the REPRO3 after 2238 – stations should be proposed before the start. Reports are now also available in YAML format.*

      *Discussion on the weighting factor, because ACs using BSW were dominating; GFZ and MUT RMS seem to be more realistic than BSW; GFZ processes large network, while MUT is processing without GLONASS.*

   b. **Report of the EPN Troposphere Coordinator**

      *Operational processing runs smoothly, repro3 activities started. Will use the same exclusion file or information as the ACC. CV asks for the coordinate solution used for the combination of the Repro3. RP replies that it is the weekly combined solution, same approach as for the operational processing. Publication of repro3 troposphere solution expected for the next symposium.*

   c. **Report of the Reference Frame Coordinator**

      New EPN repro3: period coverage 1996-01-01 - 2025-06-15. Aligned to origin, scale and orientations wrt IGS20 using 50 ref stations. *No visible changes from repro3 to operational (was not the case from repro2 to operational). Publication not yet ready.*

      *Discussion on the cleaning which is done by the ACC between the rapid and the final combination. Tools at RFC level are not that effective as before. Discussion on the directory naming used for storing the accumulated solution (CWWWW). Currently, different solutions difficult to find. Backward changes may confuse users. IGS has*

*changed its structure, which may be a good justification to change on EPN level.*

*Questions: stations without velocities. If collocated, then take velocity from collated station. Some station with unconventional behaviour – not to publish. Discussion about some Italian stations which have outliers in rapid solutions.*

**5. Working groups**

**a. Height Reference & Working Group on "European Unified Height Reference"**

*1) UELN: Martina Sacher has retired September 2025, new co-worker at BKG with focus on height monitoring. Work of Martina with UELN (including GB membership) taken over by Tobias Bauer, transfer of data and knowledge since summer. Levelling data of Serbia received 25 March 2025, to be introduced into UELN and to compute EVRF2019 heights "under force" for the Serbian benchmarks (see WG). This requires information about levelling connections to neighbouring countries HU, BG, RO, ... (information for HU provided after GB meeting) => due to the overall situation, new EVRF probably earliest 2027/2028 (as announced at EUREF symposium 2025 but contrary to EUREF newsletter 2024).*

*2) WG: As new EVRF will take longer (see above), it was decided to compute and publish first version of a European Height Reference Surface (EHRS) based on the currently available GNSS/levelling data with EVRF2019 heights (announced at EUREF Symposium 2025) and EGG2015 gravimetric quasigeoid model, envisaged EUREF Symposium 2026. GNSS/levelling data also to be published as open data (except countries that chose "delivery by email upon request to EUREF WG" > a few countries, or "only by direct application to country" => Latvia). Preliminary "experimental" version with some limitations (completeness; "static" levelling solution, not yet sufficiently accurate velocity model to harmonize GNSS and levelling epochs for continental Europe) => for now publication without official approval by GB. Test computations of corrector surface with preliminary data had been ongoing this year carried out by Sander Varbla (TalTech, currently at TUM). TBD: finalize GNSS/levelling dataset and corrector surface after internal presentation and discussion within WG, preparation of publication (upload, DOI, documentation).*

***Action Item for JS: New GNSS/levelling dataset could be update of "EUVN-DA" (with new name, e.g. "European GNSS/levelling dataset", and links "EUVN-DA" and "EHRS_CP").***

**b. EUREF Study Group on alternatives of ETRS89**

*XC presents the status of the study group and the next steps to be discussed at meeting #6 on November 14. Abstract submitted for REFAG2026. Next work on white paper. Proposal for prolongation of the study group without fixed end date is accepted by the GB. Target date to update national coordinates: end of December. ZA: what are the limits for coordinate change to be acceptable? XC: will be addressed.*

**c. EPN REPRO3**

*Each AC has provided cleaned NEQ and TSD. RFC daily combinations, multiyear solution in progress, EPN troposphere work is to be started. Proceeding paper from IAG Scientific Assembly in Rimini in preparation. Abstract to REFAG2026.*

**d. EPN Densification**

*EPOS-EPND combination in IGb14, solution is available at EPND webpage, in future EPOS has impact on EPND, lot of countries are not ready for repro but are doing operational – Italy and France. For Germany, AdV accepted to provide the DREF*

*online solution processed by BKG to EPND. BM: GFZ proposed to process the SAPOS stations, but no green light from SAPOS or AdV yet.*

**e. European deformation/velocity model (Rebekka Steffen)**

*EuVeM2022 based on EPND2150, EPND velocity model and uncertainties both for horizontal and vertical velocities ETRF2014 frame. Methodology and model available on Lantmäteriet webpage. ML asks for possible EUREF product. LH asks for rejections on the input velocities of some stations. Filtering is part of the process. ZA asks for potential users of this model. NKG has its own model. LH asks if JS could or does use the model in its computation. JS: on experimental level possible. CB: users asking how to transform coordinates without velocities? This kind of model could be in help.*

**6. EUREF Strategy**

a. **EUREF Strategy** – Open Space discussions

*Discussion topics: (1) EUREF in relation to UN-GGIM:Europe & GGCE, (2) ETRS89; (3) Velocity/deformation models; (4) EUREF GB membership; (5) Future height systems; (6) Monitoring of EPN stations; (7) EUREF data policy (FAIR principles; DOI; (8) EPN analysis – some ACs that are one person; (9) Capacity development through EUREF webinars.*

*Discussion topics were proposed and grouped into three areas which became the discussion topic for three round table discussions: "EUREF and organizations", "Reference frames" and "EUREF sustainability".*

*<u>EUREF and organizations</u>*

- *EUREF in relation to UN-GGIM:Europe & GGCE (etc?), also GGOS regional*
- *Landscape of EUREF and Connections to EuroGeographics, EuroSDR, EPOS, EuPOS*
- *Visibility of EUREF, outreach (Ex. EuroGeographics has a webinar on future reference frames*
- *Ambition on EUREF tutorials. Maybe also arrange webinars?*

*From the discussions:*

- *Relationship between EUREF and UN-GGIM*
- *UN-GGCE position paper -> wait that paper and discuss it*
- *Sustainability/improvement of global geodesy supply chain*
- *EUREF landscape*
  - *What organisations are influenced/influenced in global, regional and national level*
  - *To add at global level: ISO, EPSG, commission 2, regional level: GGOS regional*
  - *Overview of relations – to we want to have any or what we have*
- *MoUs*
  - *MoUs – EUMETNET, EuroGeographics, CEGRN (is active by JZ), EUPOS, EPOS (most living one)*

*<u>Reference frames</u>*

- *ETRS89 (important and many aspects, but we should respect that we have the established study group. Also, velocity/deformation models*
- *Future height systems/frames*

*From the discussions:*

- *Impact of inSAR – velocity field – using precise velocities rely on GNSS, we would …*

- *Levelling: why maintain levelling networks; it is precise in short distance; independent validation of geoid model; (spectral errors in gravimetric quasi-geoid); political reason(?) and some money issue*
- *Geoid change over time (negligible in most areas of Europe, but ~1 cm in 20 yrs in Fennoscandia)*
- *Realization of IHRS/F in Europe,*
  - *and (precise) relation to EVRS/F*
  - *Potential of Chronometric levelling (optical clocks and relativistic effects)*
  - *Frequency transfer as part of the geodetic networks (timing labs)*
- *Key items ETRS89, velocity, future height -> solving problem continental problem – geoid models and velocity fields – information from levelling, GNSS, INSAR complimentary*
- *Combination of techniques: European Combined Geodetic Network (ECGN); EUREF collocation for ETRS, EVRS, geoid, geopotential*
- *Global reference frame realization of EPN?!*
- *Velocity (models)*
  - *for kinematic reference frames*
  - *Data formats for velocity models (e.g. GeoTIFF and others)*
  - *Precise velocities rely on GNSS*
  - *But GNSS lack spatial resolution (EPND instrumental here)*
  - *How to discriminate between station instability (local effects) and crustal motions (regional deformation)?*
  -

*<u>EUREF Sustainability</u>*

- *EUREF membership, also chairpersons for EUREF and the GB and secretary*
- *EUREF data policy (FAIR, DOI etc)*
- *EPN analysis. We have some Acs that are "one person", people retire etc. Issue relevant to several components of EUREF*
- *Information to the younger generation! Attracting young generation and transmitting what we have done to new generations.*

*From the discussions:*

- *Past EUREF – was a label that facilitated receiving funds – new things every year, now – operational work and no new stuff. We have to facilitate ourselves, no one comes to EUREF -> we need to approach people.*
- *If you are not visible, you are not necessary*
- *Sustainability linked to visibility – why and how important is that what we are doing.*
- *EUREF should focus to its core stuff – what is minimal what we should do?*

**b. Strategy for GB:** GB and member states/plenary interactions

*ZA asks for the number of users of our products. Any statistics available, e.g. from Regional Data Centers? With respect to reference frames, EuroGeographics and EuroSDR are usually mentioned, not EUREF. CB raises the question on the justification to have an EPN. Do we need a different EPN, e.g. with concentration on collocation stations. CV presents the ideas of the sub-group on reference frames. Continue levelling? Kinematic reference frames?*

## 7. EUREF2026 Symposium Paris

*XC presents the status of the preparations for the 2026 EUREF symposium. Finding the main location was an issue, but is solved now, and the date is now fixed: 22th of June GB meeting, 23-25 June*

*EUREF Symposium. Main organizer is IGN. Social event planned for Thursday – cocktail dinner with finger food. Social event to move to Wednesday – LOC will see it. Limit for participation is 130. Tutorial topics and/or key note on Galileo HAS or DORIS or "easy tutorial" on CATREF. Tutorial topic to be chosen in December to mention it in EUREF newsletter. Proposal to add a new 4th session on collaborations, possibly including a podium discussion with the presenters. Registration fee 375 € as early bird, 450 € for late registration. Study if reduced fees are possible for young scientists. Should we create an award for young scientists? Web page ready in November. Reach out MoU partners to give a presentation on symposium.*

***Action Item to XC: write a first EUREF mail to save-the-date of the 2026 symposium***

***Action item to XC: contact last session chair to ask them if they want to chair again their session or leave their sit.***

***Action Item to KK: send to XC the sessions structure and sessions names of the past symposia***

**8. Status of campaign evaluation/validation**

**i. Serbian campaign**

*FK presents again what has been shown at the last symposium. National ETRS89 implemented through ETRF2000. Campaign 2023 – maintain and monitor densification of ETRF. Based on CORS stations, measurements from July 2016 to August 19, 2023 together with static points. Discussion points: no reference stations in the South of Serbia -> added into a test solution. Antenna models from Geo++ for some stations -> no introduction as new realization – "previous ETRS89 densification" is the 2010 campaign. ML: this is value for it in Serbia to follow the best practices, we have role on ongoing evaluation and sustainability of ETRS89. Way to maintain the implementation of ETRS89. GB accepts the campaign and prepares a resolution for symposium 2026*

***Action Item for ALL: prepare a resolution on the Serbian campaign for the 2026 symposium with a modified (compared to former campaign resolutions) wording***

**ii. ROMPOS campaign**

*86 active stations, Benchmark campaign performed and validated by TL. 30 days of data chosen in order to compute only coordinates for the network. Alignment to IGS20. Discussion: Report is not complete, SINEX files missing. DYNG station shall not be used because of large residual. To validate the results – if alignment exceeds 10 mm, should not be included as reference station. Missing reference stations in the south. No ETRS89 coordinates provided. Conclusion: few technical issues and report to be completed + SINEX files to be included (sent to JL).*

***Action Item to WS: compile a list of clarification points and send them to the Romanian colleagues***

**9. EPN**

**a. (Repeated) questions to the EPN CB**

*Real time data of EPN stations: no data policy, but what is the data license agreement? It is open data – but only for the RINEX data? MP is asking if the data license should come from the stream provider. If we would install a data license, we would need to build up from scratch station-by-station. List of stations instead? No, list of providers with links. Section in site logs? Who might complain if EPN RT streams disappear?*

***Action Item to WS/BKG: write an answer to Martin Ferianc (GKU) clarifying the open data policy of the EPN data***

***Action Item to LH, CB, RP and WS: prepare a concept for future real-time data provision by or within EUREF***

*Concerning velocities: if model is used, which uncertainties/standard deviations? CB: time to modernize the tool at EPN CB. LH: KAD has something available based on PROJ which might be a basis. What about the models for other regions? Can you transform velocities?*

***Action Item to CB: write a draft for Data Policy for EPN data and distribute it to the GB***

**b. Status of InSAR**

*LH gives the status of the InSAR stations within the EPN and the IGS. Abbreviations are already in the vocabulary App of Markus Bradke (IGS IC). ML asks for possible additional information, e.g. which transponder (satellite) / frequency. XC reports on an action item for him on DOMES numbers. If successful, EUREF mail or similar to the station providers.*

***Action Item to LH: update the Dutch stations in M3G with available INSAR information and ask the Slovakian colleagues to do it similarly***

**c. Managing GNSS Station Anomalies: Proposal for Temporary Exclusion of EPN stations**

*CV explains the problem with outlier of stations, in particular with the height components of several Italian stations. CB explains that ROB is not removing any outliers (except very large ones), so that the ACC could identify a problem by checking with the other ACs. RP explains that radomes have been installed at most of the stations during 2025. ELBA another example. Decision is to not remove outliers by individual ACs but to improve the information chain. Maybe guidelines need a small improvement?*

**10. EUREF Governance**

**a. EUREF 2025 Resolutions – Status**

*WS reviews the resolutions of 2025. LH was contacted by Roger Lott and it seems not only KAD. New names in EPSG available dated October 25, 2025.*

***Action Item to LH: ask Roger Lott if his initiative is in relation to the EUREF 2025 resolution no. 5***

**b. Memoranda of Understanding**

*On day 1 during the strategy, WS reviews the MoUs of EUREF. Proposal is to renew the MoU with EuroGeographics and consider a new MoU with EuroSDR.*

***Action Item to ML, WS and KK: contact EuroGeographics, EuroSDR EUPOS etc. and consider/propose a new or renewed MoU (possibly before the next EUREF symposium)***

**c. Connection to EPOS-GNSS**

*CB proposes to include an activity in the MoU on getting young people attracted for Geodesy. BM suggests to have a meeting with all EPN and EPOS ACs, possibly in Paris.*

***Action Item to XC: invite, in due time, the EPOS Analysis Centres to the 2026 symposium in Paris***

*CB presents the work plan which is quite detailed but carefully formulated. Discussion on the visibility of EUREF within EPOS. Maybe someone from the EUREF*

*GB should go to the EPOS Days March 16-20 in Cagliari, Sardegna. Discussion on capacity buildings. TB proposes a talk or even a session on the products and their usage within the symposium. One session for young scientists (ECS)?*

**d. Outreach of EUREF**

*Deadline for REFAG2026 extended to Nov, 02, 2025. ML suggests a poster presentation on 35 years of ETRS89 for REFAG2026. ZA suggests to make it wider to EUREF in general, maybe as a basis for a flyer.*

**11. AOB**

**a. EUREF Newsletter 2025**

*WS suggests to publish a EUREF newsletter also this year.*

***Action Item to ALL: send contributions for the EUREF 2025 newsletter to AA to be published before Christmas***

**b. Next GB meeting(s)**

*Optimally in February and in person. Some partners (BKG, ROB) will investigate the options.*

**Participants**

Z. Altamimi
A. Araszkiewicz
T. Bauer
C. Bruyninx
A. Caporali (excused)
X. Collilieux
R. Dach (online)
L. Huisman
A. Kenyeres
K. Kollo
J. Legrand
M. Lidberg
T. Liwosz
B. Männel
R. Pacione
M. Poutanen
J. Schwabe
W. Söhne
J. Torres (excused)
C. Völksen
J. Zurutuza (online)

F. Kostadinovic (item 8)
J. Varenica (item 8)
S. Lazic (item 8)
L Jivall (item 8)
V. Sorta (item 8)
M. Puia (item 8)
M. Flueras (item 8)