

EPN Analysis Centres Coordinator Report

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The report of the EPN Analysis Centre Coordinator (ACC) focuses on the activities related to EPN GNSS analysis during the last year.

The EPN ACC combines and analyses GNSS coordinate solutions computed by the EPN Analysis Centres (AC).

- Status of operational AC and combined coordinate solutions
 - recent changes and improvements
- EPN solutions in EPN-Repro3 project
- Summary and outlook

17 EPN Analysis Centres

AC	Agency
ASI	Centro di Geodesia Spaziale G. Colombo, Matera, Italy
BEK	Bavarian Academy of Sciences and Humanities, Germany
BEV	Federal Office of Metrology and Surveying, Austria
BKG	Bundesamt für Kartographie und Geodäsie, Germany
COD	Astronomical Institute, University of Bern, Switzerland
GFZ	GeoForschungsZentrum, Potsdam, Germany
IGE	Instituto Geográfico Nacional, Spain
IGN	L'Institut national de l'information géographique et forestière, France
LPT	Federal Office of Topography swisstopo, Switzerland
MUT	Military University of Technology, Poland
NKG	Nordic Geodetic Commision, Lantmäteriet, Sweden
RGA	Republic Geodetic Authority, Serbia
ROB	Royal Observatory of Belgium, Belgium
SGO	Lechner Knowledge Center, Hungary
SUT	Slovak University of Technology, Slovakia
UPA	University of Padova, Italy
WUT	Warsaw University of Technology, Poland

EPN Analysis Centres characteristics

AC	Software	Provided solutions				No. of stations	
						in 2026	change ¹
ASI	GipsyX 2.1	Final	Rapid	–	–	122	+2/ 0
BEK	Bernese 5.4	Final	Rapid	–	Repro3	143	+2/–1
BEV	Bernese 5.4	Final	–	–	–	171	0/–1
BKG	Bernese 5.5	Final	Rapid	–	Repro3	160	+4/–1
COD	Bernese 5.5	Final	–	–	–	39	0/ 0
GFZ	EPOS.P8	Final	–	–	Repro3	111	+1/–1
IGE	Bernese 5.4	Final	Rapid	–	Repro3	100	+2/–1
IGN	Bernese 5.4	Final	–	–	Repro3	62	+0/–1
LPT	Bernese 5.5	Final	Rapid	NRT	–	60	+1/ 0
MUT	GAMIT 10.71	Final	Rapid	–	Repro3	156	+1/ 0
NKG	Bernese 5.4	Final	Rapid	NRT	Repro3	111	+3/ 0
RGA	Bernese 5.4	Final	–	–	–	71	+2/ 0
ROB	Bernese 5.4	Final	Rapid	–	Repro3	116	+2/ 0
SGO	Bernese 5.4	Final	Rapid	–	Repro3	68	+3/ 0
SUT	Bernese 5.4	Final	Rapid	NRT	Repro3	97	+2/ 0
UPA	Bernese 5.4	Final	Rapid	–	Repro3	116	+4/–1
WUT	Bernese 5.4	Final	Rapid	–	Repro3	157	+3/–1

¹ change in number of stations in AC networks since last Symposium

Recent changes: New stations in EPN solutions

- New EPN stations included in AC and combined solutions:

Station	Start date	Processing ACs
ALKS00LVA	22-03-2026	BKG, NKG, WUT
BFST00GBR	15-03-2026	BKG, IGE, ROB
DLKS00LVA	22-03-2026	NKG, SUT, WUT
FOCS00ROU	30-11-2025	RGA, SGO, UPA
KELY00GRL ¹	15-03-2026	GFZ, MUT, NKG, WUT
MURE00ROU	30-11-2025	RGA, SGO, UPA
PAD100ITA	20-07-2025	ASI, LPT, UPA
PCAR00AND	28-09-2025	ASI, BEK, BKG, IGE
PEN200HUN ²	08-03-2026	SGO, SUT, UPA
WT2100DEU	30-11-2025	BEK, BKG, ROB

- Decommissioned stations: FUNC00PRT (06-07-2008–16-05-2026), PRYL00UKR (19-02-2017–12-07-2025)

¹KELY00GRL has been reincluded to EPN; Previously in EPN from 23-09-2001 to 02-06-2018

²PEN200HUN has been reincluded to EPN; Previously in EPN from 16-06-2013 to 23-06-2018

Recent changes: Recombination of AC solutions

In November 2025, the daily and weekly solutions for weeks 2238–2313 (27 November 2022 – 15 June 2024) were recombined and updated at the EPN DCs:

- the new solutions are based on all (17) AC solutions, including:
 - new solutions from IGN and RGA ACs
 - some updated solutions from several ACs (BEV, BKG, and ROB)
- For consistency, before combination all AC solutions were analyzed again for period 2238-2313 according to the present methodology
 - Step 1: check metadata in AC SINEX files
 - Step 2: stack AC daily solutions and check their quality (examine station position time series, exclude outliers)

Recent changes: New product files

Two **new product files** are available (from week 2399, 23-12-2025):

1 reports from daily combinations in **YAML** format:

- file name:

- EUR00PSSNX_YYYYDDD0000_01D_01D_SUM.**YML**

- these reports contain the same information as text reports (e.g., AC station position residuals and RMS values, lists of station position outliers and excluded stations), but allow for convenient data extraction (e.g. in Perl or Python scripts)

2 daily and weekly solutions in SINEX format **without covariance matrices**:

- file names:

- EUR00PSSNX_YYYYDDD0000_01D_01D_SNX.**CRD**

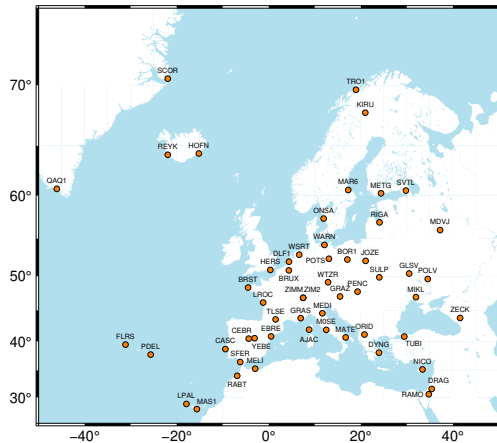
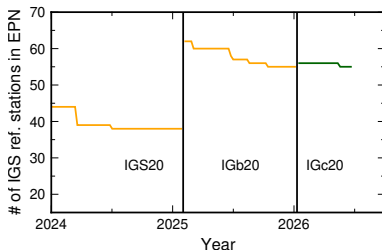
- EUR00PSSNX_YYYYDDD0000_07D_07D_SNX.**CRD**

- considerably smaller sizes than full SINEX files. May be convenient for users interested only in station positions

Recent changes: Switch from IGb20 to IGc20

Since GPS week 2401 EPN combined solutions have been aligned to the **IGc20 reference frame** (EPN LAC mail no. 3093)

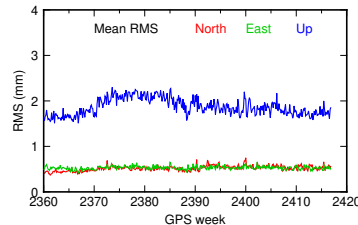
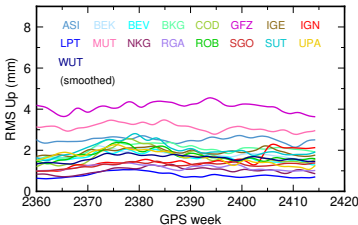
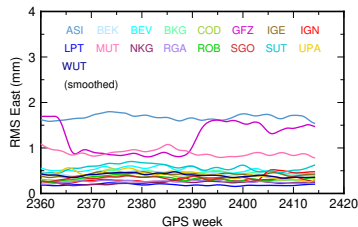
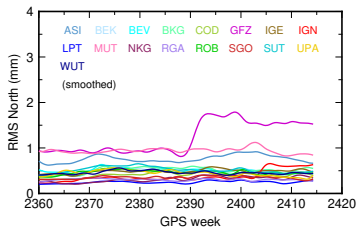
- at the epoch of switch 56 EPN stations available in IGc20 (vs. 55 in IGb20)
 - one new EPN station: **CASCOOPRT**
 - presently 55 stations (FUNCOOPRT decommissioned)



Present EPN IGc20 stations
(June 2026)

Combined solutions: AC solutions agreement (last year)

- RMSs of position residuals (smoothed) between each AC solution and combined solution
- Bottom right: Mean RMS values



The goal of the EPN-Repro3 project was to reanalyse all EPN GNSS data since January 1996 to November 2022 in the uniform reference frame (IGS20) and using consistent methodology (according to the guidelines for the EPN ACs).

- The project started in November 2022 and was conducted by the EPN Reprocessing Working group chaired by Christof Völksen
- 12 EPN ACs participated: BEK, BKG, GFZ, IGE, IGN, MUT, NKG, ROB, SGO, SUT, UPA, and WUT
- The task of the EPN Analysis Centres Coordinator was to analyze and combine daily AC repro3 solutions

- November 2022 – start of the project
- June-July 2024
 - first complete AC solutions available (ROB, SGO, SUT)
- June 2025 (EPN AC workshop and EUREF Symposium in Covilhã)
 - 11 ACs completed their solutions
 - corrections of certain solutions, or missing solutions needed from several ACs
- August 2025
 - AC solutions accepted by the ACC
 - combination of daily solutions finished in mid-August
 - EPN-Repro3 combined solutions provided to the EUREF Reference Frame Coordinator

The basic steps of combination procedure (the same methodology as in case of operational solutions):

- 1 Check station metadata in AC SINEX files
- 2 Stack individual daily AC solutions into AC long-term solutions (CATREF software)
 - examine station position time series, exclude outliers, detect potential issues
- 3 Combine cleaned daily AC solutions (Bernese GNSS Software)
- 4 Stack combined daily solutions into long-term solutions (CATREF software)
 - examine station position time series and exclude outliers
- 5 Combine daily combined solutions into weekly solutions

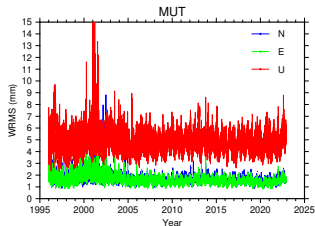
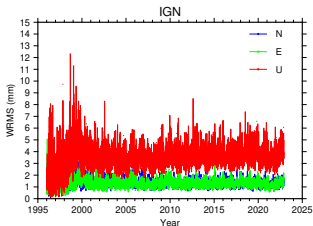
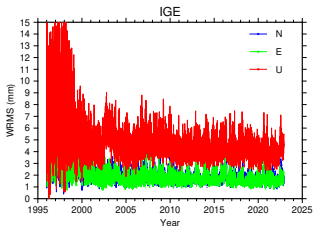
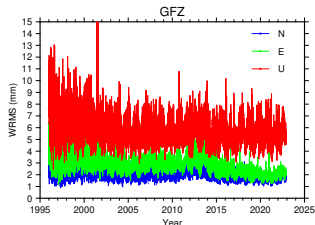
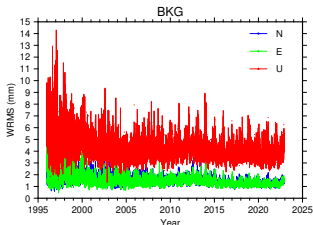
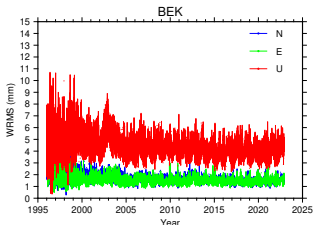
Repro3: Stacking of individual AC daily solutions

- Results from the stacking of individual AC daily solutions from years 1996-2022 into AC long-term solutions

AC	Software	No. of used daily solutions	No. of sites	Mean WRMS		
				N (mm)	E (mm)	U (mm)
BEK	Bernese 5.4	9827	156	1.59	1.50	4.33
BKG	Bernese 5.5	9827	189	1.55	1.46	4.23
GFZ	EPOS.P8	9827	134	2.05	2.83	5.79
IGE	Bernese 5.4	9827	118	2.05	1.94	4.72
IGN	Bernese 5.4	9827	76	1.30	1.25	3.51
MUT	GAMIT 10.71	9826	180	1.64	1.59	4.80
NKG	Bernese 5.4	9827	125	1.40	1.39	4.03
ROB	Bernese 5.4	9827	142	1.17	1.08	3.11
SGO	Bernese 5.4	9804	76	1.52	1.46	3.61
SUT	Bernese 5.4	9827	109	1.41	1.29	3.89
UPA	Bernese 5.4	9041	126	1.96	1.79	5.39
WUT	Bernese 5.4	9827	191	1.77	1.58	4.85

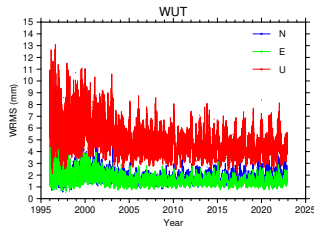
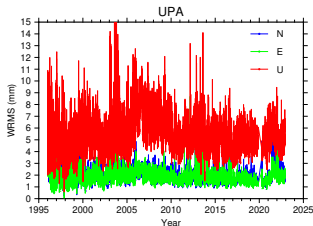
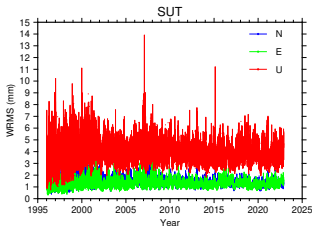
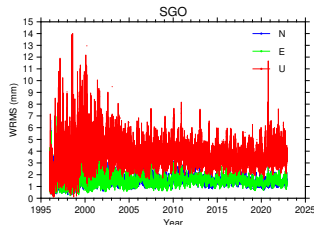
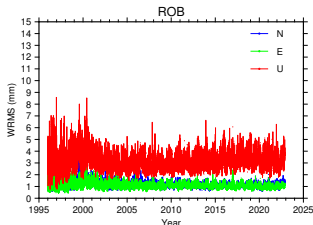
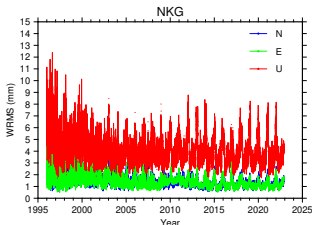
Repro3: WRMS of AC solutions (1/2)

- WRMS of station position residuals between AC daily solutions and AC long-term solution



Repro3: WRMS of AC solutions (2/2)

- WRMS of station position residuals between AC daily solutions and AC long-term solution



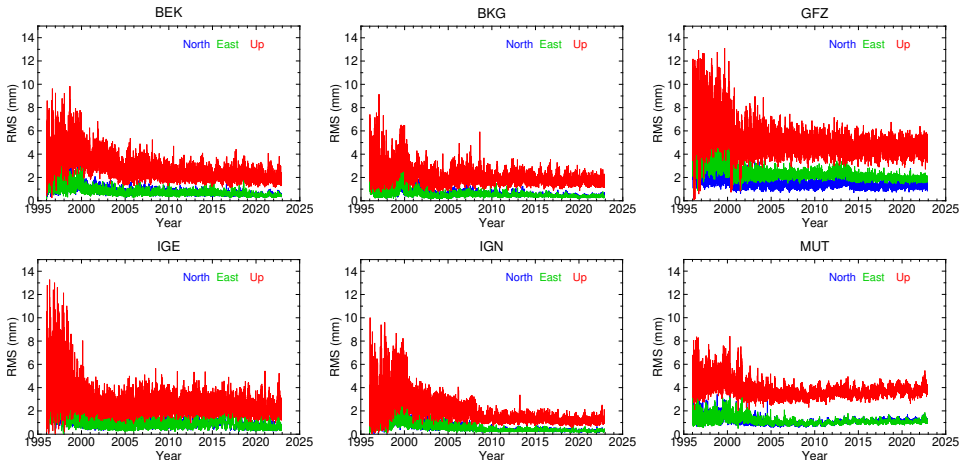
The cleaned AC Reporo3 solutions were combined to obtain the main product: **the EPN daily combined solutions**.

Characteristics of the combination process:

- the daily AC solutions combined on a normal equation level using Bernese GNSS software
 - weighting factors (WF) for Bernese solutions: 1. For other solutions (GFZ and MUT) the WFs computed wrt Bernese solutions using mean values of NEQ elements and mean WRMS values (slide 13)
 - each AC solution was compared with the combined solution to evaluate its quality
- the combined solutions were aligned to IGS20 reference frame using no-net-translation minimum constraint conditions

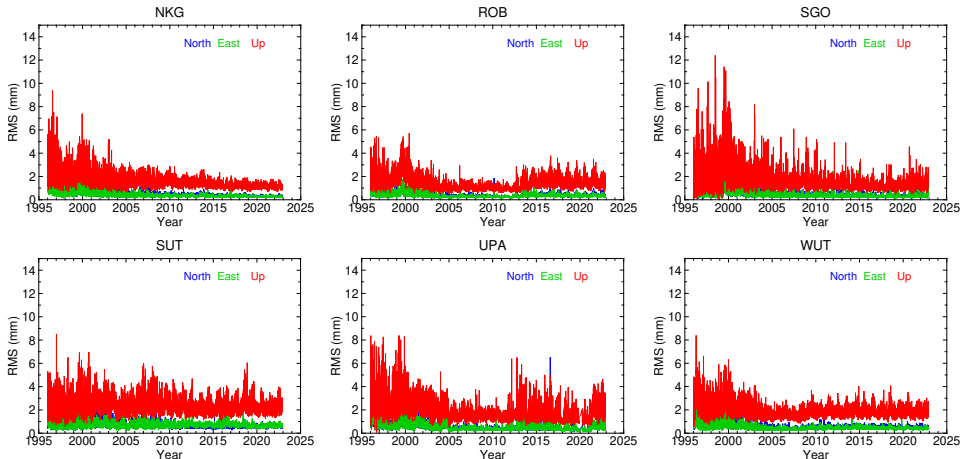
Repro3: RMS of AC station position residuals (1/2)

- RMS of station position residuals between AC daily solutions and daily combined solution



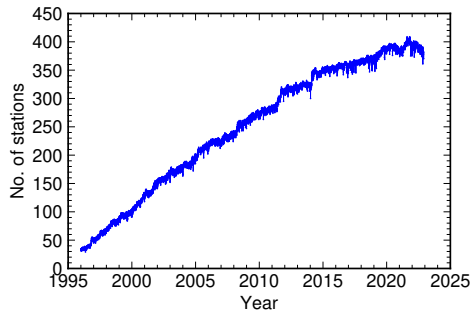
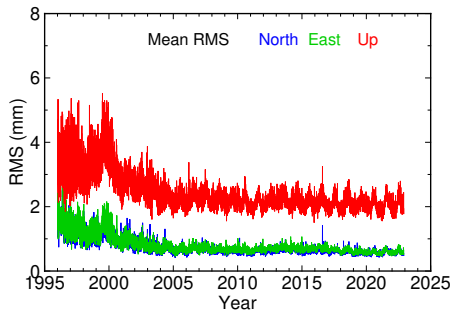
Repro3: RMS of AC station position residuals (2/2)

- RMS of station position residuals between AC daily solutions and daily combined solution



Repro3: Combined solutions

- **Left:** The daily RMS values of position residuals between AC solutions and the combined solution
- **Right:** Number of stations in EPN-Repro3 daily combined solution



Repro3: Daily and weekly combined products

The EPN Repro3 daily and weekly products:

- Daily coordinate solutions and reports:

EUROE03SNX_YYYYDDD0000_01D_01D_SOL.SNX

EUROE03SNX_YYYYDDD0000_01D_01D_SUM.SUM

EUROE03SNX_YYYYDDD0000_01D_01D_SUM.YML

- Weekly coordinate solutions and reports:

EUROE03SNX_YYYYDDD0000_07D_07D_SOL.SNX

EUROE03SNX_YYYYDDD0000_07D_07D_SUM.SUM

The EPN Repro3 daily and weekly products are available at the BKG and BEV EPN Data Centers, as well as on the EPOS GNSS Products Portal.

More details on the entire EPN-Repro3 project can be found in the dedicated paper:

Christof Völksen, Tomasz Liwosz, Juliette Legrand, Martin Lidberg, Andrzej Araszkiewicz, Carine Bruyninx, Manuel G. Hidalgo, Martin Imrišek, Lila Jean-Louis, Tina Kempe, Benjamin Männel, Johan Leclercq, Rosa Pacione, Juraj Papco, Sándor Tóth, Lin Wang, Junchen Xue & Joaquín Zurutuza (2026). *EPN-Repro3: Improved Maintenance of Regional Reference Frames Through Standardized and Complete Reprocessing of all Available GNSS Data (1996-Present)*. In: International Association of Geodesy Symposia. Springer, Berlin, Heidelberg.

https://doi.org/10.1007/1345_2026_371

- The ACC continued combination of operational AC solutions
 - AC solutions for weeks 2238–2318 recombined (new and updated AC solutions included)
 - new product files available (CRD and YML files)
- The combination of AC Repro3 solutions was finished in August 2025
 - all products are available at the EPN DCs
- The EPN combined solutions from 1996 to the present are consistent and expressed in the IGS20 reference frame and its updated versions (IGb20, IGc20)