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EUREF NEWSLETTER

SEASON'S GREETINGS

BY THE EUREF CHAIR MARTIN LIDBERG

Dear colleagues,

Thank You all for your contribution and engagement in geodesy!

Many of you contribute to geodesy at Global, European or National level and for to the progress of EUREF. An example is the EPN-Repro3, as reported below, which is a major achievement for EUREF, where many persons have contributed in various ways. Several countries have also worked on reprocessing for the EPN Densification.

Without going into details, I think that we do good progress in practically all parts of EUREF activities. Personally, I am very happy with the study group on ETRS89 and future reference frames for Europe. I find this as a strategic activity where we look into alternatives for the ETRS89 and also how to realize ETRS89.

I also like to thank everyone involved, from the local organizers to all participants, for making the EUREF Symposia in Covilhã as a success! I had a good feeling on the way home. I think it was the atmosphere with good discussions and that we work together with an eye towards the future. Thus, I am very happy for the invitation to the EUREF Symposium 2026 in Paris - many thanks!

Looking beyond geodesy and EUREF, we still have a conflict in Europe. My thoughts go to innocent victims. The situation should never be accepted as "normal. What we can do from our profession is probably to continue to strengthen geodesy in Europe to make it booth efficient and robust – for the benefit of our society.

By that, I wish you, your relatives and friends a merry Christmas and happy end of 2025, and all the best for 2026!

Martin

EUREF GOVERNING BOARD 2025

BY THE EUREF GB CHAIR WOLFGANG SÖHNE

In 2025, the EUREF Governing Board (GB) had a number of online meetings, but thankfully also some in-person meetings.

In the first half of the year leading up to the symposium, we held a total of four online meetings: on February 12th and 28th as parts of GB97, and on May 16th and June 18th as part2 of GB98. The main topics were preparations for the annual EUREF Symposium and the election of one or more members of the Governing Board. The preparation time for the symposium was challengingly short for the local organizers. The availability of gravity data in Europe is an ongoing issue, to which Joachim Schwabe, as Chair of the Working Group "European Unified Height Reference," is dedicated. The validation of two national GNSS campaigns in Romania and Serbia was also discussed at these online meetings. These two campaigns differed from standard campaigns in that the results (coordinates) were not intended to be adopted as new official coordinates.

EUREF NEWSLETTER

EUREF GOVERNING BOARD 2025 – CONT.

BY THE EUREF GB CHAIR WOLFGANG SÖHNE

International cooperation is an increasingly important topic for the EUREF GB. Several GB members had the opportunity to participate in the GGCE Workshop in Bonn, Germany. EUREF was also represented by its Chair at the EuroSDR Workshop on Georeferencing in Norway, as well as at the IAG General Assembly in Rimini, Italy.

The GB's progress on the symposium was also discussed at the two online meetings held in the run-up to the symposium Furthermore, planned resolutions for the symposium were collected and drafted.

Due to the tight schedule of the symposium and the tutorial, only a brief meeting took place in Covilha. There, Lennard Huisman from Kadaster Netherlands was introduced as a new GB member, being the only candidate responding to the Call for Participation. Lennard brings in a wealth of geodetic expertise and can rely on his colleagues, who are always very active in EUREF.

Figure 1. GB Members during a visit in the SWEPOS Control Center (Lantmäteriet, Sweden)

EPN Reprocessing 3 (EPN-Repro3) was almost completed this year. After all participating Analysis Centers had completed their individual processing, the ACC Tomasz Liwosz was able to finalize the combination. Finally, the RFC Juliette Legrand was tasked with calculating a new accumulated solution. Also the combination of the troposphere solutions will closely follow.

The Reference Frames

ETRS89

BY ZUHEIR ALTAMIMI AND XAVIER COLLILIEUX

The study group on alternatives to ETRS89 was created by the EUREF governing board in October 2024. It comprises 16 members and 21 corresponding members from over 17 countries. The study group has organized 7 web meetings in 2025. It is currently working on the following four tasks, with their respective status:

TASKS	STATUS	COMMENT
List advantages and drawbacks of current ETRS89 and its realizations with respect to user needs	**Done**	Presented at EUREF meeting 2025
Make an inventory of the strategies adopted in other regions of the world	**In progress**	-
List alternatives to ETRS89 as well as their strengths and weaknesses	**In progress**	-
Evaluate the order of magnitude of coordinate differences in these systems and the impact on national realizations.	**Started**	Reference dataset (national coordinates) under construction

The work of the working group will be presented in REFAG 2026 symposium in Munich as well as in EUREF 2026 symposium in Paris. The expected final deliverable is a white paper that documents ETRS89 alternatives, including their pros and cons.

EVRS

BY TOBIAS BAUER AND JOACHIM SCHWABE

INSPIRE endorsed the use of the European Vertical Reference System (EVRS) to express gravity-related heights in Europe. The heights of EVRS are determined by the common adjustment of national levelling networks in the United European Levelling Network (UELN). The latest EVRS realization is EVRF2019, which has been released in 2019 and updated in 2020. The heights in EVRF2019 can be downloaded from the **EVRS website**.

After more than 25 years of dedicated service for the vertical reference frames in Europe, Martina Sacher has retired from Federal Agency for Cartography and Geodesy of Germany (BKG) in September 2025. Her tasks involved data management for the United European Levelling Network (UELN) and computation of heights for the European Vertical Reference Frames (EVRF), latest EVRF2019. In the future, the work will be continued by Tobias Bauer (BKG). For communication, please use the new functional mail address **heights@bkg.bund.de**.

In 2025:

- Serbia provided their latest national levelling network which can now be included in the UELN for the first time. Additional border crossing data to neighbouring countries of Serbia remain under preparation and are expected to be delivered soon.
- Czechia and Saxony in Germany are working together in updating the cross-border levelling.

The last newsletter anticipated the release of a new EVRF in the year 2025. However, this was not feasible due to the personal changes and ongoing work to include new levelling data from e.g. Serbia in the UELN. The work is now expected to last until 2027.

THE EUREF PERMANENT GNSS NETWORK (EPN)

BY CARINE BRUYNINX AND JULIETTE LEGRAND

GNSS@ROB

Ten new GNSS stations were integrated into the EPN in 2025 (highlighted in green in Figure 2): two in Romania, two in G.-D. Luxemburg, two in France, one in Andorra, Cyprus, Italy, and Germany. Detailed information on all stations is available from the EPN Central Bureau (**https://epncb.oma.be**). During the same period, three stations were decommissioned (BACA00ROU, IGNF00FRA, PADO00ITA).

Figure 2. New GNSS stations (in green) integrated in the EPN in 2025.

Following **Resolution No. 1 of the 2025 EUREF Symposium in Covilha**, the **EPN station guidelines** were updated in September 2025 to reflect that all EPN stations will, by default, be included into the GNSS network of the European Plate Observing System (EPOS). All EPN metadata from **M3G** and EPN RINEX data from the **EPN Historical Data Centre** will gradually become discoverable within EPOS starting in 2026. The updated station guidelines also include revisited recommendations for the formats to be used when providing data to EUREF.

This year also saw a significant increase in the number of EPN stations with assigned Digital Object Identifiers (DOI). Approximately 230 EPN stations now have DOI-referenced datasets, searchable via M3G, enhancing data visibility, citation, and recognition for data providers.

Additionally, the Open Data Portal built on top of the EPN Historical Data Centre, transitioned from beta to full operational status in 2025. This transition included an update of the GNSS-DCAT- AP schema used by the portal (**https://doi.org/10.5281/zenodo.7777568**).

The Coordinators

Analysis Center Coordinator

BY TOMASZ LIWOSZ AND ANDRZEJ ARASZKIEWICZ

In 2025, the EPN Analysis Centres Coordinator (ACC) continued to analyze and combine the operational solutions submitted by the EPN Analysis Centres (ACs).

In October 2025, the EPN operational combined solutions for weeks 2238-2313 (27 November 2022 to 11 May 2024) were recombined to ensure better consistency with subsequent solutions. The new solutions are based on all 17 AC solutions (including previously missing solutions from two ACs) and include updated solutions from several ACs. Before the combination, all individual AC daily solutions were preprocessed consistently according to the present combination strategy.

This preprocessing involved: (1) checking of station metadata in AC SINEX files, and (2) stacking of daily AC solutions into a multi-year solution to assess the quality of station position time series.

In August 2025, the EPN ACC also completed the generation of combined solutions covering the period 1996-2022 as part of the EPN-Repro3 project.

A total of 12 EPN ACs were participating in this project providing daily solutions of their EPN sub-networks. The EPN-Repro3 combined products consist of daily and weekly solutions in SINEX format, along with accompanying combination reports in text format and new reports in YAML format.

Troposphere Coordinator

BY ROSA PACIONE

In 2025, the EPN Troposphere Coordinator (TC) continued to analyze and combine the operational solutions of the EPN Analysis Centres (AC). All the 17 EPN ACs are delivering final tropospheric operational products conformed to IGS20 standards. The comparisons of the AC final solutions w.r.t. the combined tropospheric product is available at the EPNCB website: https://epncb.oma.be/_productsservices/troposphere/mean_zpd_biases.php. In addition, for each EPN station bias and standard deviation of the contribution solution w.r.t. the combined product are monitored. Related plots can be found at the EPNCB website; as an example below the link for MATE00ITA: **https://www.epncb.oma.be/_productsservices/troposphere/zpd_biases_station.php?station=MATE00ITA**.

In 2005 8 new EPN stations (namely AAER00FRA, ASGA00CYP, ECH200LUX GVDG00GRC, IGNP00FRA KLSQ00GR, PCAR00AND, TROS00LUX) have been successfully included in the final combination. In addition, 10 EPN ACs are delivering rapid troposphere estimates obtained as a by-product of the rapid site coordinate processing. These rapid solutions are the input for a rapid operational troposphere combination available with a latency of 22 hours after the end of observations of the analyzed day. Because of the distributed processing of the EPN stations, about 200 stations are included in the rapid combination. During the last months of 2025 and due to the availability of the EPN-Repro3 site coordinate combined product, the preparatory phase of EPN-Repro3 tropospheric combination (January 1996 - November 2022) has started.

Reference Frame Coordinator

BY JULIETTE LEGRAND

The EPN-Repro3 forms the basis of a new reference frame solution targeted for release at the beginning of 2026. It combines EPN-Repro3 daily position solutions (January 1996– November 2022) with EPN operational daily solutions (November 2022–June 2025). The multi-year solution is computed with CATREF and expressed in IGc20 using minimal constraints on 50 reference stations. Outliers, position discontinuities, and velocity changes have been corrected, and harmonization with the global IGS solution ensures consistency with the global frame.

Reference Frame Coordinator – cont.

BY JULIETTE LEGRAND

The retrieval of additional historical data increased the dataset by 16% between 1996 and 2023, significantly extending many station time series and reducing by half the number of stations with fewer than five years of observations (see Figure 3). These improvements strengthen the reliability of the estimated velocities.

The carefully aligned analysis strategy ensured a smooth transition between EPN-Repro3 and operational products, with no visible discontinuities in residual RMS, transformation parameters, or station position time series.

The new solution also shows excellent agreement with IGc20, with 90% of stations matching within 4 mm horizontally and 10 mm vertically for positions, and within 0.25 mm/yr horizontally and 0.75 mm/yr vertically for velocities. These results highlight the robustness of the new solution and its suitability as the densification of ITRF2020 in Europe.

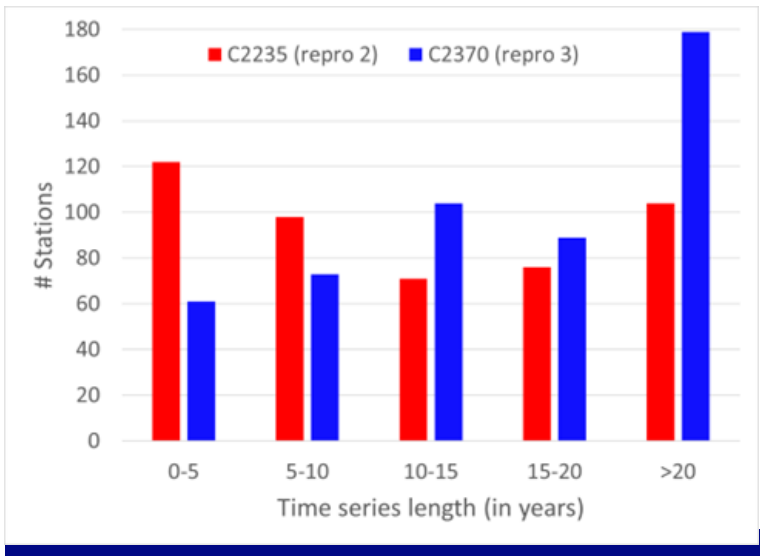

Figure 3. Comparison of station time series lengths before and after the inclusion of historical data (1996–2023).

The Working Groups

WG on European Unified Height Reference

BY JOACHIM SCHWABE AND TOBIAS BAUER

Since its establishment in 2024, one focus of the WG was related to the collection and preparation of a new European GNSS/leveling dataset. The new dataset shall replace the now outdated compilation from the EUVN-DA (European Vertical Reference Network - Densification Action) and also serve as basis to compute a European Height Reference Surface (EHRS), a height transformation model between the latest ETRF and EVRF. Accordingly, it will be named EHRS_CP (EHRS Control Points). As the new version of the EVRF is still pending (see section on the EVRS), it was decided to publish the first versions of the EHRS and EHRS_CP based on the current EVRF2019.

The finalization and release is now envisaged around mid-2026, ideally in time with the EUREF Symposium 2026.

WG on Reprocessing

BY CHRISTOF VÖLKSEN

The work of the EPN Reprocessing Working Group on the third reprocessing campaign, EPN-Repro3, was completed in 2025. All participating Analysis Centres processed the available data covering the period from 1996 to 2022.

EPN-Repro3 followed a coordinated processing strategy aligned with IGS repro3 standards to ensure uniformity and robustness. Twelve EPN Analysis Centres (ACs) processed overlapping geodetic networks so that each GNSS station was analysed independently by at least three ACs, enabling strong cross-validation. All ACs applied the same modelling conventions and antenna calibration models—specifically type-mean calibrations consistent with IGS20—to ensure full consistency. The data analysis followed the standard EPN routine procedure.

The EPN Analysis Centre Coordinator (ACC) carried out the work required to transform the individual AC solutions into a coherent, validated, high-quality combined product. After receiving the daily SINEX files from the 12 ACs, the ACC performed an extensive multi-stage combination procedure.

WG on Reprocessing – cont.

BY CHRISTOF VÖLKSEN

The ACC first reviewed the station metadata in each daily solution and reported any issues—such as incorrect antenna or radome codes—to the ACs for correction. Afterwards, the ACC used CATREF to stack the daily solutions into long-term series, allowing outliers and discontinuities to be identified and removed. The cleaned daily solutions were then combined at the normal-equation level, with the procedure repeated until all remaining outliers had been eliminated, and the resulting daily combined solutions were aligned to IGS20. These daily combinations were subsequently stacked again to detect and resolve any final inconsistencies, leading to the generation of the final weekly combined solutions.

Detailed reports documenting residuals, excluded stations, metadata errors, AC-specific issues, and other diagnostics are available. This workflow ensured that EPN-Repro3 delivered a robust, fully validated, and internally consistent reference-frame product. EPN-Repro3 is particularly important because it supports the future EUREF reference frame solutions, providing the most accurate and up-to-date positions and velocities of the EPN GNSS stations. Together with the upcoming operational solutions, it will form the core of this product in the coming years. Initial investigations by the Reference Frame Coordinator are highly encouraging and show an excellent level of consistency between the current operational solutions and the EPN-Repro3 results, confirming that both solution lines are fully compatible. In addition to the coordinate solution, EPN-Repro3 also estimated troposphere parameters, which are now being processed by the EPN Troposphere Coordinator. Here, too, the overlap of the networks allows optimal parameters to be estimated for each station.

The first results of EPN-Repro3 were presented at the EUREF Symposium in Covilhã, Portugal. Since the EUREF symposium in June, the combined daily solutions of the individual ACs have been revised and the last outliers and metadata inconsistencies have been eliminated. We also presented our work as a poster at the IAG Scientific Assembly 2025 in Rimini. A paper has been submitted to the IAG symposium proceedings and is currently under review. We also plan to present our research at the IAG symposium REFAG 2026 in Munich. As chair of the EPN Reprocessing Working Group, I would like to thank everyone involved for their outstanding work. It is only thanks to this collaboration that this major undertaking could be realized.

EUREF SYMPOSIUM 2026

BY XAVIER COLLILIEUX

The EUREF 2026 Symposium will be jointly organized by the National Institute of Geographic and Forest Information (IGN), the Francophone Association of Topography (AFT), the University of Paris Cité, and the Institute of Physics of the Globe of Paris (IPGP). The event will take place from June 23 to June 25, 2026, in Paris. The first morning will begin with a tutorial session, which will be followed in the afternoon by the official opening of the symposium.

The symposium website will go live in early January, at which point participants will be able to submit abstracts. We look forward to welcoming a large and diverse group of attendees to discuss EUREF activities, national agency initiatives, and ongoing research in the field of geometric and altimetric reference frames in Europe. The symposium will also provide a platform for exploring collaborations and synergies with partners of our sub-commission.

See you there !