

The report of the EPN Analysis Centres Coordinator

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EUREF Symposium 2025

Covilhã, Portugal, June 25-26, 2025

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 AC and combined coordinate solutions
- Status of EPN AC solutions in EPN reprocessing 3 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 2025	change ¹
ASI	GipsyX 2.1	Final	Rapid	–	–	120	+2/–2
BEK	Bernese 5.4	Final	Rapid	–	Repro3	143	+4/–1
BEV	Bernese 5.4	Final	–	–	–	172	0/–4
BKG	Bernese 5.4	Final	Rapid	–	Repro3	157	+3/–2
COD	Bernese 5.5	Final	–	–	–	39	0/ 0
GFZ	EPOS.P8	Final	–	–	Repro3	111	0/–3
IGE	Bernese 5.4	Final	Rapid	–	Repro3	99	+2/–3
IGN	Bernese 5.4	Final	–	–	Repro3	64	+4/–2
LPT	Bernese 5.5	Final	Rapid	NRT	–	59	0/–1
MUT	GAMIT 10.71	Final	Rapid	–	Repro3	156	0/–2
NKG	Bernese 5.4	Final	Rapid	NRT	Repro3	108	0/ 0
RGA	Bernese 5.4	Final	–	–	–	69	0/–2
ROB	Bernese 5.4	Final	Rapid	–	Repro3	115	+4/–3
SGO	Bernese 5.4	Final	Rapid	–	Repro3	66	0/–1
SUT	Bernese 5.4	Final	Rapid	NRT	Repro3	96	+2/ 0
UPA	Bernese 5.4	Final	Rapid	–	Repro3	114	0/–5
WUT	Bernese 5.4	Final	Rapid	–	Repro3	155	+1/–2

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

Recent changes in EPN analysis

New AC solutions:

- IGN AC started provided operational final solutions in June 2024 (from week 2314)
 - IGN provided all previous solutions as well (for weeks 2238-2313)
- RGA AC provided new solutions for weeks 2238-2304
- NKG AC started providing NRT solutions this year

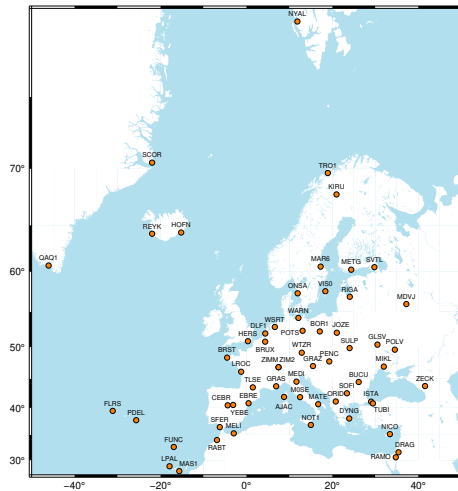
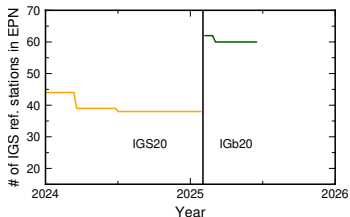
New EPN stations included in AC and combined solutions:

Station	Start date	Processing ACs
AAERO0FRA	18-05-2025	IGE, IGN, ROB, SUT
ASGA00CYP	13-04-2025	ASI, BEK, WUT
ECH200LUX	20-04-2025	BEK, BKG, IGN, ROB
GVDG00GRC	14-07-2024	ASI, BEK, BKG
IGNP00FRA	16-02-2025	IGE, IGN, ROB, SUT
TROS00LUX	20-04-2025	BEK, BKG, IGN, ROB

Recent changes: Switch from IGS20 to IGb20

Since GPS week 2352 EPN combined solutions have been aligned to the IGb20 reference frame

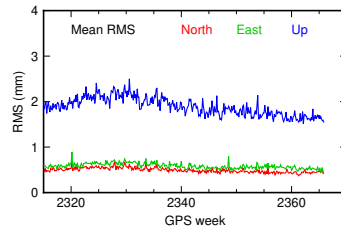
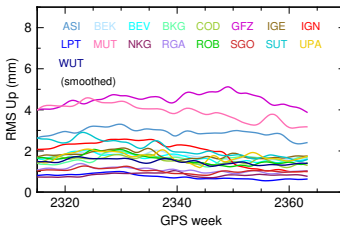
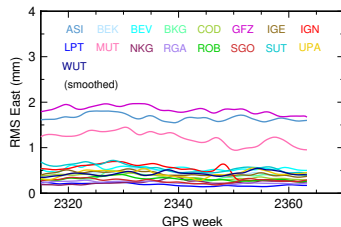
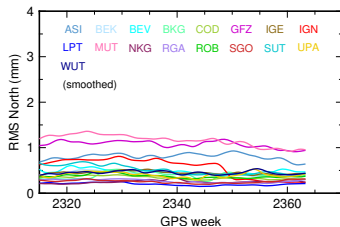
- at the time of the switch 62 EPN stations available in IGb20 (vs. 38 in IGS20)
- presently 60 usable EPN IGS20 stations (due to discontinuities)



EPN IGb20 stations

Combined solutions: AC solutions agreement (last year)

- RMSs of position residuals (smoothed) between each AC solution and combined solution (from GPS week 2314 to 2365)
- Bottom right: Mean RMS values



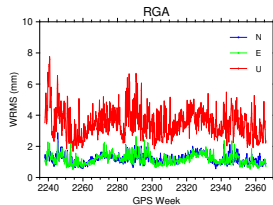
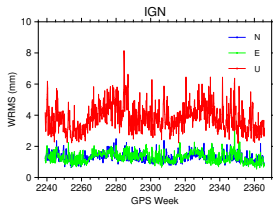
Recombination of solutions for GPS weeks 2238-2313

New combined solutions were computed for weeks 2238-2313.

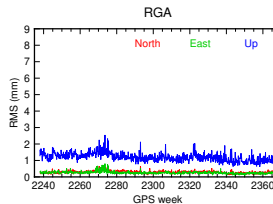
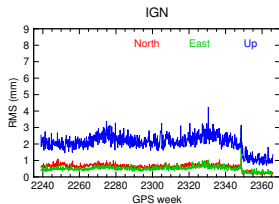
- the new solutions are based on all (17) AC solutions, including:
 - new solutions from IGN for weeks 2238-2313
 - new solutions from RGA for weeks 2238-2304
 - updated solutions from ROB for weeks 2238-2286
 - updated solutions from BEV for 12 weeks
 - updated solutions from BKG for 35 weeks
- For consistency, 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: check quality of AC solutions (examine station position time series, exclude outliers)
- The new combined solutions will be uploaded to the DCs (BKG, BEV) after the Symposium

WRMS and RMS of new AC solutions: IGN, RGA

- WRMS of station position residuals between AC daily solutions and AC long-term solution (step 2)



- RMS of station position residuals between AC daily solutions and combined daily solution (step 3)



Status of EPN reprocessing 3 project

The goal of the EPN reprocessing 3 project is 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 is conducted by the EPN Reprocessing Working group chaired by Christof Völksen

- 12 ACs participate in the EPN reprocessing 3 project: BEK, BKG, GFZ, IGE, IGN, MUT, NKG, ROB, SGO, SUT, UPA, and WUT
- The task of the ACC is to analyze and combine daily AC repro3 solutions

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

EPN Repro3 – status of AC solutions (as of 9.06.2025)

AC	Software	No. of sites	Provided solutions	No. of. daily SNX files
BEK	Bernese 5.4	156	1996-2022	9827
BKG	Bernese 5.4	189	1996-2022	9827
GFZ	EPOS.P8	134	1996-2022	9827
IGE	Bernese 5.4	118	1996-2022	9827
IGN	Bernese 5.4	76	1996-2022	9827
MUT	GAMIT 10.71	180	1996-2022	9827
NKG	Bernese 5.4	125	1996-2022	9827
ROB	Bernese 5.4	142	1996-2022	9827
SGO	Bernese 5.4	76	1996-2022	9804
SUT	Bernese 5.4	109	1996-2022	9827
UPA	Bernese 5.4	126	1996-2022	8857
WUT	Bernese 5.4	191	1996-2022	9827

Stacking of AC daily solutions into AC long-term solutions (step 2)

- Mean WRMS values of position residuals of AC daily solutions wrt. the AC long-term solutions

AC	Completed solutions	No. of used daily solutions ¹	No. of sites	Mean WRMS		
				N (mm)	E (mm)	U (mm)
BEK	1996-2022	9827	156	1.59	1.50	4.33
BKG	1996-2022	9827	189	1.55	1.46	4.23
GFZ	1996-2022	9827	134	2.05	2.83	5.79
IGE	1996-2022	9827	118	2.05	1.94	4.72
IGN	1996-2022	9827	76	1.30	1.25	3.51
MUT	1996-2022	9826	180	1.64	1.59	4.80
NKG	1996-2022	9827	125	1.40	1.39	4.03
ROB	1996-2022	9827	142	1.17	1.08	3.11
SGO	1996-2022	9803	76	1.52	1.46	3.60
SUT	1996-2022	9827	109	1.41	1.29	3.89
UPA	2003-2022	6509	126	1.93	1.78	5.52
WUT	1996-2022	9827	191	1.77	1.58	4.85

¹ – some UPA daily solutions caused problems during the stacking and were excluded

Combination of AC solutions (step 3)

In step 3 the AC daily solutions were combined:

- exclusion of the position outliers identified in step 2
- detection and exclusion of position outliers in AC daily solutions wrt. the daily combined solutions

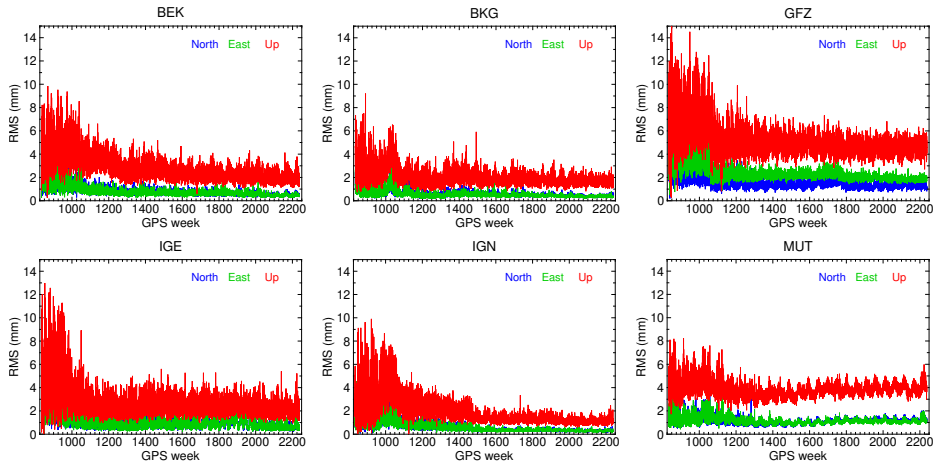
The preliminary combined solutions are based on:

- 11 AC solutions for GPS weeks 0834-1199 (1996.0-2003.0)
 - UPA solutions not used yet
- 12 AC solutions for GPS weeks 1200-2237 (2003.0-2022.9)
 - ~10% combined solutions based on 10 or 11 AC solutions

A few daily solutions from IGN, MUT, GFZ, IGE, SGO, and UPA ACs had to be excluded from combinations due to (1) small number of stations, (2) problems with normal equations inversion, or (3) increased number of position outliers.

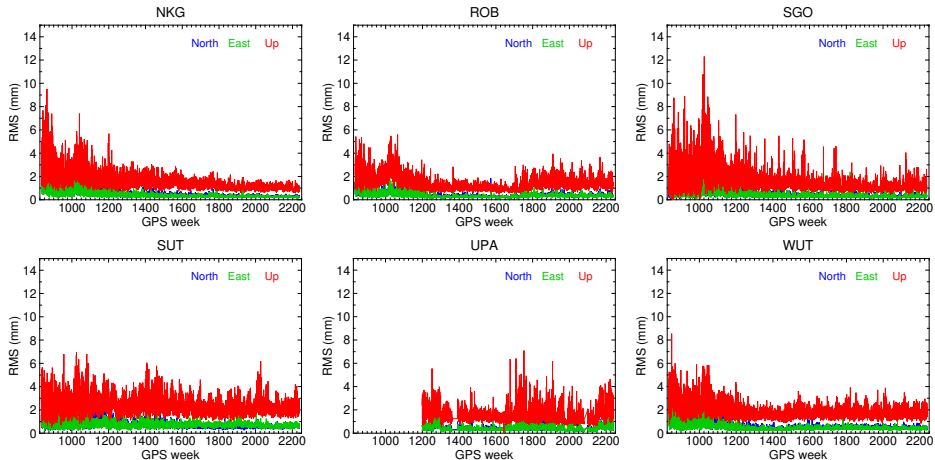
RMS of AC residuals

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



WRMS of AC solutions

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



- Since week 2314 operational combined solutions have been based on all 17 AC solutions
- Solutions for weeks 2238-2313 were recombined to include new and updated AC solutions
- The combination of EPN Repro3 solutions in progress
 - the individual AC solutions analyzed and cleaned
 - preliminary combined daily solutions created
 - some AC solutions cause problems during combinations and we recommend their refinement, so that they could be included in final combinations