

ARA-DAC Weekly Analysis Result: 2300 (GFA)

Technical Report

GPS Week: 2300 (GFA)

<http://geolabpasaia.org/gnss/ARA-euref/>

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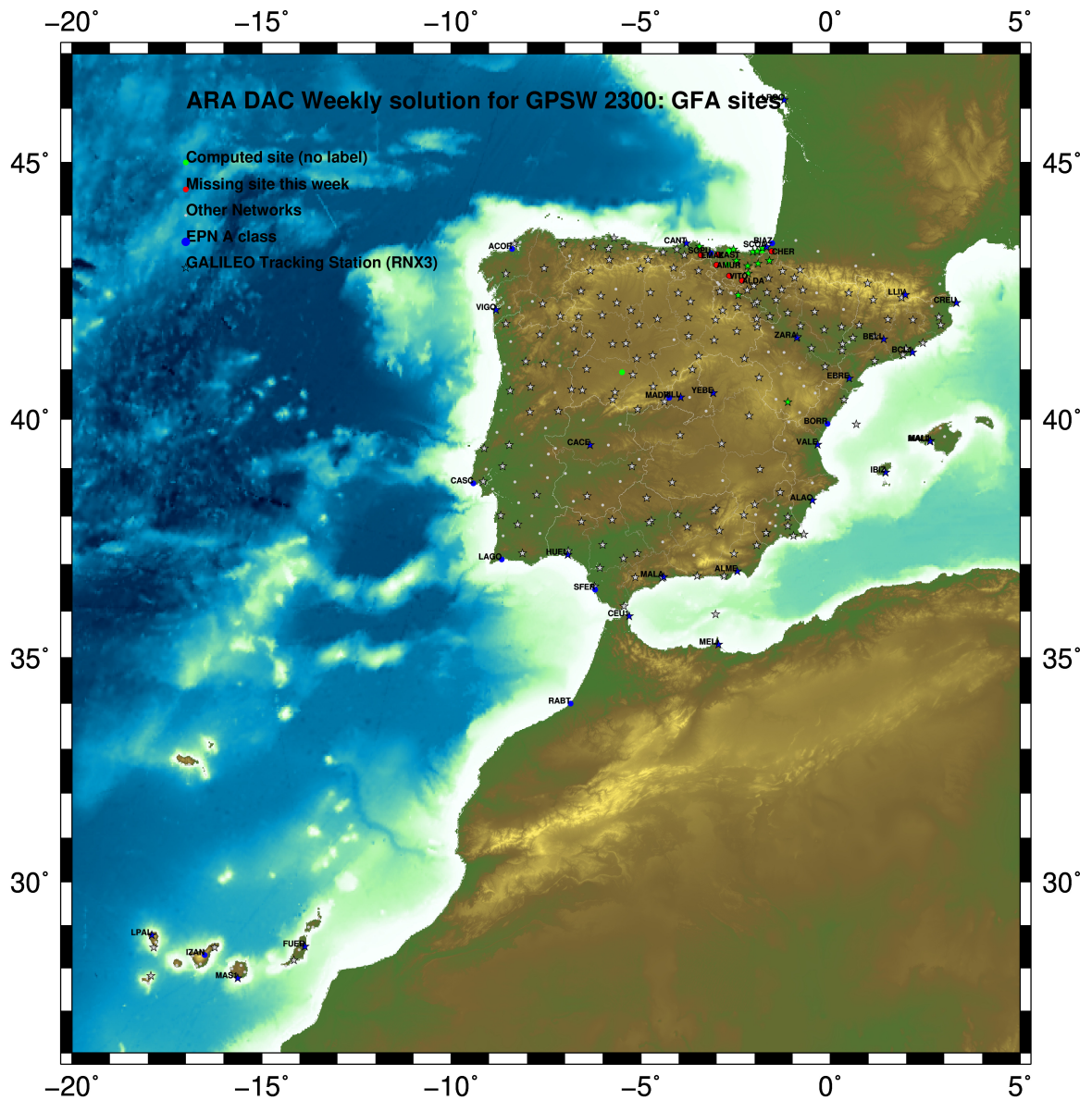


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1 Introduction

In may 2015 ARA (EUREF's acronym of the ARANZADI's Department of Applied Geodesy), kicks off as a EUREF's Operational Center. In July 2015, the Densification solutions ARA computes routinely in a weekly basis start being submitted to the EUREF's EPN Densification Project.

2 Map of Computed Sites



GM 2024 Feb 26 05:12:08

Fig.1: Computed Sites for GPS Week2300 (GFA)

3 Main Computation Parameters

The main parameters considered in the ARA analysis follow strictly the EPN recommendations.

- Preprocessing: Independent baselines are defined by the criterion of maximum common observations. Cycle slips are fixed with the MAUPRP program, analysing triple phase differences for each independent baseline. If MAUPRP does not fix all slips for one station, that station is edited out.
- Basic Observable : Carrier phase, L_1 and L_2 ; a priori sigma of single differences: 0.002 m.
 - sampling (for ambiguity resolution): 30 s
 - sampling (for final processing): 180 s
 - Systems: GPS+GLONASS observations are used (Galileo is used if available starting GPS week 1986)
- Modelled observable: Double differences of carrier phase using different combinations based on the distance.
- Ground antenna phase center calibrations: Group APCV used from the PCV_COD.I20 file and individual calibrations from EPNC_20.ATX. In case no calibration values of an antenna/radome pairs are not available for a certain GNSS system at some station, the observation of this/these GNSS/GNSSs are excluded from the analysis of that station.
- Reference sites: the latest IGS cumulative solution is used to align our solution to the latest IGS20 release, regularly updated and available at: IGS0OPSSNX_1994002_00U_00U_CRD.SNX.gz. Following the EUREF guidelines, no other individual calibrations are included in the analysis starting GPSW 2238 (IGS20); also applies to repro3 solutions, which are based on IGS20 standards.
- Troposphere:
 - minimum elevation is 3 deg.; elevation dependent weighting.
 - VMF3 mapping function. ZPD parameters are estimated using the VMF3 mapping function.
 - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2014b (Scherneck).
- Atmospheric loading: not corrected, following the latest recommendations for IGS20 products.
- Tidal displacements:
 - Mean pole model : IERS2010_v1.2.0
 - Subdaily pole model: DESAI2016
 - Nutation model : IAU2000R06

4 Estimated Parameters

- Adjustment: Least Squares
- Rejection Criteria: $3 \times \text{rms}$ of single differences, in the weekly combination of daily normal equations (ADDNEQ)
- Station coordinates: minimum constraints (MC) to IGS sites (only translations).
- Troposphere: 3 deg. After having obtained coordinates valid for the entire week, tropospheric zenith delay is solved at each site at intervals of 1 hour throughout the week, holding the coordinates constrained at the weekly values.

- Ionospheric: second and third "High Order Ionosphere (HOI)" corrections used, using CODE files, to improve Ambiguity Resolution.
- Satellite clock bias: not estimated because are eliminated by double differencing the phase data.
- Receiver clock bias: not estimated because are eliminated by double differencing the phase data.
- Orbits and ERPs: CODE's orbits and ERP for both rapid and final solutions. DE421 planetary ephemeris and JGM3 Earth geopotential model is used.
- Ambiguity: an advanced ambiguity resolution (AR) scheme is included:
 - Code-Based Widelane (WL) and Narrow Line (NR) AR for baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane and narrow-lane AR is computed.
 - Phase-Based Widelane (L_5) AR for baselines shorter than 200km, the code-based wide-lane AR is replaced by a phase-only wide-lane with a subsequent narrow-lane AR.
 - Quasi-Ionosphere-Free (QIF) AR for the remaining real-valued ambiguities for baselines shorter than 2000km.
 - Direct L_1/L_2 AR for baselines shorter than 20km
- AR Verification: Each baseline is processed by introducing the resolved integer ambiguities and checking the residuals. If there is any problem, the ambiguities are re-initialized.

5 Computed Coordinates

In this section the adjusted coordinates are summarized. Note that the sites with an A flag are the computed ones, whereas sites flagged as W (IGS cumulative solution) are the ones used in the Minimal Constraints condition.

5.1 IGS20

The Reference Frame considered in this section is the IGS20 (IGS cumulative solution), mapped from 2015.0 to the observation epoch.

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ARA FINAL WEEKLY COMBINATION: FINAL ORBITS
26-FEB-24 04:09
-----
LOCAL GEODETIC DATUM: IGS20          EPOCH: 2024-02-07 11:59:45
-----
NUM STATION NAME      X (M)      Y (M)      Z (M)      FLAG  SYSTEM
-----
111 ACRD 13434M001    4594489.51736  -678367.33802  4357066.33222  W      G
 50 ALSA 19419M001    4677250.78435  -176770.30579  4319079.92990  A      GRE
384 BIAZ 10074M002    4634455.99780  -124344.88709  4365785.50935  W      GR
101 BIDA 00000M000    4644177.77082  -145778.23388  4354832.53380  A      GR
113 BRZR 19387M001    4662220.94126  -220769.81189  4333309.49004  A      GR
573 CACE 13447M001    4899866.45942  -544566.94632  4033770.26057  W      GRE
592 CANT 13438M001    4625924.26882  -307096.14784  4365771.61441  W      GRE
908 CREU 13432M001    4715420.07389  273178.15000  4271946.89737  W      GRE
135 EBRE 13410M001    4833519.94088  41537.48276  4147461.77263  W      GRE
180 ELGE 19353S001    4657557.34421  -202241.38084  4338991.93964  A      GRE
209 GERN 19389M001    4642811.26901  -217222.83583  4353278.92634  A      GR
257 HOND 15012M002    4640529.26630  -145675.89754  4358781.80975  A      GRE
235 IGEL 19352S001    4645951.37747  -165574.41483  4352550.47767  A      GRE
240 ISPS 19484M001    4640596.42890  -206963.68775  4356391.96870  A      GRE
252 LARE 19440M001    4632831.90825  -279026.05469  4360314.48451  A      GRE
256 LAZK 19354S001    4666098.29446  -178186.10214  4330463.72821  A      GRE
261 LEIT 19428M001    4663520.88811  -155858.62946  4334519.94304  A      GRE
334 ORDN 19427M001    4659695.72853  -130864.64702  4338948.93888  A      GRE
345 PASZ 19351S001    4644909.01001  -156644.98137  4353623.13084  A      GRE
493 PASA 19351S001    4644909.01053  -156644.98103  4353623.13146  A      GRE
553 RIO1 13448M002    4708446.77711  -199490.19320  4284089.78906  A      GR
558 SALA 13469M001    4803054.43718  -462130.98079  4158379.13134  A      GR
526 SCDA 10088M002    4639940.45595  -136224.86555  4359552.47447  W      GRE
715 SOPU 19386M001    4643997.85799  -255913.81881  4350063.19365  W      GR
443 TERU 13487M001    4867391.27289  -95523.26408  4108341.74126  A      GR
616 YEBE 13420M001    4848724.52002  -261631.83829  4123094.38528  W      GRE
655 ZARA 13462M001    4773803.11855  -73505.89602  4215454.15058  W      GRE
    
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5.2 ETRF2000 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

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CONVERT TO ETRF2000
26-FEB-24 04:09
-----
LOCAL GEODETIC DATUM: ETRF2000      EPOCH: 2024-02-07 11:59:45
-----
NUM STATION NAME      X (M)      Y (M)      Z (M)      FLAG  SYSTEM
-----
111 ACRD 13434M001    4594489.85891  -678367.96777  4357065.85622  W
 50 ALSA 19419M001    4677251.19061  -176770.94454  4319079.45379  A
384 BIAZ 10074M002    4634456.41489  -124345.52054  4365785.03768  W
101 BIDA 00000M000    4644178.18414  -145778.86856  4354832.06099  A
113 BRZR 19387M001    4662221.34273  -220770.44895  4333309.01462  A
573 CACE 13447M001    4899866.79304  -544567.61234  4033769.75990  W
592 CANT 13438M001    4625924.66125  -307096.78074  4365771.14093  W
908 CREU 13432M001    4715420.53700  273177.50822  4271946.42412  W
135 EBRE 13410M001    4833520.36277  41536.82603  4147461.28594  W
180 ELGE 19353S001    4657557.74864  -202242.01729  4338991.46488  A
209 GERN 19389M001    4642811.67256  -217223.47054  4353278.45265  A
257 HOND 15012M002    4640529.67995  -145676.53178  4358781.33726  A
235 IGEL 19352S001    4645951.78793  -165575.04978  4352550.00443  A
240 ISPS 19484M001    4640596.83409  -206964.32217  4356391.49535  A
252 LARE 19440M001    4632832.30403  -279026.68835  4360314.01083  A
256 LAZK 19354S001    4666098.70145  -178186.73955  4330463.25305  A
261 LEIT 19428M001    4663521.29844  -155859.26650  4334519.46841  A
334 ORDN 19427M001    4659696.14258  -130865.28353  4338948.46493  A
345 PASZ 19351S001    4644909.42176  -156645.61617  4353622.65781  A
493 PASA 19351S001    4644909.42228  -156645.61583  4353622.65843  A
553 RIO1 13448M002    4708447.17750  -199490.83574  4284089.30992  A
558 SALA 13469M001    4803054.79199  -462131.63521  4158378.64028  A
526 SCDA 10088M002    4639940.87093  -136225.48969  4359552.00216  W
715 SOPU 19386M001    4643998.25606  -255914.45376  4350062.71932  W
443 TERU 13487M001    4867391.67315  -95523.91529  4108341.24973  A
616 YEBE 13420M001    4848724.89906  -261632.49772  4123093.89306  W
655 ZARA 13462M001    4773803.53041  -73506.54602  4215453.66750  W
    
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5.3 ETRF2014 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2014 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

CONVERT TO ETRF2014 26-FEB-24 04:09

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2024-02-07 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACDR 13434M001	4594489.81888	-678368.00465	4357065.90860	W	
50	ALSA 19419M001	4677251.14813	-176770.98293	4319079.50607	A	
384	BLAZ 10074M002	4634456.37269	-124345.55932	4365785.09013	W	
101	BIDA 00000M000	4644178.14191	-145778.90721	4354832.11339	A	
113	BRZR 19387M001	4662221.30057	-220770.48724	4333309.06693	A	
573	CACE 13447M001	4899866.74913	-544567.64835	4033769.81142	W	
592	CANT 13438M001	4625924.61976	-307096.81887	4365771.19332	W	
908	CREU 13432M001	4715420.49236	273177.46835	4271946.47662	W	
135	EBRE 13410M001	4833520.31769	41536.78754	4147461.33791	W	
180	ELGE 19353S001	4657557.70646	-202242.05567	4338991.51722	A	
209	GERN 19389M001	4642811.63059	-217223.50893	4353278.50503	A	
257	HOND 15012M002	4640529.63776	-145676.57045	4358781.38967	A	
235	IGEL 19352S001	4645951.74576	-165575.08835	4352550.05682	A	
240	ISPS 19484M001	4640596.79211	-206964.36061	4356391.54773	A	
252	LARE 19440M001	4632832.26238	-279026.72656	4360314.06320	A	
256	LAZK 19354S001	4666098.65909	-178186.77798	4330463.30537	A	
261	LEIT 19428M001	4663521.25603	-155859.30503	4334519.52075	A	
334	ORON 19427M001	4659696.10013	-130865.32216	4338948.51729	A	
345	PAS2 19351S001	4644909.37956	-156645.65478	4353622.71021	A	
493	PASA 19351S001	4644909.38008	-156645.65444	4353622.71083	A	
553	RI01 13448M002	4708447.13474	-199490.87391	4284089.36210	A	
558	SALA 13469M001	4803054.74899	-462131.67197	4158378.69208	A	
526	SC0A 10088M002	4639940.82872	-136225.52840	4359552.05458	W	
715	SOPU 19386M001	4643998.21421	-255914.49200	4350062.77167	W	
443	TERU 13487M001	4867391.62819	-95523.95312	4108341.30151	A	
616	YEBE 13420M001	4848724.85490	-261632.53503	4123093.94481	W	
655	ZARA 13462M001	4773803.48646	-73506.58435	4215453.71956	W	

6 Quality Control

6.1 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repeatabilities refer to the IGS20 solution and are given with respect to the Local frame (North-East-Up).

GFA FINAL WEEKLY COMBINATION: FINAL ORBITS 26-FEB-24 04:09

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.92	1.01	3.58
ALSA 19419M001	7	XXXXXX	1.22	0.74	3.02
BLAZ 10074M002	7	XXXXXX	1.80	0.65	4.17
BIDA 00000M000	7	XXXXXX	0.93	0.69	4.32
BRZR 19387M001	7	XXXXXX	2.65	4.44	2.84
CACE 13447M001	7	XXXXXX	0.90	1.13	2.20
CANT 13438M001	7	XXXXXX	1.48	1.10	2.65
CREU 13432M001	7	XXXXXX	0.98	2.43	3.36
EBRE 13410M001	7	XXXXXX	0.32	1.34	4.39
ELGE 19353S001	7	XXXXXX	0.74	1.54	2.75
GERN 19389M001	6	XXXXX	2.05	1.27	4.60
HOND 15012M002	7	XXXXXX	1.71	1.50	3.49
IGEL 19352S001	7	XXXXXX	3.55	1.10	3.99
ISPS 19484M001	7	XXXXXX	1.25	1.29	4.83
LARE 19440M001	7	XXXXXX	1.32	1.99	3.88
LAZK 19354S001	7	XXXXXX	1.40	2.29	5.86
LEIT 19428M001	7	XXXXXX	2.02	1.18	6.20
ORON 19427M001	7	XXXXXX	1.79	1.13	3.05
PAS2 19351S001	1	X	0.05	0.12	0.22
PASA 19351S001	7	XXXXXX	1.77	1.35	4.30
RID1 13448M002	7	XXXXXX	1.36	0.93	3.73
SALA 13469M001	7	XXXXXX	0.39	0.63	2.86
SCDA 10088M002	7	XXXXXX	1.22	1.81	2.76
SOPU 19386M001	7	XXXXXX	2.23	1.32	3.83
TERU 13487M001	7	XXXXXX	0.75	1.33	5.39
YEBE 13420M001	7	XXXXXX	0.75	1.09	2.09
ZARA 13462M001	7	XXXXXX	0.94	0.94	3.51

Comparison of individual solutions:

ACOR 13434M001	N	0.92	-1.50	-1.03	-0.51	0.17	0.21	1.14	0.32
ACOR 13434M001	E	1.01	0.06	-1.72	0.34	1.18	0.91	0.12	0.87
ACOR 13434M001	U	3.58	1.94	1.33	-0.91	8.19	-1.84	0.27	0.20
ALSA 19419M001	N	1.22	-0.19	-0.76	-0.27	-1.02	1.29	-0.46	2.29
ALSA 19419M001	E	0.74	-0.13	0.60	0.33	-1.56	-0.58	0.14	0.18
ALSA 19419M001	U	3.02	-3.20	-5.06	-0.12	-0.63	0.41	3.34	2.68
BLAZ 10074M002	N	1.80	-1.07	-1.27	-0.61	-0.12	0.98	2.92	2.61
BLAZ 10074M002	E	0.65	0.17	0.62	-0.60	-0.58	-0.60	1.02	0.17
BLAZ 10074M002	U	4.17	-3.27	-2.83	0.70	-4.75	1.08	7.72	1.42
BIDA 00000M000	N	0.93	0.11	0.17	0.74	0.11	-0.42	1.22	1.71
BIDA 00000M000	E	0.69	-1.07	0.20	-0.34	0.52	0.28	1.03	-0.40
BIDA 00000M000	U	4.32	-2.68	-5.47	-0.00	-3.14	1.69	7.31	2.96
BRZR 19387M001	N	2.65	1.40	0.88	1.17	2.56	-1.96	-4.99	1.65
BRZR 19387M001	E	4.44	1.67	3.20	1.24	3.46	-5.93	-7.51	0.45
BRZR 19387M001	U	2.84	-1.55	-0.89	1.95	1.50	-3.54	-5.04	-1.17
CACE 13447M001	N	0.90	0.42	0.30	0.54	-0.08	-0.82	-0.57	-1.80
CACE 13447M001	E	1.13	1.06	0.77	1.66	0.37	-0.63	0.83	-1.38
CACE 13447M001	U	2.20	2.06	-2.71	0.83	0.89	1.03	3.80	-0.61
CANT 13438M001	N	1.48	-0.41	-1.49	-0.18	0.94	-1.29	2.47	1.40
CANT 13438M001	E	1.10	0.44	1.68	0.85	0.18	-1.10	-1.22	0.87
CANT 13438M001	U	2.65	1.60	-3.98	-3.08	-1.11	-3.48	0.43	-0.80
CREU 13432M001	N	0.98	1.01	-1.05	1.03	1.00	0.01	0.20	-1.24
CREU 13432M001	E	2.43	-2.76	-0.92	-1.69	-1.19	-2.72	3.52	1.68
CREU 13432M001	U	3.36	1.23	-1.17	-0.90	-0.49	-3.93	-6.68	1.94
EBRE 13410M001	N	0.32	-0.02	-0.38	0.04	0.31	-0.09	0.28	0.52
EBRE 13410M001	E	1.34	-2.60	-0.82	-1.18	0.09	-1.05	0.03	0.91
EBRE 13410M001	U	4.39	-2.67	-5.54	1.56	1.63	1.58	2.12	-8.11
ELGE 19353S001	N	0.74	-0.57	-0.90	0.04	0.57	0.68	1.02	0.56
ELGE 19353S001	E	1.54	-1.15	-0.55	-1.61	-1.34	0.36	2.83	-0.43
ELGE 19353S001	U	2.75	-1.81	-3.68	1.27	1.16	-4.73	-1.04	1.43
GERN 19389M001	N	2.05	-0.23	0.18	1.41	3.22	-2.92	0.00	
GERN 19389M001	E	1.27	0.06	1.41	0.40	0.95	-2.02	-1.09	
GERN 19389M001	U	4.60	0.77	-4.21	-0.23	0.40	-5.76	7.35	
HOND 15012M002	N	1.71	-0.97	-1.11	0.19	-0.08	0.27	3.43	1.86
HOND 15012M002	E	1.50	0.81	1.41	0.86	0.66	-2.27	-2.06	0.47
HOND 15012M002	U	3.49	0.62	-3.73	3.15	-1.61	-2.64	-2.39	5.80
IGEL 19352S001	N	3.55	-2.70	-2.75	-1.38	-0.52	5.78	4.99	0.43
IGEL 19352S001	E	1.10	-0.40	1.15	-0.24	-0.83	1.50	-1.58	0.48
IGEL 19352S001	U	3.99	-0.14	-5.42	-0.08	-0.79	-1.10	7.98	0.75
ISPS 19484M001	N	1.25	-0.66	-0.53	0.18	-0.29	2.12	1.90	-0.70
ISPS 19484M001	E	1.29	-0.30	1.44	-0.43	-1.16	-1.43	0.62	1.98
ISPS 19484M001	U	4.83	2.21	-4.27	1.63	-7.65	3.54	0.94	6.49
LARE 19440M001	N	1.32	-0.78	-1.04	0.47	-1.24	1.92	0.39	1.79
LARE 19440M001	E	1.99	0.44	0.12	0.45	-0.43	4.20	-0.94	-2.16
LARE 19440M001	U	3.88	-0.06	-5.63	-2.30	-0.70	2.65	2.27	-6.38
LAZK 19354S001	N	1.40	-0.45	-1.30	-0.23	-1.12	2.61	0.18	1.30
LAZK 19354S001	E	2.29	-1.11	-1.05	-0.97	0.15	4.82	-2.09	-0.78
LAZK 19354S001	U	5.86	-5.56	-5.09	-2.20	-5.10	7.69	7.69	0.18
LEIT 19428M001	N	2.02	-0.90	-1.29	-0.21	-1.16	4.48	-0.08	0.81
LEIT 19428M001	E	1.18	-0.73	-0.57	-0.73	-0.86	2.24	0.08	-1.06
LEIT 19428M001	U	6.20	-6.44	-6.42	1.46	-6.84	5.19	8.19	2.29
ORON 19427M001	N	1.79	-1.76	-2.09	-1.21	-0.26	0.46	2.19	2.27
ORON 19427M001	E	1.13	-1.17	0.70	-0.05	-1.52	-1.85	-0.06	0.34
ORON 19427M001	U	3.05	-0.51	-3.51	-0.46	2.62	3.46	4.89	-0.40
PAS2 19351S001	N	0.05				0.05			
PAS2 19351S001	E	0.12				0.12			
PAS2 19351S001	U	0.22				0.22			
PASA 19351S001	N	1.77	-1.25	-1.48	-0.08	-0.21	1.96	2.55	2.16
PASA 19351S001	E	1.35	0.21	1.33	0.12	0.23	-2.50	1.48	-0.74
PASA 19351S001	U	4.30	-2.59	-7.21	-1.15	-0.01	1.68	4.89	4.90
RID1 13448M002	N	1.36	-1.00	-0.60	-1.17	-0.35	2.16	1.28	1.36
RID1 13448M002	E	0.93	-1.06	1.38	-0.19	0.69	-0.46	-0.67	-0.99
RID1 13448M002	U	3.73	-2.37	-6.15	1.33	-3.03	2.97	3.08	3.30
SALA 13469M001	N	0.39	-0.23	-0.27	0.05	-0.38	0.76	0.21	0.12

SALA	13469M001	E	0.63	0.13	0.19	0.96	0.59	0.65	-0.04	-0.82
SALA	13469M001	U	2.86	-2.87	-3.73	0.58	3.54	3.68	-0.00	0.85
SCDA	10088M002	N	1.22	0.26	0.66	1.70	-1.39	-0.42	0.62	1.75
SCDA	10088M002	E	1.81	1.13	2.15	1.44	-1.93	-1.60	-2.21	0.76
SCDA	10088M002	U	2.76	-0.63	-4.53	0.30	-1.03	3.16	3.62	-0.72
SOPU	19386M001	N	2.23	-0.85	-1.11	0.07	-0.52	4.60	2.33	1.03
SOPU	19386M001	E	1.32	0.55	1.52	1.32	0.04	1.91	-0.29	-1.52
SOPU	19386M001	U	3.83	-1.89	-7.20	-1.62	-1.84	-0.69	4.24	-2.85
TERU	13487M001	N	0.75	-0.25	-0.96	-0.22	0.80	-0.15	-1.24	0.33
TERU	13487M001	E	1.33	-1.81	0.49	-0.96	-0.61	0.35	-2.03	-1.27
TERU	13487M001	U	5.39	-4.07	-6.40	-2.04	-8.85	5.06	2.70	1.27
YEBE	13420M001	N	0.75	-0.09	-0.39	-0.37	-0.33	0.71	-0.70	1.41
YEBE	13420M001	E	1.09	0.44	0.04	0.84	0.87	0.87	0.73	-2.04
YEBE	13420M001	U	2.09	-2.38	0.39	-2.63	2.96	0.44	0.89	1.96
ZARA	13462M001	N	0.94	-0.53	-1.68	-0.53	0.07	1.32	-0.42	0.09
ZARA	13462M001	E	0.94	-1.32	0.12	-0.96	-0.73	-1.24	-0.67	-0.32
ZARA	13462M001	U	3.51	-4.43	-4.85	-2.92	1.34	1.60	1.94	3.76

6.2 Datum verification

In this section, the datum verification is shown. A 3 parameter Helmert 3D (3 translations) is computed to the minimally constrained sites.

TRANSFORMATION IN EQUATORIAL SYSTEM (X, Y, Z):
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

LIST OF REMOVED STATIONS:

OUTLIER CRITERIA: 15.00 15.00 20.00

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	1.81	-4.48	1.41
2	ALAC 13433M001	I W	0.25	0.65	0.39
3	ALME 13437M001	I W	-0.15	0.83	2.28
4	BCL1 19482M001	I W	-1.19	-0.07	-1.24
5	BELL 13431M001	I W	0.55	-0.90	1.71
6	BIAZ 10074M002	I W	1.43	1.62	-2.13
7	BORR 13480M001	I W	-2.86	-3.06	-2.19
8	BRST 10004M004	I W	0.09	-1.03	3.40
9	CACE 13447M001	I W	0.60	1.78	5.81
10	CANT 13438M001	I W	1.57	1.63	-2.11
11	CASC 13909S001	I W	2.20	-0.94	1.68
12	CEU1 13449M002	I W	0.83	1.92	1.16
13	CREU 13432M001	A W	-1.36	-4.95	-8.02
14	EBRE 13410M001	I W	0.84	1.47	-0.71
16	FLRS 31907M001	I W	-2.14	-0.45	2.78
17	FUER 31330M001	I W	0.30	-0.24	0.59
19	HUEL 13451M001	I W	0.68	3.36	-9.17
20	IBIZ 13454S001	I W	-0.02	2.19	-0.30
21	IZAN 31309M002	I W	-1.62	-1.24	-0.32
22	LAGO 13903M001	I W	-0.27	-1.41	0.88
23	LLIV 13436M001	I W	-2.93	0.07	1.86
24	LPAL 81701M001	I W	0.56	0.19	-4.72
25	LROC 10023M001	I W	-0.14	0.80	3.28
26	MADR 13407S012	I W	-1.96	0.20	-1.34
27	MAL1 13444M002	I W	2.97	1.72	-5.82
28	MALA 13443M001	I W	2.12	-1.42	2.75
29	MALL 13444M001	I W	-1.01	2.01	1.25
30	MAS1 31303M002	I W	-1.53	-1.76	1.51
31	MELI 19379M001	I W	0.33	-0.06	0.82
32	PDEL 31906M004	I W	-1.80	-3.71	-3.95
33	RABT 35001M002	I W	0.32	-0.83	-3.49
34	SCOA 10088M002	I W	1.64	1.78	-8.55
35	SFER 13402M004	I W	-1.66	-4.06	7.36
36	SOPU 19386M001	I W	0.76	1.71	1.58
37	VALE 13439M001	I W	-0.18	2.47	-1.40
38	VIGO 13450M001	I W	0.36	2.14	2.28
39	VILL 13406M001	I W	-1.22	-0.30	4.36
40	YEBE 13420M001	I W	-0.84	0.98	4.49
41	ZARA 13462M001	I W	0.08	1.47	-0.98
42	ZIMM 14001M004	I W	-0.78	0.24	5.70
RMS / COMPONENT			1.40	2.00	3.77
IQR			1.93	2.65	4.04
MEAN			-0.08	0.01	0.07
MEDIAN			0.08	0.19	0.85
MIN			-2.93	-4.95	-9.17
MAX			2.97	3.36	7.36
OVERALL RMS/IQR/MAX(3D)			2.59	2.86	9.79
					HUEL 13451M001 #SUM
ALL RMS / COMPONENT			1.40	2.00	3.77
ALL IQR			1.93	2.65	4.04
ALL MEAN			-0.08	0.01	0.07
ALL MEDIAN			0.08	0.19	0.85
ALL MIN			-2.93	-4.95	-9.17
ALL MAX			2.97	3.36	7.36
ALL OVERALL RMS/IQR/MAX(3D)			2.59	2.86	9.79
					HUEL 13451M001 #SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 40
NUMBER OF COORDINATES : 120
RMS OF TRANSFORMATION : 2.59 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.41 MM
TRANSLATION IN Y : 0.00 +- 0.41 MM
TRANSLATION IN Z : -0.00 +- 0.41 MM

NUMBER OF ITERATIONS : 1

6.3 Adjustment Statistics

In this section, the summary of the global adjustment and not subnetworks are shown. Also, the Helmert parameters of the combined solution with respect to the daily solutions are shown.

```
* STATISTICAL PARAMETER-----VALUE(S)-----
NUMBER OF OBSERVATIONS          18601142
NUMBER OF UNKNOWN               201329
NUMBER OF DEGREES OF FREEDOM    18399813
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  38.101825960777930
```

7 Equipment

7.1 Receiver List

Serial numbers not shown.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__ FIRMWARE____
ACOR A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
ALSA A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
BIAZ A 1 P 24:035:00000 24:041:86370 SPECTRA SP90M -----
BIDA A 1 P 24:035:00000 24:041:86370 LEICA GR10 -----
BRZR A 1 P 24:035:00000 24:041:86370 LEICA GR30 -----
CACE A 1 P 24:035:00000 24:041:86370 TRIMBLE NETR9 -----
CANT A 1 P 24:035:00000 24:041:86370 LEICA GR10 -----
CREU A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
EBRE A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
ELGE A 1 P 24:035:00000 24:041:86370 LEICA GR30 -----
GERN A 1 P 24:035:00000 24:040:86370 LEICA GR30 -----
HOND A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
IGEL A 1 P 24:035:00000 24:041:86370 LEICA GR30 -----
ISPS A 1 P 24:035:00000 24:041:86370 TRIMBLE NETR9 -----
LARE A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
LAZK A 1 P 24:035:00000 24:041:86370 LEICA GR30 -----
LEIT A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
ORON A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
PAS2 A 1 P 24:037:00000 24:037:86370 STONEX SC2200 -----
PASA A 1 P 24:035:00000 24:041:86370 LEICA GR30 -----
RI01 A 1 P 24:035:00000 24:041:86370 LEICA GR25 -----
SALA A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
SCOA A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
SOPU A 1 P 24:035:00000 24:041:86370 LEICA GR30 -----
TERU A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
YEBE A 1 P 24:035:00000 24:041:86370 LEICA GR50 -----
ZARA A 1 P 24:035:00000 24:041:86370 TRIMBLE NETR9 -----
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are used.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__ DAZI
ACOR A 1 P 24:035:00000 24:041:86370 LEIAT504 LEIS -----
ALSA A 1 P 24:035:00000 24:041:86370 LEIAR10 NONE -----
BIAZ A 1 P 24:035:00000 24:041:86370 LEIAR25 LEIT -----
BIDA A 1 P 24:035:00000 24:041:86370 LEIAS10 NONE -----
BRZR A 1 P 24:035:00000 24:041:86370 LEIAS10 NONE -----
CACE A 1 P 24:035:00000 24:041:86370 TRM29659.00 NONE -----
CANT A 1 P 24:035:00000 24:041:86370 LEIAR25_R4 LEIT -----
CREU A 1 P 24:035:00000 24:041:86370 LEIAR25_R4 NONE -----
EBRE A 1 P 24:035:00000 24:041:86370 LEIAR25_R4 NONE -----
ELGE A 1 P 24:035:00000 24:041:86370 LEIAR25_R4 LEIT -----
GERN A 1 P 24:035:00000 24:040:86370 LEIAS10 NONE -----
HOND A 1 P 24:035:00000 24:041:86370 LEIAR20 LEIM -----
IGEL A 1 P 24:035:00000 24:041:86370 LEIAR20 LEIM -----
ISPS A 1 P 24:035:00000 24:041:86370 TRM59900.00 SCIS -----
LARE A 1 P 24:035:00000 24:041:86370 LEIAR20 LEIM -----
LAZK A 1 P 24:035:00000 24:041:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 24:035:00000 24:041:86370 LEIAR10 NONE -----
ORON A 1 P 24:035:00000 24:041:86370 LEIAR10 NONE -----
PAS2 A 1 P 24:037:00000 24:037:86370 LEIAR20 LEIM -----
PASA A 1 P 24:035:00000 24:041:86370 LEIAR20 LEIM -----
RI01 A 1 P 24:035:00000 24:041:86370 LEIAR25_R4 LEIT -----
SALA A 1 P 24:035:00000 24:041:86370 LEIAR25 NONE -----
SCOA A 1 P 24:035:00000 24:041:86370 TRM55971.00 NONE -----
SOPU A 1 P 24:035:00000 24:041:86370 LEIAS10 NONE -----
TERU A 1 P 24:035:00000 24:041:86370 LEIAR20 LEIM -----
YEBE A 1 P 24:035:00000 24:041:86370 LEIAR20 LEIM -----
ZARA A 1 P 24:035:00000 24:041:86370 TRM29659.00 NONE -----
```

7.3 Eccentricities

```
* SITE PT SOLN T DATA_START__ DATA_END_____ UP_____ NORTH_____ EAST_____
*SITE PT SOLN T DATA_START__ DATA_END_____ AXE ARP->BENCHMARK(M)
ACOR A 1 P 24:035:00000 24:041:86370 UNE 3.0460 0.0000 0.0000
```

ALSA	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
BIAZ	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
BIDA	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	24:035:00000	24:041:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	24:035:00000	24:041:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	24:035:00000	24:041:86370	UNE	3.0490	0.0000	0.0000
CREU	A	1	P	24:035:00000	24:041:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	24:035:00000	24:041:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
GERN	A	1	P	24:035:00000	24:040:86370	UNE	0.0771	0.0000	0.0000
HOND	A	1	P	24:035:00000	24:041:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	24:035:00000	24:041:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
LAZK	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
ORDN	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
PAS2	A	1	P	24:037:00000	24:037:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
RID1	A	1	P	24:035:00000	24:041:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	24:035:00000	24:041:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	24:035:00000	24:041:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	24:035:00000	24:041:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	24:035:00000	24:041:86370	UNE	0.0600	0.0000	0.0000
YEBE	A	1	P	24:035:00000	24:041:86370	UNE	0.0600	0.0000	0.0000
ZARA	A	1	P	24:035:00000	24:041:86370	UNE	3.2590	0.0000	0.0000

8 Inconsistencies (logsheet-RINEX metadata)

The following inconsistencies were found comparing the data available in the logsheets and the RINEX headers:

```

2024-02-25 03:48 UTC | LARE0350.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-02-25 06:58 UTC | LARE0360.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-02-25 10:05 UTC | LARE0370.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-02-25 13:12 UTC | LARE0380.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-02-25 16:25 UTC | LARE0390.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-02-25 19:34 UTC | LARE0400.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-02-26 00:03 UTC | LARE0410.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
    
```

9 References

C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. etrs89.ensg.ign.fr/memo-V8.pdf

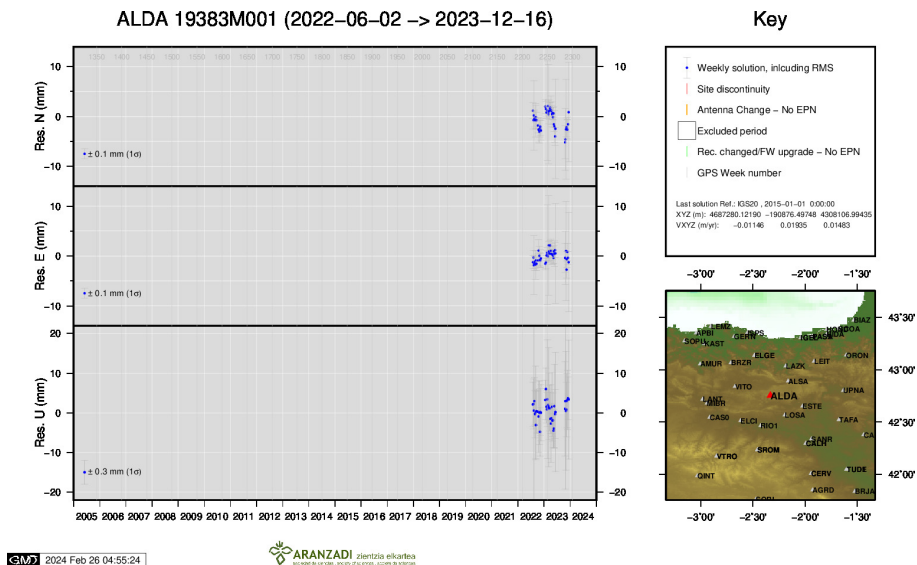
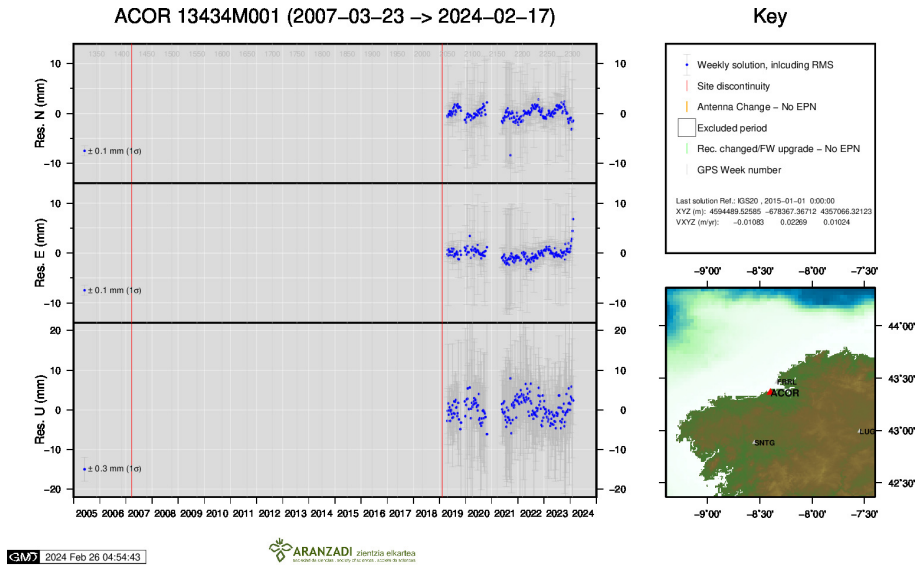
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

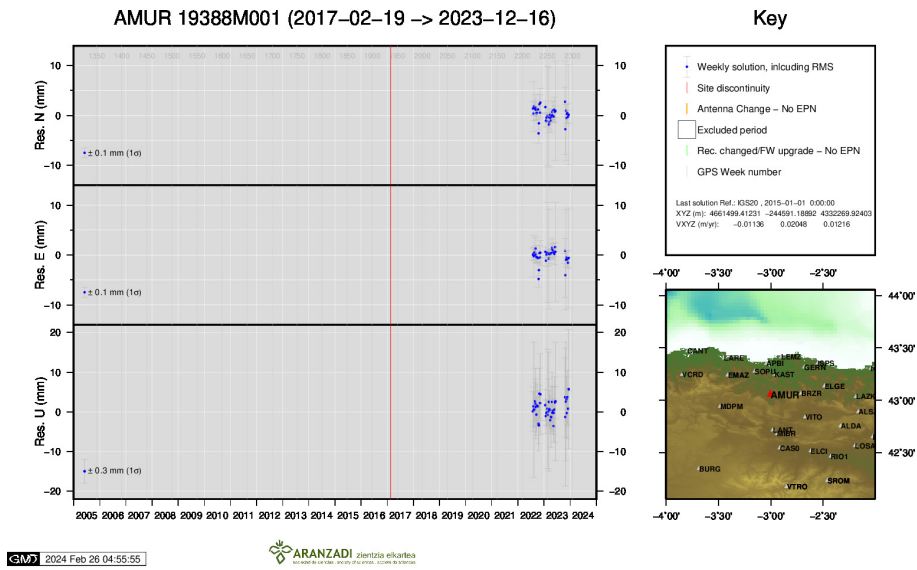
Johnston, G., Riddell, A., Hausler, G. (2017). The International GNSS Service. Teunissen, Peter J.G., Montenbruck, O. (Eds.), Springer Handbook of Global Navigation Satellite Systems (1st ed., pp. 967-982). Cham, Switzerland: Springer International Publishing. DOI: 10.1007/978-3-319-42928-1

Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

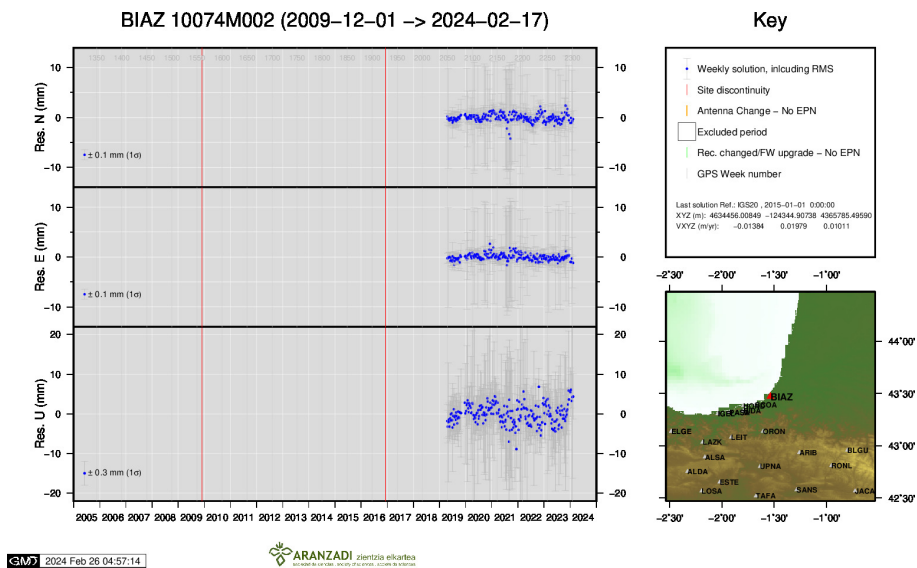
10 Cumulative Time Series

Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.

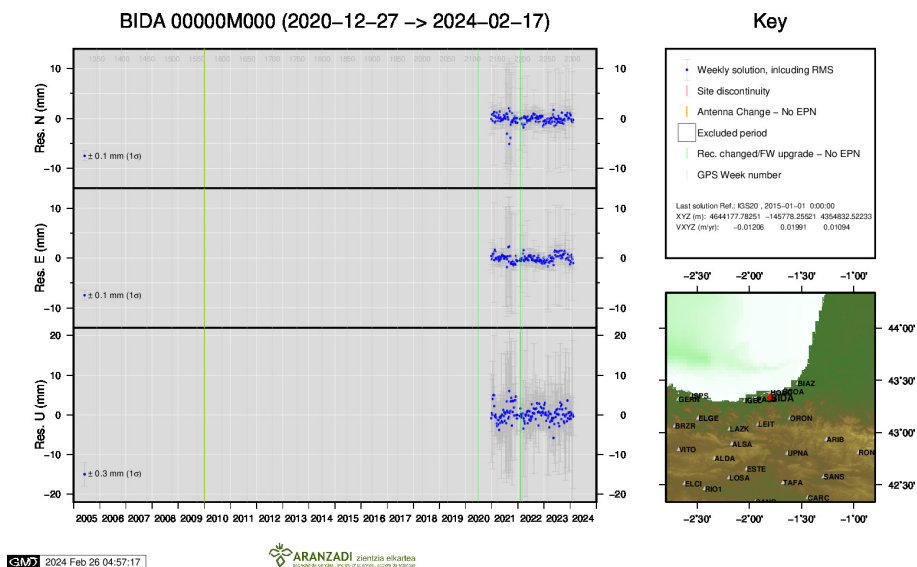




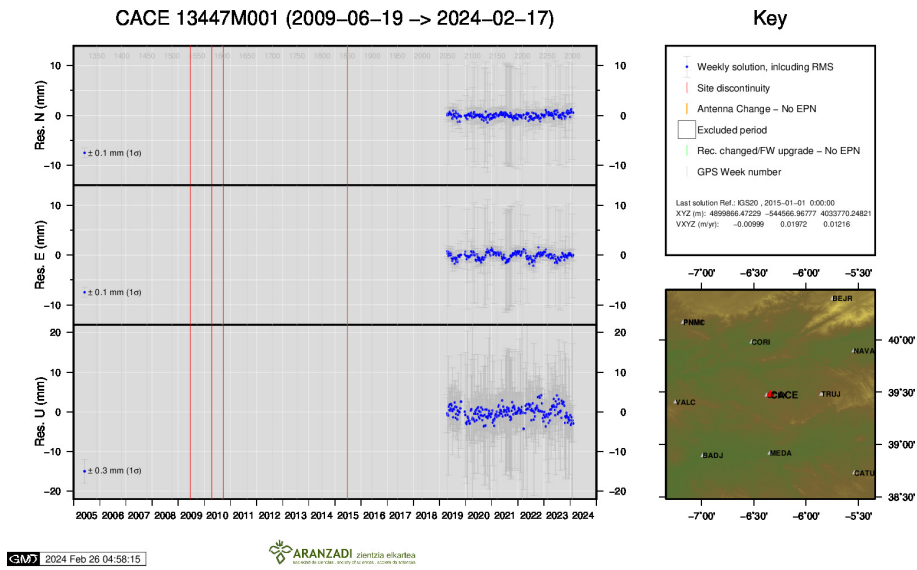
3) AMUR



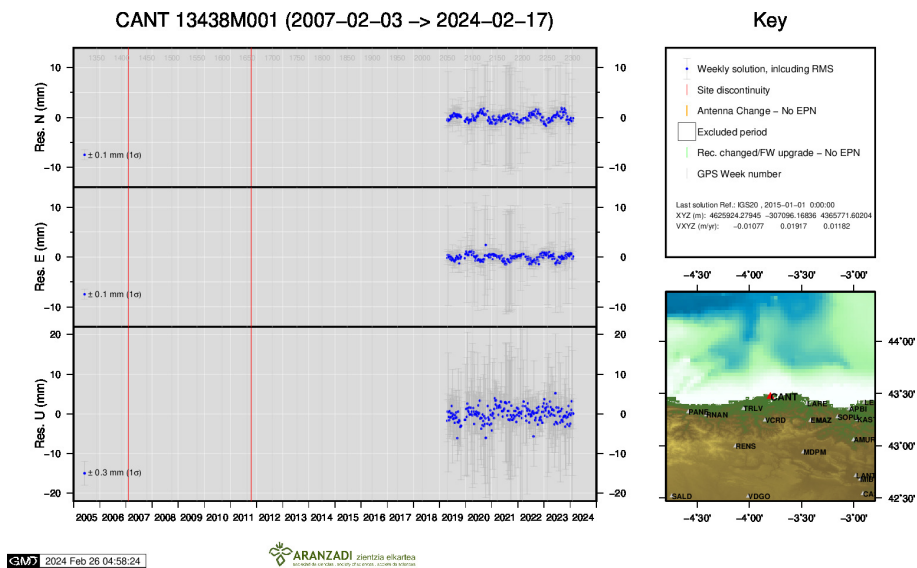
4) BLAZ



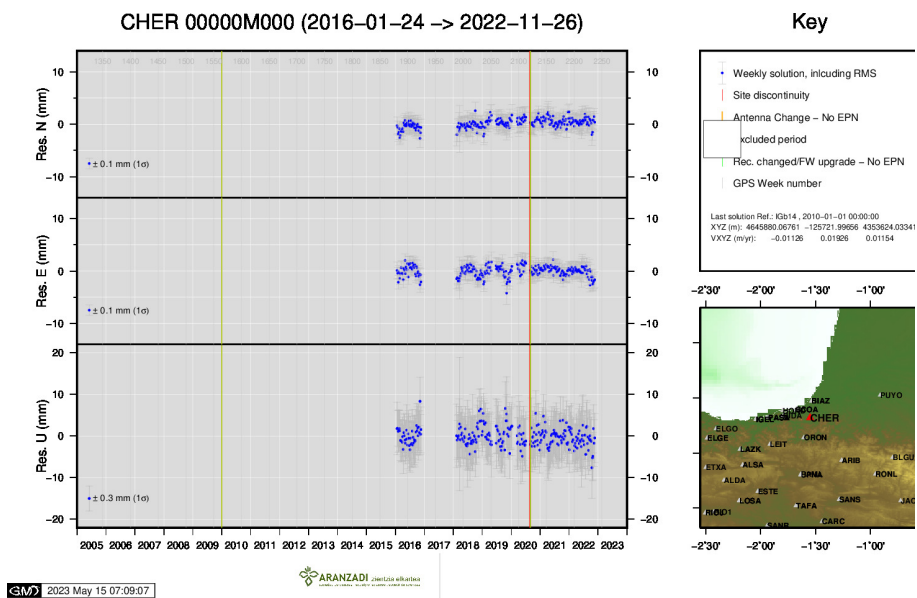
5) BIDA



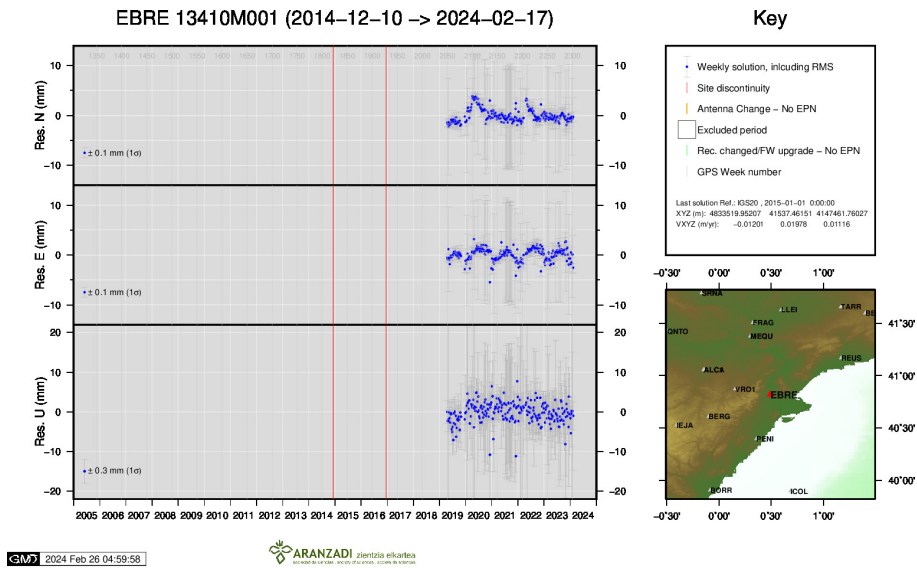
6) CACE



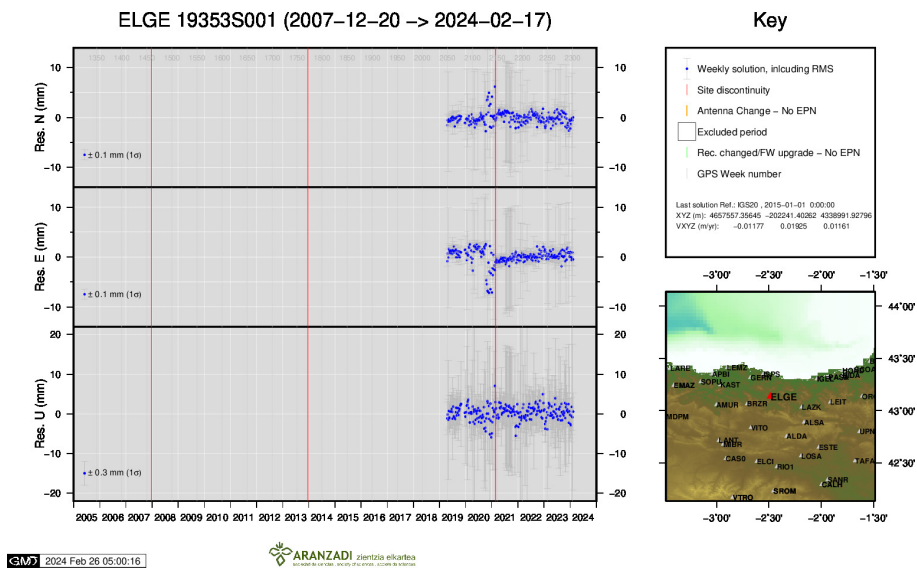
7) CANT



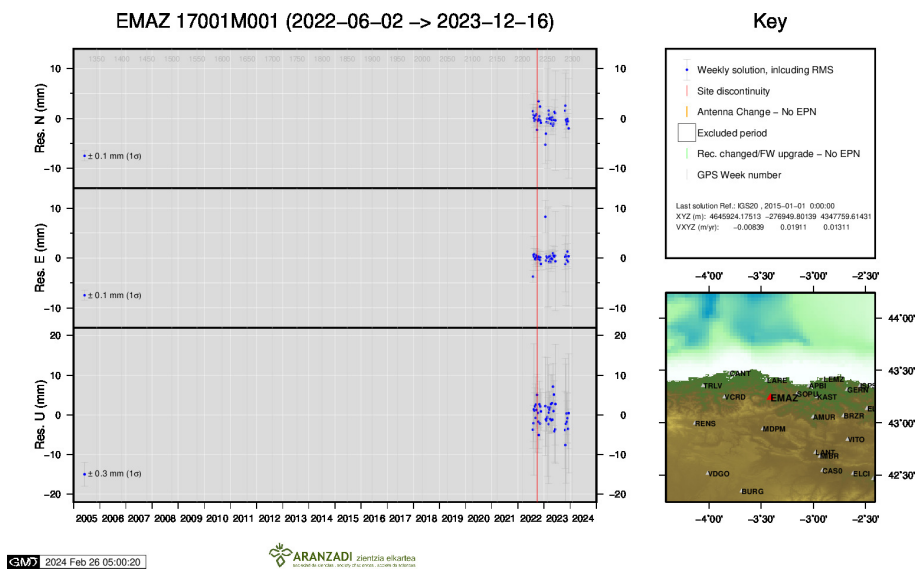
8) CHER



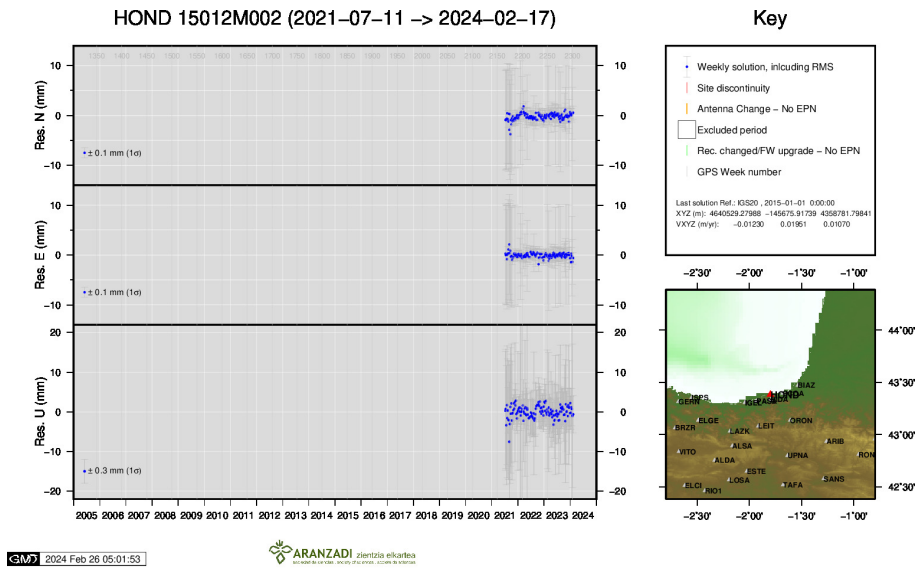
9) EBRE



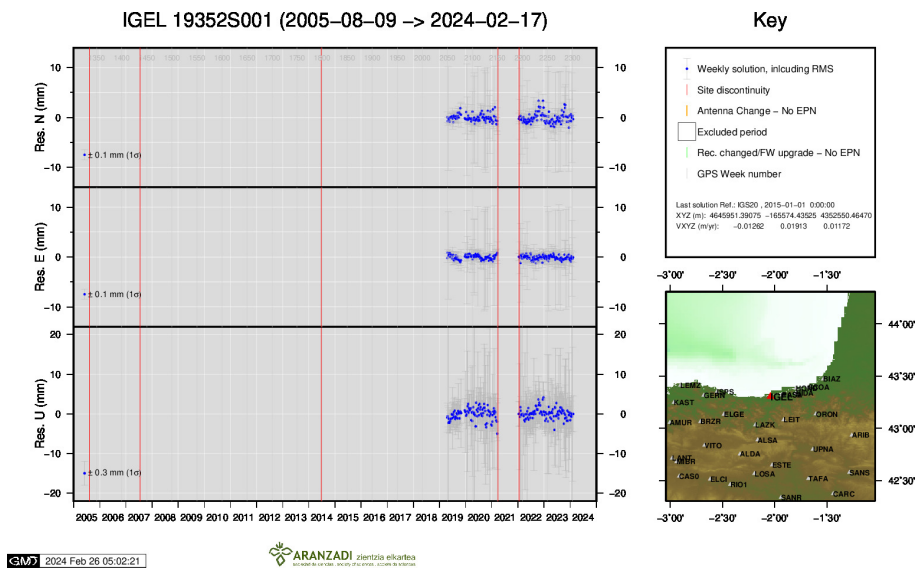
10) ELGE



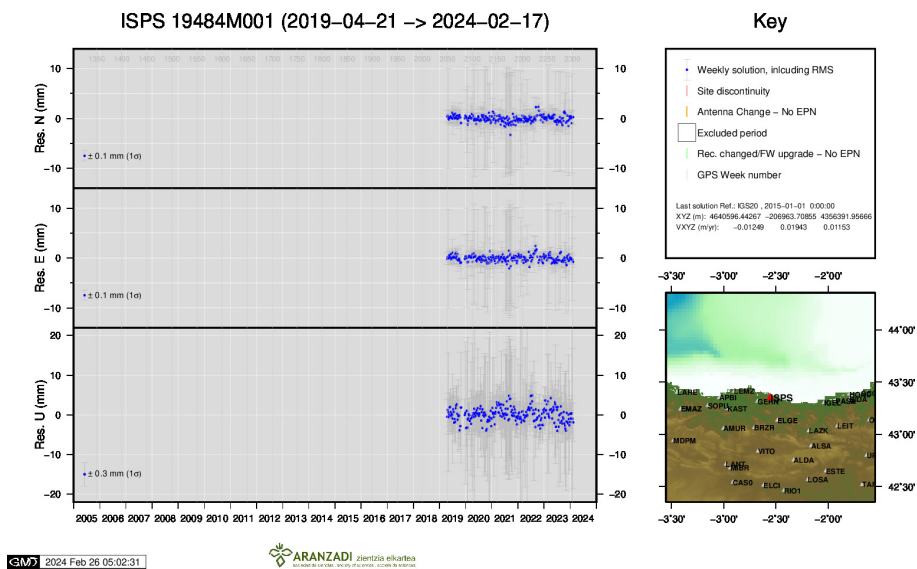
11) EMAZ



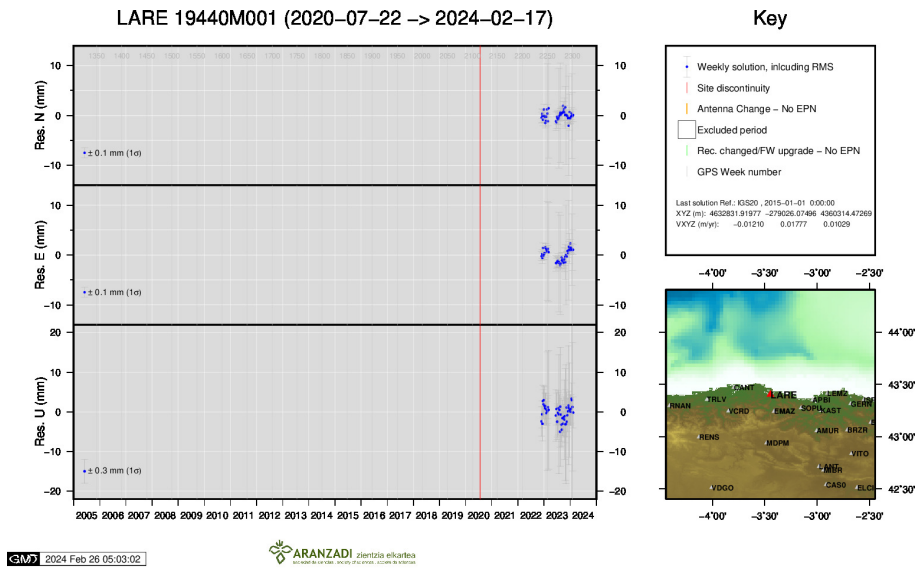
12) HOND



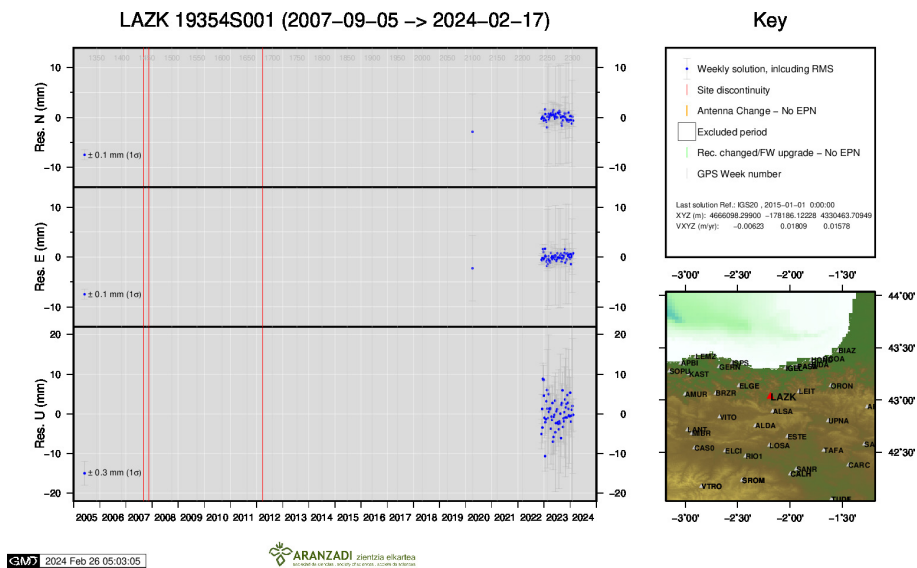
13) IGEL



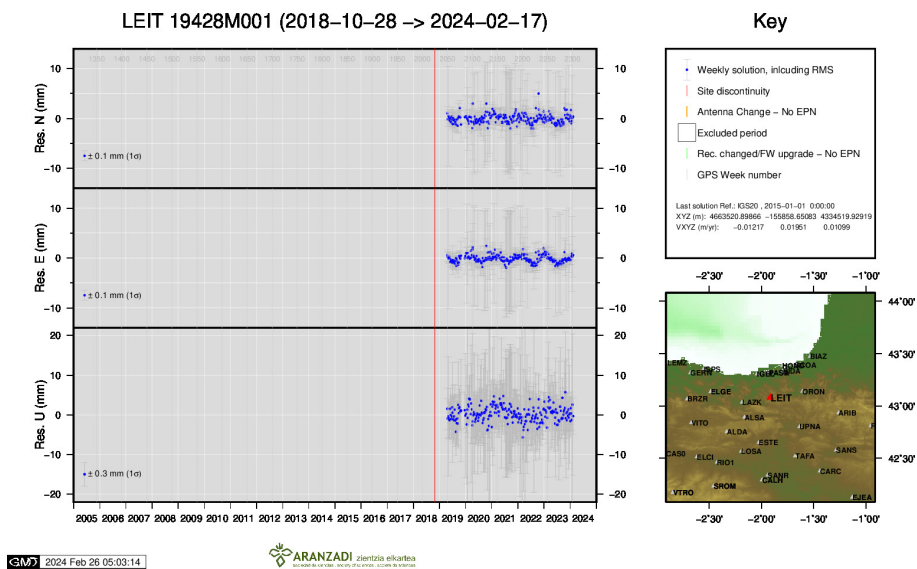
14) ISPS



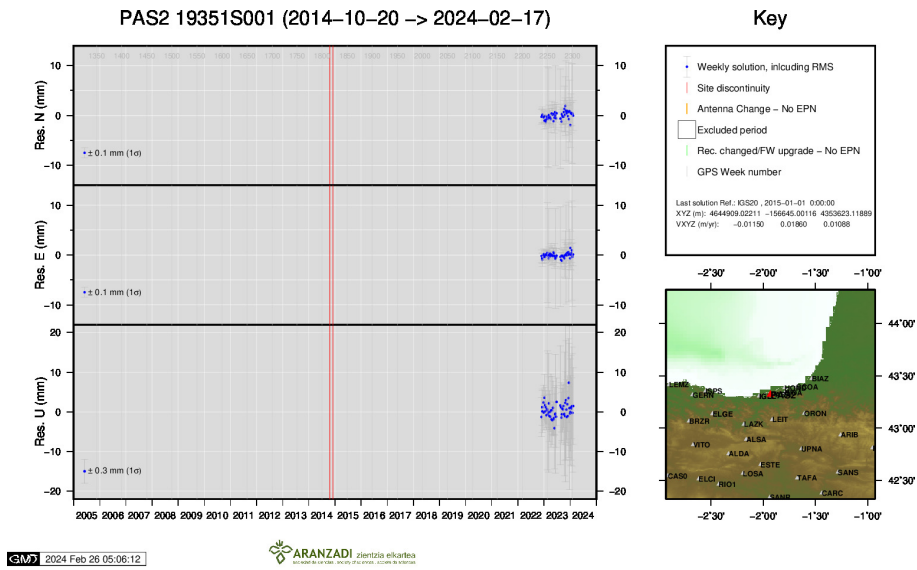
15) LARE



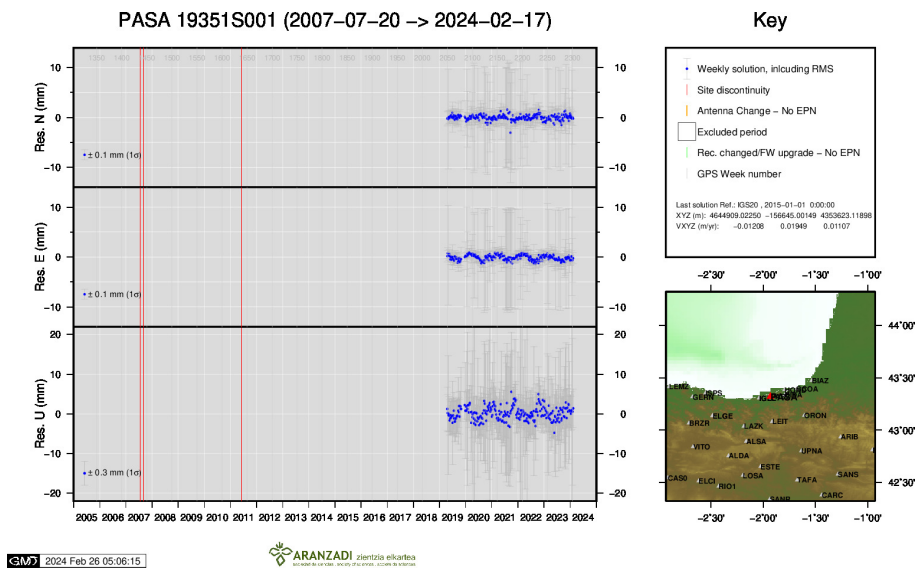
16) LAZK



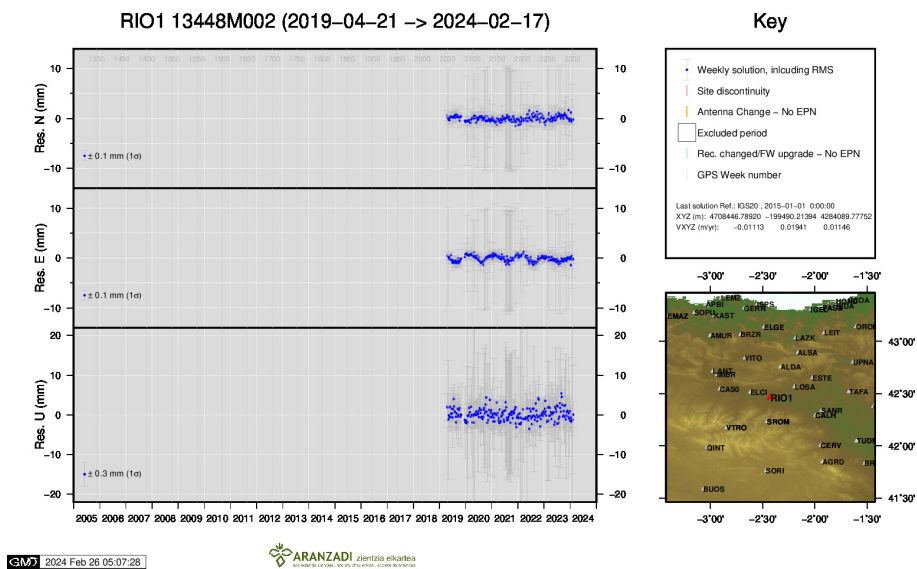
17) LEIT



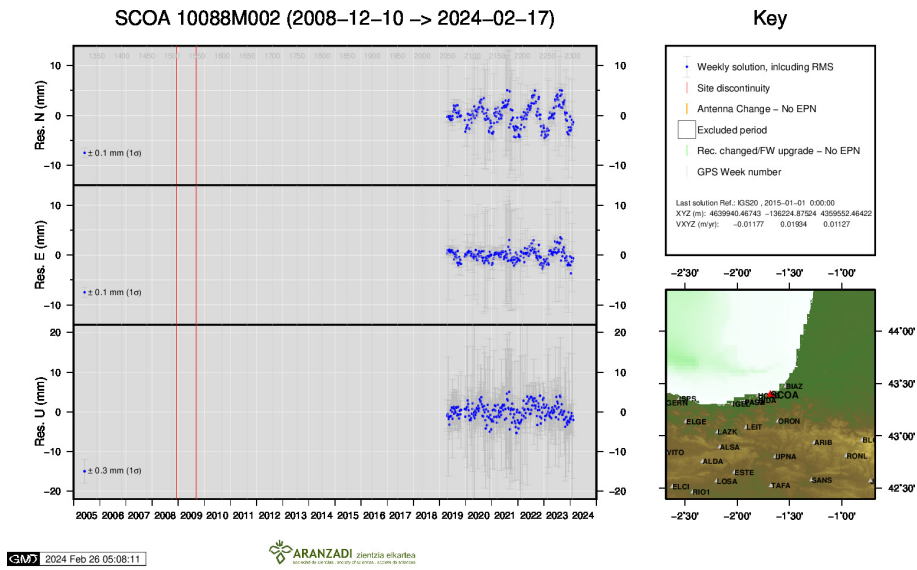
18) PAS2



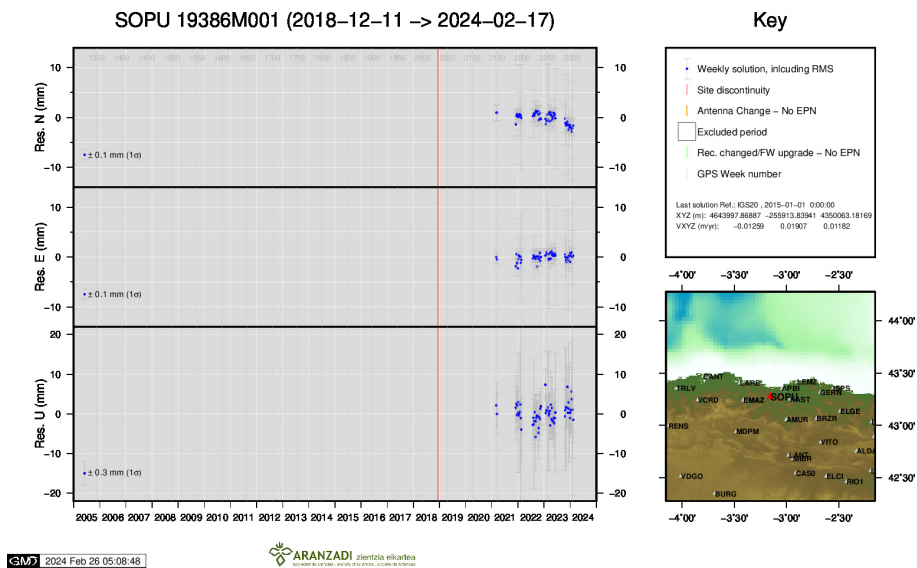
19) PASA



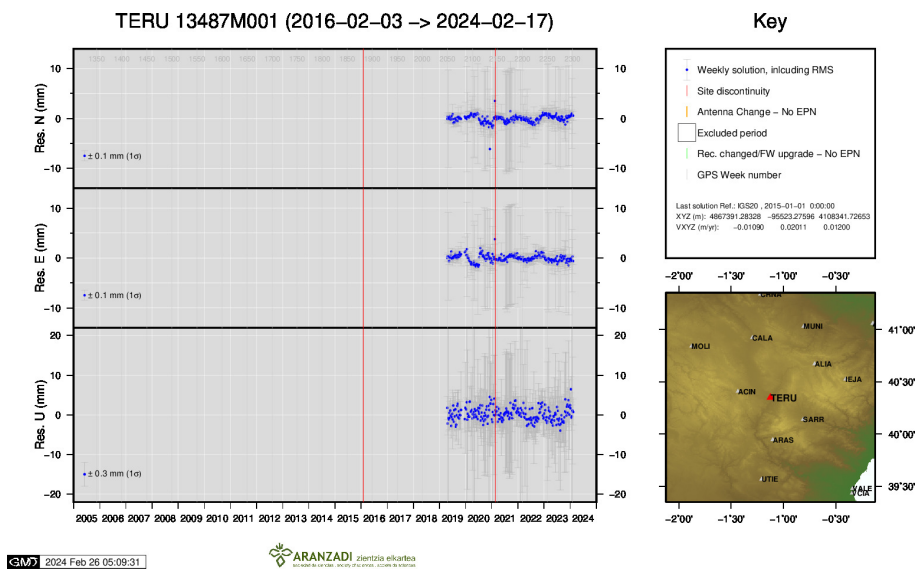
20) RIO1



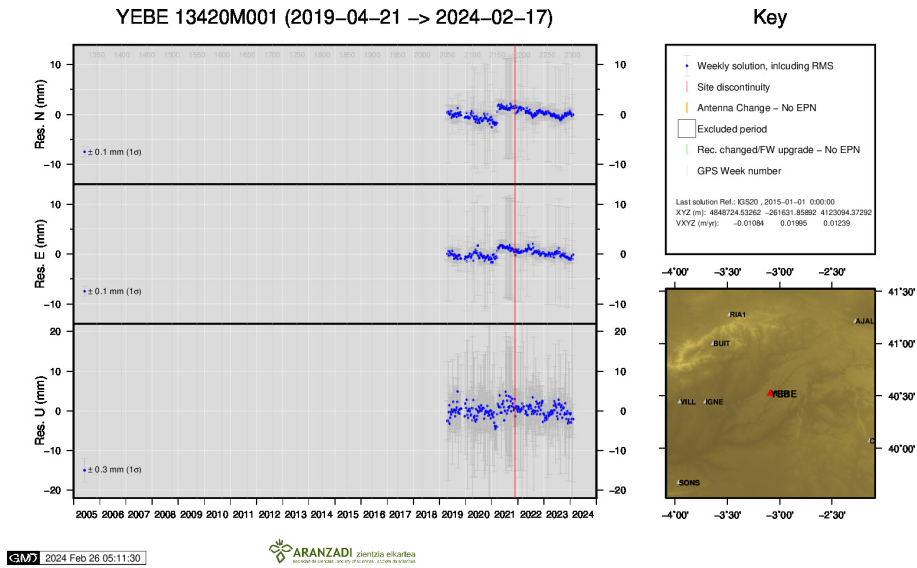
21) SCOA



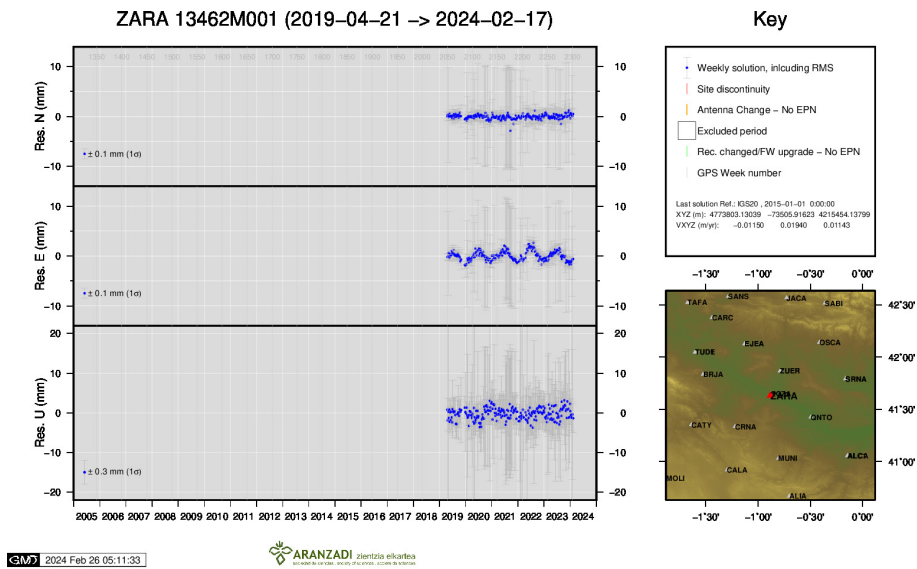
22) SOPU



23) TERU



24) YEBE



25) ZARA