

ARA-DAC Weekly Analysis Result: 2386 (GFA)

Technical Report

GPS Week: 2386 (GFA)

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

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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

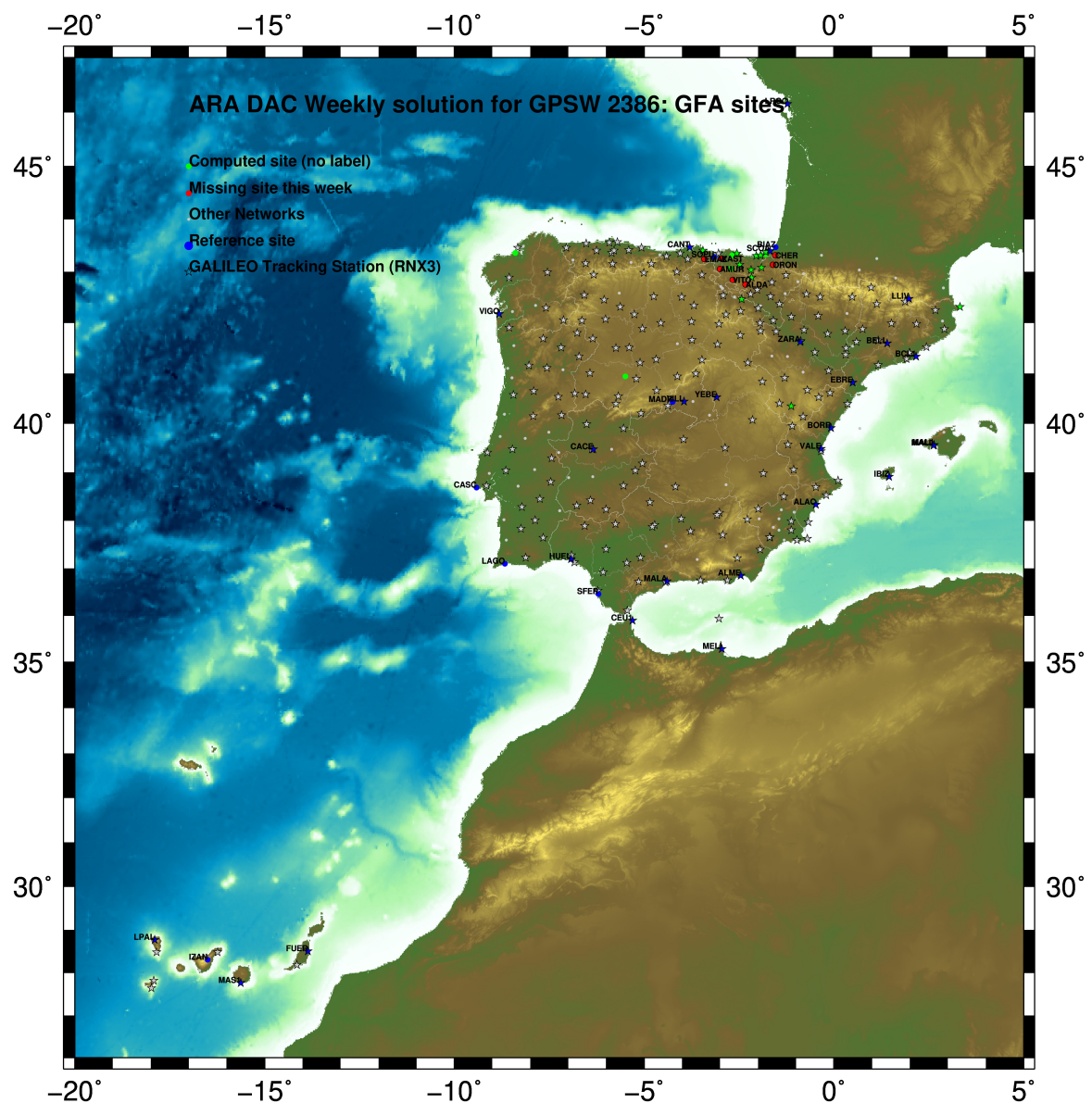


Fig.1: Computed Sites for GPS Week2386 (GFA)

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.

ARA FINAL WEEKLY COMBINATION: FINAL ORBITS						22-OCT-25 20:49
LOCAL GEODETIC DATUM: IGS20			EPOCH: 2025-10-01 11:59:45			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.47186	-678367.24618	4357066.32961	A	G
50	ALSA 19419M001	4677250.76745	-176770.27428	4319079.95183	A	GRE
384	BIAZ 10074M002	4634455.97859	-124344.85352	4365785.52941	W	GR
101	BIDA 00000M000	4644177.75216	-145778.20045	4354832.55527	A	GR
113	BRZR 19387M001	4662220.92283	-220769.77753	4333309.51214	A	GR
573	CACE 13447M001	4899866.45257	-544566.91486	4033770.28673	W	GRE
592	CANT 13438M001	4625924.25026	-307096.11574	4365771.63474	W	GRE
908	CREU 13432M001	4715420.05875	273178.18255	4271946.91767	A	GRE
135	EBRE 13410M001	4833519.92140	41537.51663	4147461.79480	W	GRE
180	ELGE 19353S001	4657557.32663	-202241.34886	4338991.96219	A	GRE
209	GERN 19389M001	4642811.25067	-217222.80398	4353278.95138	A	GR
257	HOND 15012M002	4640529.24976	-145676.86431	4358781.83054	A	GRE
235	IGEL 19352S001	4645951.35741	-165574.38193	4352550.49950	A	GRE
240	ISPS 19484M001	4640596.41426	-206963.65710	4356391.99453	A	GRE
252	LARE 19440M001	4632831.89003	-279026.02552	4360314.50237	A	GRE
256	LAZK 19354S001	4666098.27411	-178186.07069	4330463.74618	A	GRE
261	LEIT 19428M001	4663520.86886	-155858.59898	4334519.96170	A	GRE
345	PAS2 19351S001	4644908.99219	-156644.94867	4353623.15183	A	GRE
493	PASA 19351S001	4644908.99221	-156644.94867	4353623.15185	A	GRE
553	RID1 13448M002	4708446.76358	-199490.16182	4284089.81192	A	GRE
558	SALA 13469M001	4803054.42620	-462130.94757	4158379.15509	A	GR
526	SCDA 10088M002	4639940.43745	-136224.82196	4359552.49895	W	GRE
715	SOPU 19386M001	4643997.83877	-255913.78633	4350063.21343	W	GR
443	TERU 13487M001	4867391.25521	-95523.22121	4108341.76005	A	GRE
616	YEBE 13420M001	4848724.50536	-261631.80565	4123094.40644	W	GRE
655	ZARA 13462M001	4773803.10171	-73505.86366	4215454.17162	W	GRE

5.2 ETRF2000 (ETRS89) Coordinates

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

CONVERT TO ETRF2000						22-OCT-25 20:50
LOCAL GEODETIC DATUM: ETRF2000			EPOCH: 2025-10-01 11:59:45			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.82718	-678367.90795	4357065.83317	A	
50	ALSA 19419M001	4677251.19052	-176770.94545	4319079.45527	A	
384	BIAZ 10074M002	4634456.41299	-124345.51915	4365785.03750	W	
101	BIDA 00000M000	4644178.18261	-145778.86737	4354832.06217	A	
113	BRZR 19387M001	4662221.34088	-220770.44694	4333309.01631	A	
573	CACE 13447M001	4899866.79959	-544567.61459	4033769.76445	W	
592	CANT 13438M001	4625924.65884	-307096.78079	4365771.14094	W	
908	CREU 13432M001	4715420.54133	273177.50821	4271946.42411	A	
135	EBRE 13410M001	4833520.36083	41536.82663	4147461.28716	W	
180	ELGE 19353S001	4657557.74778	-202242.01763	4338991.46705	A	
209	GERN 19389M001	4642811.67090	-217223.47093	4353278.45736	A	
257	HOND 15012M002	4640529.68056	-145676.53077	4358781.33777	A	
235	IGEL 19352S001	4645951.78487	-165575.04913	4352550.00595	A	
240	ISPS 19484M001	4640596.83620	-206964.32374	4356391.50086	A	
252	LARE 19440M001	4632832.30212	-279026.69137	4360314.00835	A	
256	LAZK 19354S001	4666098.69794	-178186.74046	4330463.25061	A	
261	LEIT 19428M001	4663521.29618	-155859.26837	4334519.46669	A	
345	PAS2 19351S001	4644909.42100	-156645.61571	4353622.65850	A	
493	PASA 19351S001	4644909.42102	-156645.61571	4353622.65852	A	
553	RID1 13448M002	4708447.18050	-199490.83697	4284089.31219	A	
558	SALA 13469M001	4803054.79540	-462131.63516	4158378.64288	A	
526	SCDA 10088M002	4639940.86965	-136225.48831	4359552.00637	W	
715	SOPU 19386M001	4643998.25326	-255914.45353	4350062.71874	W	
443	TERU 13487M001	4867391.67200	-95523.91590	4108341.24734	A	
616	YEBE 13420M001	4848724.89993	-261632.49849	4123093.89301	W	
655	ZARA 13462M001	4773803.53064	-73506.54661	4215453.66777	W	

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						22-OCT-25 20:50
LOCAL GEODETIC DATUM: ETRF2014						EPOCH: 2025-10-01 11:59:45
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.78769	-678367.94420	4357065.88636	A	
50	ALSA 19419M001	4677251.14847	-176770.98329	4319079.50837	A	
384	BIAZ 10074M002	4634456.37124	-124345.55739	4365785.09077	W	
101	BIDA 00000M000	4644178.14083	-145778.90548	4354832.11539	A	
113	BRZR 19387M001	4662221.29917	-220770.48468	4333309.06943	A	
573	CACE 13447M001	4899866.75604	-544567.64994	4033769.81675	W	
592	CANT 13438M001	4625924.61784	-307096.81836	4365771.19414	W	
908	CREU 13432M001	4715420.49702	273177.46883	4271946.47743	A	
135	EBRE 13410M001	4833520.31607	41536.78868	4147461.33993	W	
180	ELGE 19353S001	4657557.70605	-202242.05546	4338991.52020	A	
209	GERN 19389M001	4642811.62939	-217223.50877	4353278.51055	A	
257	HOND 15012M002	4640529.63882	-145676.56890	4358781.39101	A	
235	IGEL 19352S001	4645951.74314	-165575.08716	4352550.05915	A	
240	ISPS 19484M001	4640596.79468	-206964.36164	4356391.55406	A	
252	LARE 19440M001	4632832.26094	-279026.72902	4360314.06154	A	
256	LAZK 19354S001	4666098.65602	-178186.77834	4330463.30375	A	
261	LEIT 19428M001	4663521.25421	-155859.30635	4334519.51985	A	
345	PAS2 19351S001	4644909.37925	-156645.65378	4353622.71172	A	
493	PASA 19351S001	4644909.37927	-156645.65378	4353622.71174	A	
553	RI01 13448M002	4708447.13816	-199490.87457	4284089.36518	A	
558	SALA 13469M001	4803054.75281	-462131.67129	4158378.69547	A	
526	SC0A 10088M002	4639940.82788	-136225.52648	4359552.05961	W	
715	SOPU 19386M001	4643998.21188	-255914.49122	4350062.77190	W	
443	TERU 13487M001	4867391.62736	-95523.95315	4108341.29992	A	
616	YEBE 13420M001	4848724.85612	-261632.53518	4123093.94555	W	
655	ZARA 13462M001	4773803.48705	-73506.58439	4215453.72063	W	

5.4 ETRF2020 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (**ETRS89**) is realized by ETRF2020 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

CONVERT TO ETRF2020						22-OCT-25 20:50
LOCAL GEODETIC DATUM: ETRF2020						EPOCH: 2025-10-01 11:59:45
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.78376	-678367.92937	4357065.89435	A	
50	ALSA 19419M001	4677251.14313	-176770.96799	4319079.51660	A	
384	BIAZ 10074M002	4634456.36563	-124345.54221	4365785.09894	W	
101	BIDA 00000M000	4644178.13531	-145778.89027	4354832.12357	A	
113	BRZR 19387M001	4662221.29393	-220770.46945	4333309.07762	A	
573	CACE 13447M001	4899866.75252	-544567.63407	4033769.82528	W	
592	CANT 13438M001	4625924.61278	-307096.80328	4365771.20226	W	
908	CREU 13432M001	4715420.49044	273177.48444	4271946.48580	A	
135	EBRE 13410M001	4833520.31050	41536.80458	4147461.34846	W	
180	ELGE 19353S001	4657557.70074	-202242.04024	4338991.52839	A	
209	GERN 19389M001	4642811.62409	-217223.49360	4353278.51871	A	
257	HOND 15012M002	4640529.63329	-145676.55371	4358781.39918	A	
235	IGEL 19352S001	4645951.73769	-165575.07196	4352550.06734	A	
240	ISPS 19484M001	4640596.78934	-206964.34647	4356391.56223	A	
252	LARE 19440M001	4632832.25581	-279026.71391	4360314.06968	A	
256	LAZK 19354S001	4666098.65066	-178186.76308	4330463.31196	A	
261	LEIT 19428M001	4663521.24878	-155859.29109	4334519.52806	A	
345	PAS2 19351S001	4644909.37377	-156645.63857	4353622.71990	A	
493	PASA 19351S001	4644909.37379	-156645.63857	4353622.71992	A	
553	RI01 13448M002	4708447.13298	-199490.85918	4284089.37346	A	
558	SALA 13469M001	4803054.74874	-462131.65570	4158378.70385	A	
526	SC0A 10088M002	4639940.82232	-136225.51129	4359552.06779	W	
715	SOPU 19386M001	4643998.20670	-255914.47606	4350062.78006	W	
443	TERU 13487M001	4867391.62231	-95523.93721	4108341.30848	A	
616	YEBE 13420M001	4848724.85154	-261632.51937	4123093.95405	W	
655	ZARA 13462M001	4773803.48167	-73506.56874	4215453.72904	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 22-OCT-25 20:50

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.67	0.62	2.30
ALSA 19419M001	7	XXXXXX	1.63	0.54	3.90
BIAZ 10074M002	7	XXXXXX	0.71	0.85	3.70
BIDA 00000M000	7	XXXXXX	1.16	0.84	4.06
BRZR 19387M001	7	XXXXXX	0.50	0.63	1.99
CACE 13447M001	7	XXXXXX	0.41	1.03	3.39
CANT 13438M001	7	XXXXXX	0.56	0.53	3.28
CREU 13432M001	7	XXXXXX	0.84	0.89	5.25
EBRE 13410M001	6	XXXXX	0.96	1.01	6.53
ELGE 19353S001	7	XXXXXX	0.43	0.39	3.20
GERN 19389M001	7	XXXXXX	0.75	0.71	3.72
HOND 15012M002	6	XX XXXX	0.59	0.29	4.83
IGEL 19352S001	7	XXXXXX	0.46	0.45	2.63
ISPS 19484M001	7	XXXXXX	0.40	0.39	2.87
LARE 19440M001	3	XXX	1.64	0.35	4.37
LAZK 19354S001	7	XXXXXX	0.84	0.37	4.20
LEIT 19428M001	7	XXXXXX	0.90	0.34	3.66
PAS2 19351S001	7	XXXXXX	0.97	0.34	3.16
PASA 19351S001	7	XXXXXX	0.98	0.34	3.13
RI01 13448M002	7	XXXXXX	0.68	0.58	4.69
SALA 13469M001	7	XXXXXX	0.36	0.44	2.07
SCDA 10088M002	7	XXXXXX	0.85	0.85	2.31
SOPU 19386M001	7	XXXXXX	1.23	0.86	5.20
TERU 13487M001	7	XXXXXX	0.98	0.65	4.57
YEBE 13420M001	7	XXXXXX	0.22	0.45	1.54
ZARA 13462M001	7	XXXXXX	0.78	0.48	4.73

Comparison of individual solutions:

ACOR 13434M001	N	0.67	-1.38	-0.42	0.11	0.30	-0.16	-0.42	0.60
ACOR 13434M001	E	0.62	0.39	-1.11	0.27	0.17	0.66	0.61	0.17
ACOR 13434M001	U	2.30	0.51	0.10	-1.07	-1.26	3.87	3.65	0.58
ALSA 19419M001	N	1.63	-2.86	0.86	1.81	-0.08	-1.83	0.20	0.51
ALSA 19419M001	E	0.54	-0.01	-0.62	-0.17	-0.36	0.19	0.98	-0.48
ALSA 19419M001	U	3.90	2.74	-0.39	-0.81	4.90	0.70	6.96	3.18
BIAZ 10074M002	N	0.71	-0.57	-0.75	0.58	0.13	-1.31	-0.14	-0.25
BIAZ 10074M002	E	0.85	-1.03	-0.26	-0.24	-0.91	-0.17	0.41	1.46
BIAZ 10074M002	U	3.70	1.22	3.97	-3.44	-2.83	-2.50	2.12	5.84
BIDA 00000M000	N	1.16	0.15	-0.52	0.40	-1.00	-2.49	0.58	0.26
BIDA 00000M000	E	0.84	0.44	-0.29	0.41	0.61	0.17	-0.52	-1.77
BIDA 00000M000	U	4.06	-0.86	-1.34	-3.90	1.63	-1.68	3.81	7.83
BRZR 19387M001	N	0.50	0.02	0.04	-0.14	-0.15	-0.71	0.07	-0.97
BRZR 19387M001	E	0.63	-0.50	-1.17	0.15	-0.30	0.73	0.01	0.30
BRZR 19387M001	U	1.99	-0.46	0.84	2.62	-0.82	2.51	2.96	-0.39
CACE 13447M001	N	0.41	-0.50	-0.30	0.36	-0.54	-0.17	-0.07	0.45
CACE 13447M001	E	1.03	0.26	-1.64	0.63	0.71	1.33	0.00	-0.96
CACE 13447M001	U	3.39	1.09	0.47	-3.51	-0.03	1.07	-5.85	-4.44
CANT 13438M001	N	0.56	-0.35	-0.28	0.45	-1.00	-0.66	0.17	-0.14
CANT 13438M001	E	0.53	0.00	-0.40	-0.49	-0.51	0.69	0.67	-0.35
CANT 13438M001	U	3.28	0.92	2.06	-3.41	-2.85	2.98	4.36	3.44
CREU 13432M001	N	0.84	-0.14	0.58	-1.21	-0.39	-1.11	0.92	0.44
CREU 13432M001	E	0.89	-0.92	-0.50	-1.14	-1.06	-0.73	0.54	0.67
CREU 13432M001	U	5.25	2.61	2.21	7.55	2.15	-1.64	8.25	4.61
EBRE 13410M001	N	0.96		0.24	1.20	-0.90	-1.39	0.59	0.14
EBRE 13410M001	E	1.01		-1.42	-0.56	-0.42	-1.15	1.11	0.26
EBRE 13410M001	U	6.53		11.38	0.58	-2.71	1.15	1.26	8.55
ELGE 19353S001	N	0.43	-0.41	-0.07	0.28	-0.22	-0.66	-0.29	-0.57
ELGE 19353S001	E	0.39	-0.36	0.08	0.19	-0.25	-0.22	-0.73	0.29
ELGE 19353S001	U	3.20	0.99	-2.99	-0.98	-0.35	1.23	5.19	4.67
GERN 19389M001	N	0.75	-1.25	0.64	0.13	0.32	0.04	-0.87	-0.71
GERN 19389M001	E	0.71	-1.33	-0.50	0.25	0.24	0.60	-0.51	0.48
GERN 19389M001	U	3.72	-0.61	0.99	-0.91	-2.87	1.42	1.96	8.16
HOND 15012M002	N	0.59	-0.38	-0.64		-0.76	-0.74	-0.23	0.12
HOND 15012M002	E	0.29	-0.29	-0.17		-0.40	-0.32	0.23	-0.04
HOND 15012M002	U	4.83	-4.21	0.74		0.68	-0.74	1.43	9.76
IGEL 19352S001	N	0.46	-0.37	-0.91	-0.20	-0.12	-0.41	0.02	-0.23
IGEL 19352S001	E	0.45	-0.39	0.76	0.11	-0.23	-0.33	-0.55	-0.15
IGEL 19352S001	U	2.63	0.13	1.14	-1.47	-0.94	-1.66	3.22	4.90
ISPS 19484M001	N	0.40	-0.20	-0.05	0.08	-0.28	-0.60	-0.61	-0.32
ISPS 19484M001	E	0.39	0.02	-0.28	0.43	-0.60	0.20	-0.12	-0.47
ISPS 19484M001	U	2.87	0.62	-1.30	-2.72	1.66	1.36	4.10	4.30
LARE 19440M001	N	1.64	-1.04	-1.08	1.77				
LARE 19440M001	E	0.35	0.13	-0.47	-0.04				
LARE 19440M001	U	4.37	4.02	-2.66	-3.87				
LAZK 19354S001	N	0.84	-1.39	-0.01	0.23	0.84	-1.21	0.19	-0.08
LAZK 19354S001	E	0.37	-0.55	-0.01	-0.20	0.01	0.35	0.42	-0.44
LAZK 19354S001	U	4.20	7.49	2.08	1.98	-0.99	-2.02	3.34	5.04
LEIT 19428M001	N	0.90	0.30	0.47	0.05	0.46	-1.97	-0.07	-0.70
LEIT 19428M001	E	0.34	-0.19	-0.38	0.09	-0.14	-0.64	0.23	-0.14
LEIT 19428M001	U	3.66	3.77	-2.67	2.88	-1.63	1.45	6.43	2.11
PAS2 19351S001	N	0.97	0.74	-1.52	0.08	0.24	-1.61	-0.32	0.05
PAS2 19351S001	E	0.34	-0.60	-0.17	0.04	0.09	0.25	-0.47	0.05
PAS2 19351S001	U	3.16	-0.10	-0.83	-1.07	-1.94	-0.76	3.50	6.44
PASA 19351S001	N	0.98	0.77	-1.57	0.06	0.19	-1.60	-0.23	-0.03
PASA 19351S001	E	0.34	-0.61	-0.15	0.05	0.04	0.32	-0.43	-0.00
PASA 19351S001	U	3.13	-0.13	-0.55	-1.16	-1.93	-0.73	3.35	6.47
RI01 13448M002	N	0.68	-0.50	-0.19	0.08	-0.34	-1.06	0.37	1.05
RI01 13448M002	E	0.58	0.65	-0.31	-0.25	-1.00	-0.15	0.10	0.62
RI01 13448M002	U	4.69	-2.90	1.21	6.27	0.16	1.53	5.11	7.35
SALA 13469M001	N	0.36	-0.54	0.19	0.05	0.17	-0.47	0.42	-0.12
SALA 13469M001	E	0.44	0.31	-0.22	0.14	-0.31	0.14	0.63	-0.71
SALA 13469M001	U	2.07	2.43	1.97	-2.02	-2.43	2.07	0.13	-1.29
SCDA 10088M002	N	0.85	-0.43	-0.93	0.94	0.07	-1.04	0.18	-1.13
SCDA 10088M002	E	0.85	-0.41	-1.83	0.58	0.47	0.29	0.32	-0.22

SCDA 10088M002	U	2.31	-0.53	4.00	-1.62	-0.91	-0.83	2.02	2.74
SOPU 19386M001	N	1.23	-1.87	1.82	-0.49	-0.56	-0.57	-0.74	0.90
SOPU 19386M001	E	0.86	-0.77	-0.86	1.14	-0.29	0.95	-0.00	-0.88
SOPU 19386M001	U	5.20	4.40	-7.41	-3.74	3.01	-0.48	3.82	7.08
TERU 13487M001	N	0.98	1.93	0.71	0.58	-0.57	-0.84	-0.37	0.15
TERU 13487M001	E	0.65	-0.78	1.04	-0.13	0.05	-0.38	0.32	0.79
TERU 13487M001	U	4.57	3.14	-3.91	-4.51	-2.03	0.66	-5.81	-6.42
YEBE 13420M001	N	0.22	0.07	-0.38	-0.05	-0.11	-0.34	0.04	-0.02
YEBE 13420M001	E	0.45	0.09	-0.62	-0.04	-0.16	0.50	0.67	-0.34
YEBE 13420M001	U	1.54	0.09	1.26	-3.02	1.01	1.43	-0.04	-0.67
ZARA 13462M001	N	0.78	0.69	-1.03	-1.06	0.37	-0.78	-0.49	0.06
ZARA 13462M001	E	0.48	-0.73	-0.51	0.02	0.23	0.35	0.43	0.48
ZARA 13462M001	U	4.73	4.28	2.41	3.22	-4.49	-0.60	4.67	7.56

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				
2	ALAC 13433M001	I W	1.96	-1.63	-0.14		
3	ALME 13437M001	I W	-0.65	-0.08	4.72		
4	BCL1 19482M001	I W	-0.30	-1.24	4.05		
5	BELL 13431M001	I W	-1.34	-0.31	3.48		
6	BIAZ 10074M002	I W	1.07	0.31	-4.56		
7	BORR 13480M001	I W	-5.49	-0.56	0.34		
8	BRST 10004M004	I W	-0.98	-0.72	3.27		
9	CACE 13447M001	I W	1.95	1.76	-3.27		
10	CANT 13438M001	I W	0.04	1.24	-2.02		
11	CASC 13909S001	I W	1.52	0.03	0.88		
12	CEU1 13449M002	I W	1.42	-0.15	-3.61		
14	EBRE 13410M001	I W	-2.09	0.22	-1.48		
16	FLRS 31907M001	I W	0.66	-3.41	-3.55		
17	FUER 31330M001	I W	0.76	-0.94	2.50		
19	HUEL 13451M001	I W	2.28	3.52	-8.95		
20	IBIZ 13454S001	I W	0.19	1.67	0.27		
21	IZAN 31309M002	I W	-0.85	-2.36	-1.14		
22	LAGO 13903M001	I W	0.85	0.58	2.24		
23	LLIV 13436M001	I W	-2.49	2.29	3.26		
24	LPAL 81701M001	I W	2.37	1.43	-1.36		
25	LROC 10023M001	I W	0.31	0.89	-1.71		
26	MADR 13407S012	I W	-0.27	1.41	-4.52		
27	MAL1 13444M002	I W	3.58	-1.34	0.63		
28	MALA 13443M001	I W	2.92	-0.02	4.70		
29	MALL 13444M001	I W	-0.45	0.57	3.67		
30	MAS1 31303M002	I W	-0.76	-3.12	4.40		
31	MELI 19379M001	I W	0.29	-0.61	4.34		
32	PDEL 31906M004	I W	-1.05	-1.78	0.49		
33	SCOA 10088M002	I W	-2.38	-0.37	-14.25		
34	SFER 13402M004	I W	-1.21	-6.40	4.50		
35	SOPU 19386M001	I W	-0.83	1.13	2.30		
36	VALE 13439M001	I W	-0.37	2.49	-5.62		
37	VIGO 13450M001	I W	2.11	2.01	0.90		
38	VILL 13406M001	I W	-0.49	-0.50	2.46		
39	YEBE 13420M001	I W	-0.79	0.25	3.05		
40	ZARA 13462M001	I W	-0.62	0.91	-3.09		
41	ZIMM 14001M004	I W	-1.27	-0.27	4.06		
	RMS / COMPONENT		1.74	1.85	4.19		
	IQR		1.93	1.85	5.30		
	MEAN		-0.01	-0.08	0.03		
	MEDIAN		-0.30	-0.02	0.63		
	MIN		-5.49	-6.40	-14.25		
	MAX		3.58	3.52	4.72		
OVERALL RMS/IQR/MAX(3D)			2.83	2.97	14.46	SCOA 10088M002	#SUM
ALL	RMS / COMPONENT		1.74	1.85	4.19		
ALL	IQR		1.93	1.85	5.30		
ALL	MEAN		-0.01	-0.08	0.03		
ALL	MEDIAN		-0.30	-0.02	0.63		
ALL	MIN		-5.49	-6.40	-14.25		
ALL	MAX		3.58	3.52	4.72		
ALL	OVERALL RMS/IQR/MAX(3D)		2.83	2.97	14.46	SCOA 10088M002	#SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 37
NUMBER OF COORDINATES : 111
RMS OF TRANSFORMATION : 2.83 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.46 MM
TRANSLATION IN Y : 0.00 +- 0.46 MM
TRANSLATION IN Z : 0.00 +- 0.46 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              19218378
NUMBER OF UNKNOWN                   187768
NUMBER OF DEGREES OF FREEDOM        19030610
PHASE MEASUREMENTS SIGMA             0.00100
SAMPLING INTERVAL (SECONDS)          180
VARIANCE FACTOR                      2.399814051508442
```

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 25:271:00000 25:277:86370 LEICA GR50 -----
ALSA A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
BIAZ A 1 P 25:271:00000 25:277:86370 SPECTRA SP90M -----
BIDA A 1 P 25:271:00000 25:274:86370 LEICA GR10 -----
BRZR A 1 P 25:271:00000 25:271:86370 LEICA GR30 -----
CACE A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
CANT A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
CREU A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
EBRE A 1 P 25:272:00000 25:277:86370 LEICA GR50 -----
ELGE A 1 P 25:271:00000 25:274:86370 LEICA GR30 -----
GERN A 1 P 25:271:00000 25:271:86370 LEICA GR30 -----
HOND A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
IGEL A 1 P 25:271:00000 25:274:86370 LEICA GR30 -----
ISPS A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
LARE A 1 P 25:271:00000 25:273:86370 LEICA GR50 -----
LAZK A 1 P 25:271:00000 25:274:86370 LEICA GR30 -----
LEIT A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
PAS2 A 1 P 25:271:00000 25:277:86370 STONEX SC2200 -----
PASA A 1 P 25:271:00000 25:277:86370 LEICA GR30 -----
RI01 A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
SALA A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
SCOA A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
SOPU A 1 P 25:271:00000 25:271:86370 LEICA GR30 -----
TERU A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
YEBE A 1 P 25:271:00000 25:277:86370 LEICA GR50 -----
ZARA A 1 P 25:271:00000 25:277:86370 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 25:271:00000 25:277:86370 LEIAT504 LEIS ----
ALSA A 1 P 25:271:00000 25:277:86370 LEIAR10 NONE ----
BIAZ A 1 P 25:271:00000 25:277:86370 LEIAR25 LEIT ----
BIDA A 1 P 25:271:00000 25:274:86370 LEIAS10 NONE ----
BRZR A 1 P 25:271:00000 25:271:86370 LEIAS10 NONE ----
CACE A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
CANT A 1 P 25:271:00000 25:277:86370 LEIAR25.R4 LEIT ----
CREU A 1 P 25:271:00000 25:277:86370 LEIAR25.R4 NONE ----
EBRE A 1 P 25:272:00000 25:277:86370 LEIAR25.R4 NONE ----
ELGE A 1 P 25:271:00000 25:274:86370 LEIAR25.R4 LEIT ----
GERN A 1 P 25:271:00000 25:271:86370 LEIAS10 NONE ----
HOND A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
IGEL A 1 P 25:271:00000 25:274:86370 LEIAR20 LEIM ----
ISPS A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
LARE A 1 P 25:271:00000 25:273:86370 LEIAR20 LEIM ----
LAZK A 1 P 25:271:00000 25:274:86370 LEIAR25.R4 LEIT ----
LEIT A 1 P 25:271:00000 25:277:86370 LEIAR10 NONE ----
PAS2 A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
PASA A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
RI01 A 1 P 25:271:00000 25:277:86370 LEIAR25.R4 LEIT ----
SALA A 1 P 25:271:00000 25:277:86370 LEIAR25 NONE ----
SCOA A 1 P 25:271:00000 25:277:86370 TRM55971.00 NONE ----
SOPU A 1 P 25:271:00000 25:271:86370 LEIAS10 NONE ----
TERU A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
YEBE A 1 P 25:271:00000 25:277:86370 LEIAR20 LEIM ----
ZARA A 1 P 25:271:00000 25:277:86370 TRM29659.00 NONE ----
```

7.3 Eccentricities

```
*
*SITE PT SOLN T DATA_START__ DATA_END_____ AXE ARP-->BENCHMARK(M)-----
ACOR A 1 P 25:271:00000 25:277:86370 UNE 3.0460 0.0000 0.0000
ALSA A 1 P 25:271:00000 25:277:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 25:271:00000 25:277:86370 UNE 0.0000 0.0000 0.0000
```

BIDA	A	1	P	25:271:00000	25:274:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	25:271:00000	25:271:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	25:271:00000	25:277:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	25:271:00000	25:277:86370	UNE	3.0490	0.0000	0.0000
CREU	A	1	P	25:271:00000	25:277:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	25:272:00000	25:277:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	25:271:00000	25:274:86370	UNE	0.0000	0.0000	0.0000
GERN	A	1	P	25:271:00000	25:271:86370	UNE	0.0771	0.0000	0.0000
HOND	A	1	P	25:271:00000	25:277:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	25:271:00000	25:274:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	25:271:00000	25:277:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	25:271:00000	25:273:86370	UNE	0.0000	0.0000	0.0000
LAZK	A	1	P	25:271:00000	25:274:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	25:271:00000	25:277:86370	UNE	0.0000	0.0000	0.0000
PAS2	A	1	P	25:271:00000	25:277:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	25:271:00000	25:277:86370	UNE	0.0000	0.0000	0.0000
RI01	A	1	P	25:271:00000	25:277:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	25:271:00000	25:277:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	25:271:00000	25:277:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	25:271:00000	25:271:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	25:271:00000	25:277:86370	UNE	0.0600	0.0000	0.0000
YEBE	A	1	P	25:271:00000	25:277:86370	UNE	0.0600	0.0000	0.0000
ZARA	A	1	P	25:271:00000	25:277:86370	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:

```

2025-10-19 03:13 UTC | BIDA2710.250 | RECEIVER TYPE | LEICA GR30 -> LEICA GR10 (source: bida_20200626.log
2025-10-19 03:13 UTC | BIDA2710.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.52/6.525 (source: bida_20200626.log
2025-10-19 06:20 UTC | BIDA2720.250 | RECEIVER TYPE | LEICA GR30 -> LEICA GR10 (source: bida_20200626.log
2025-10-19 06:20 UTC | BIDA2720.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.52/6.525 (source: bida_20200626.log
2025-10-19 09:54 UTC | BIDA2730.250 | RECEIVER TYPE | LEICA GR30 -> LEICA GR10 (source: bida_20200626.log
2025-10-19 09:54 UTC | BIDA2730.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.52/6.525 (source: bida_20200626.log
2025-10-19 13:00 UTC | BIDA2740.250 | RECEIVER TYPE | LEICA GR30 -> LEICA GR10 (source: bida_20200626.log
2025-10-19 13:00 UTC | BIDA2740.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.52/6.525 (source: bida_20200626.log
2025-10-19 03:13 UTC | CANT2710.250 | RECEIVER TYPE | LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-10-19 03:13 UTC | CANT2710.250 | RECEIVER FIRM. VERS. | 4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-10-19 06:20 UTC | CANT2720.250 | RECEIVER TYPE | LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-10-19 06:20 UTC | CANT2720.250 | RECEIVER FIRM. VERS. | 4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-10-19 09:54 UTC | CANT2730.250 | RECEIVER TYPE | LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-10-19 09:54 UTC | CANT2730.250 | RECEIVER FIRM. VERS. | 4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-10-19 03:13 UTC | ISPS2710.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 06:20 UTC | ISPS2720.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 09:54 UTC | ISPS2730.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 13:00 UTC | ISPS2740.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 16:01 UTC | ISPS2750.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 19:01 UTC | ISPS2760.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 22:07 UTC | ISPS2770.250 | ANTENNA SER. NO. | -> 24238009 (source: isps00esp_20250114.log
2025-10-19 03:13 UTC | LEIT2710.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 06:20 UTC | LEIT2720.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 09:54 UTC | LEIT2730.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 13:00 UTC | LEIT2740.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 16:01 UTC | LEIT2750.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 19:01 UTC | LEIT2760.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 22:07 UTC | LEIT2770.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.83.342 (source: leit00esp_20250924.log
2025-10-19 19:01 UTC | PASA2760.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.80/7.900 (source: pasa00esp_20240418.log
2025-10-19 22:07 UTC | PASA2770.250 | RECEIVER FIRM. VERS. | 4.83/7.900 -> 4.80/7.900 (source: pasa00esp_20240418.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

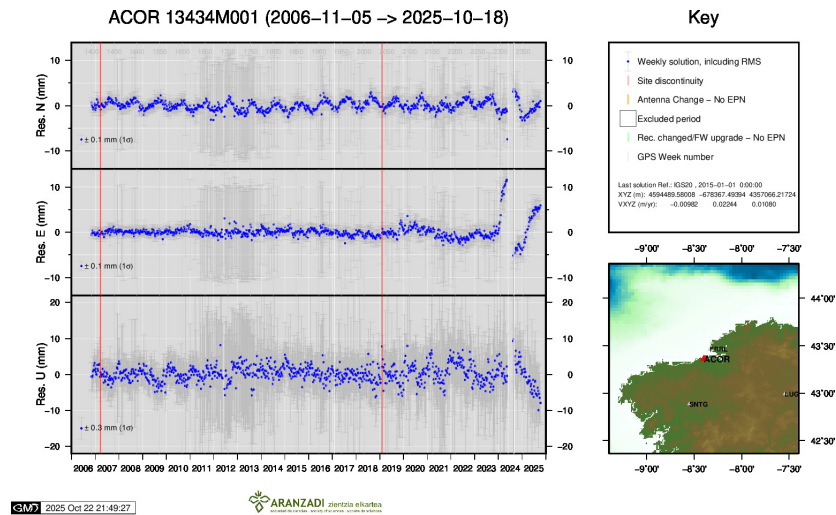
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

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

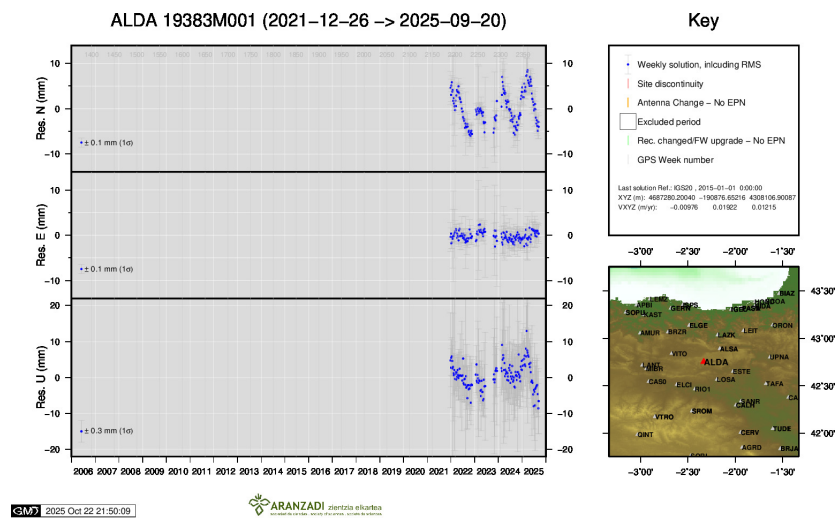
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

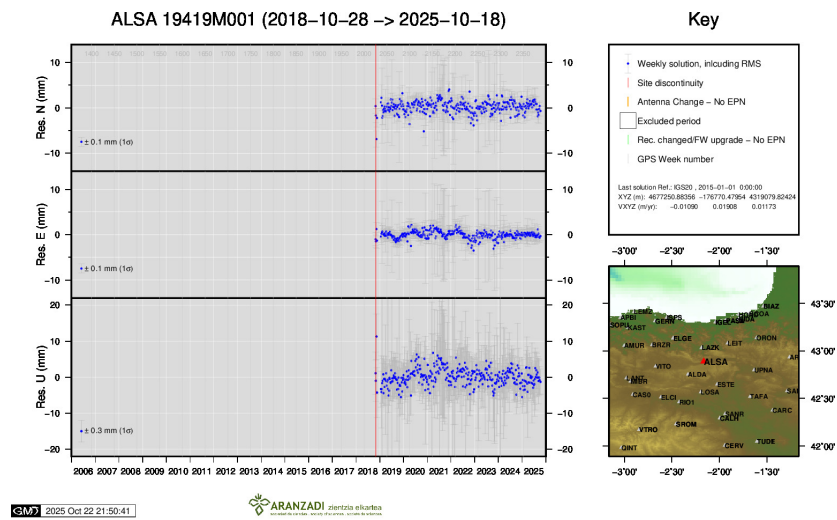
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



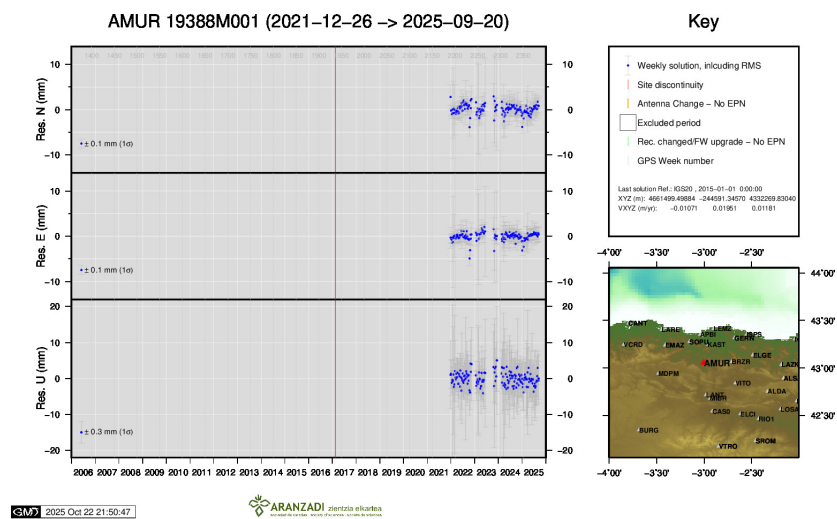
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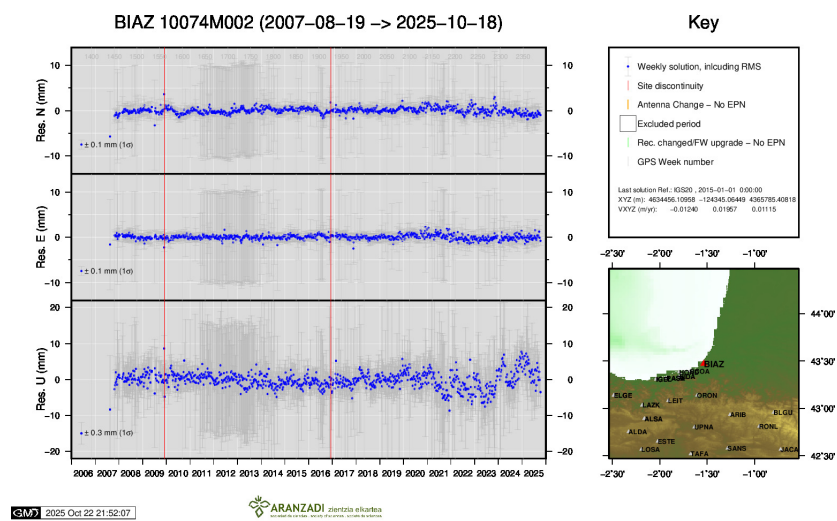
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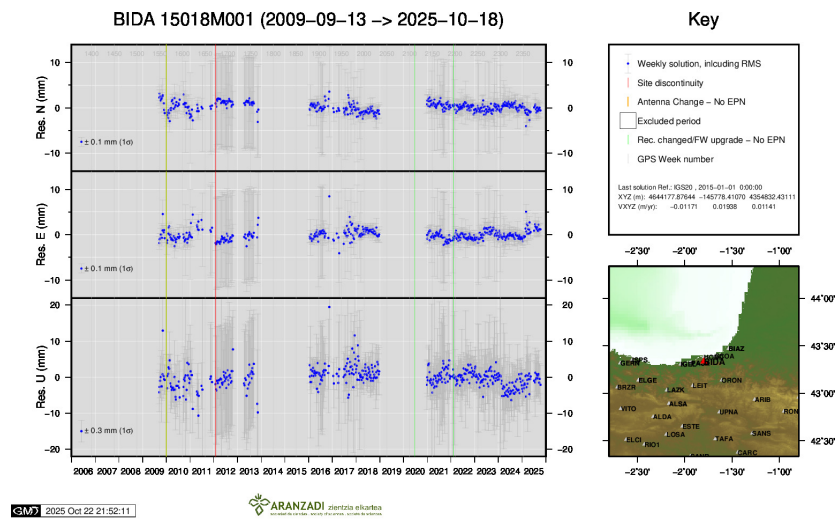
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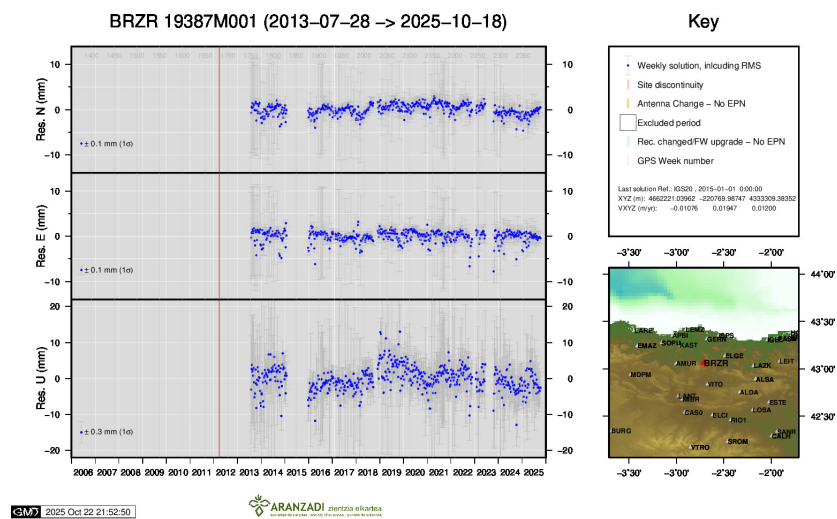
4) AMUR



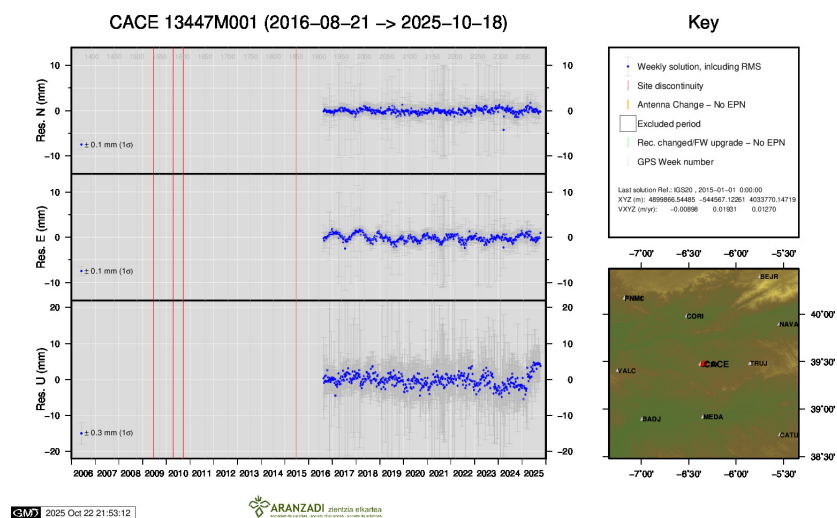
5) BIAZ



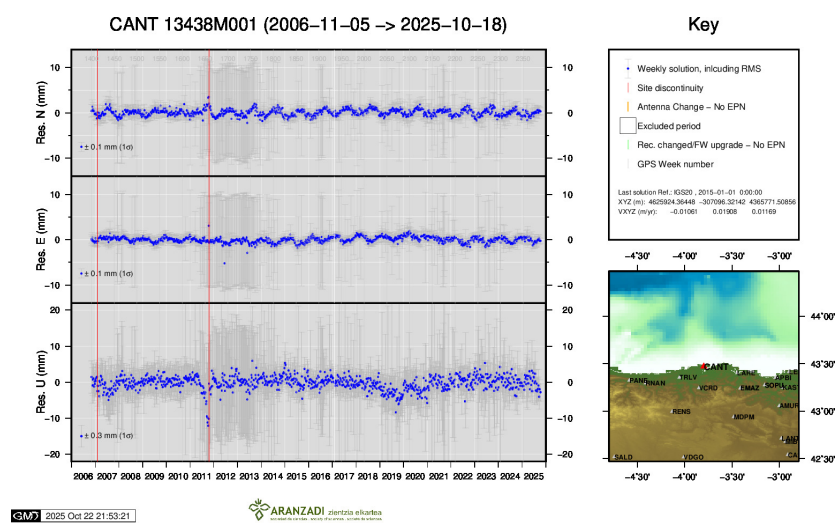
6) BIDA



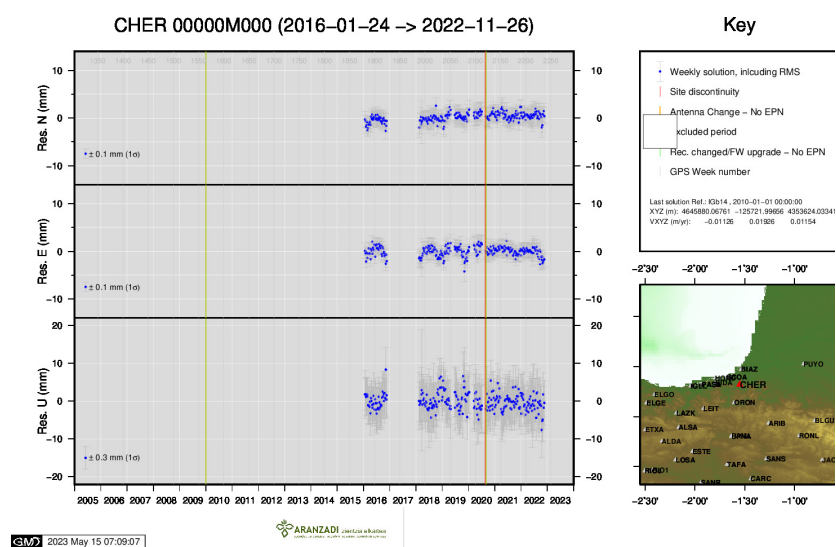
7) BRZR



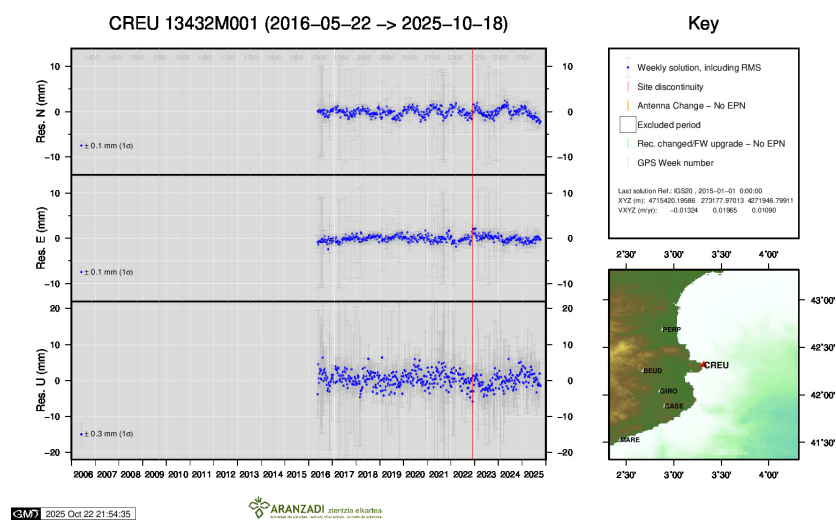
8) CACE



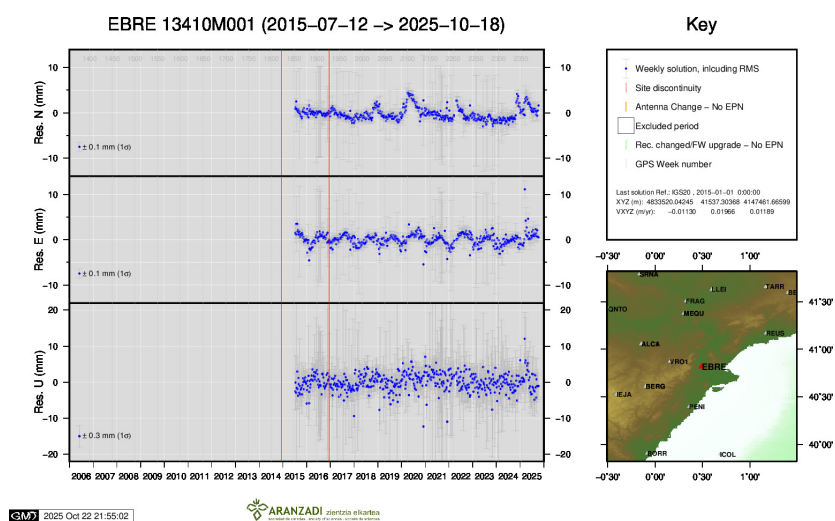
9) CANT



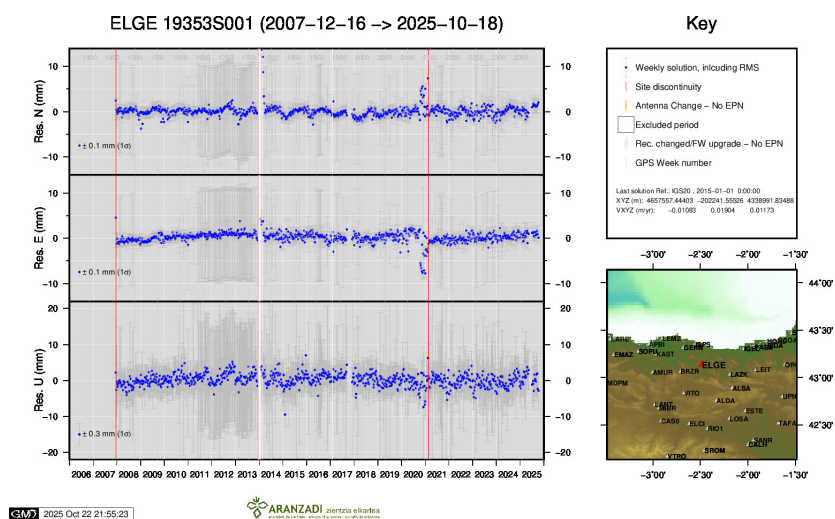
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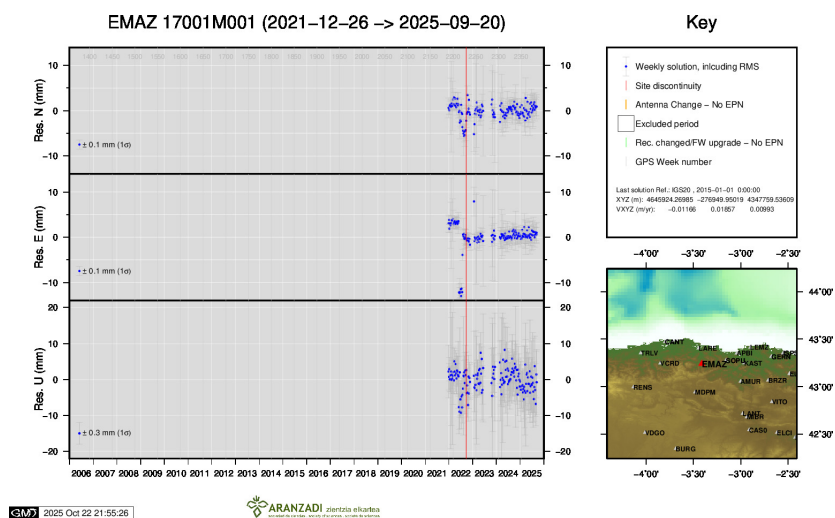
11) CREU



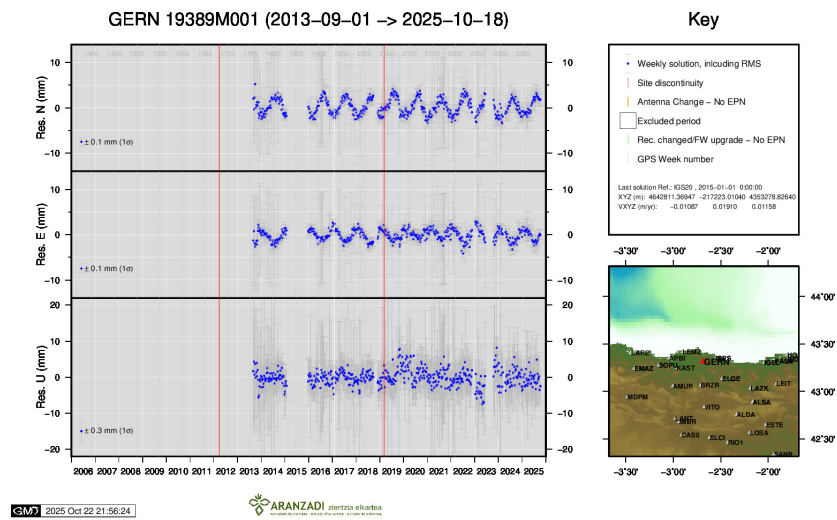
12) EBRE



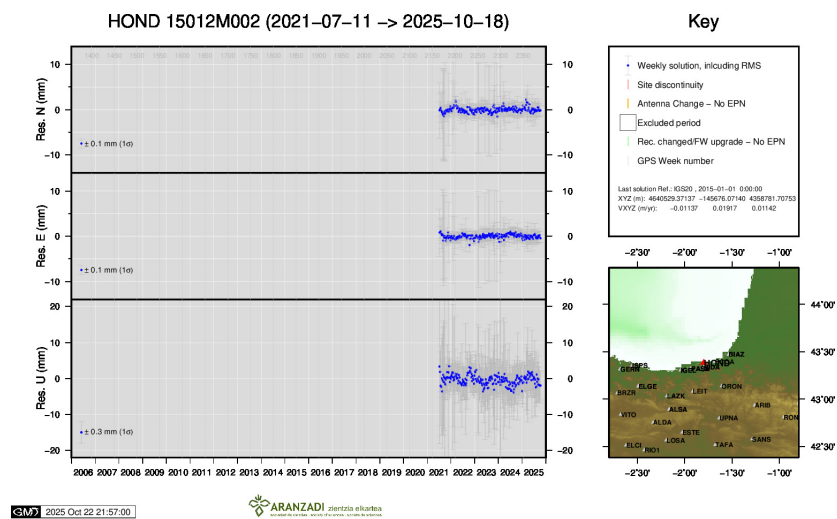
13) ELGE



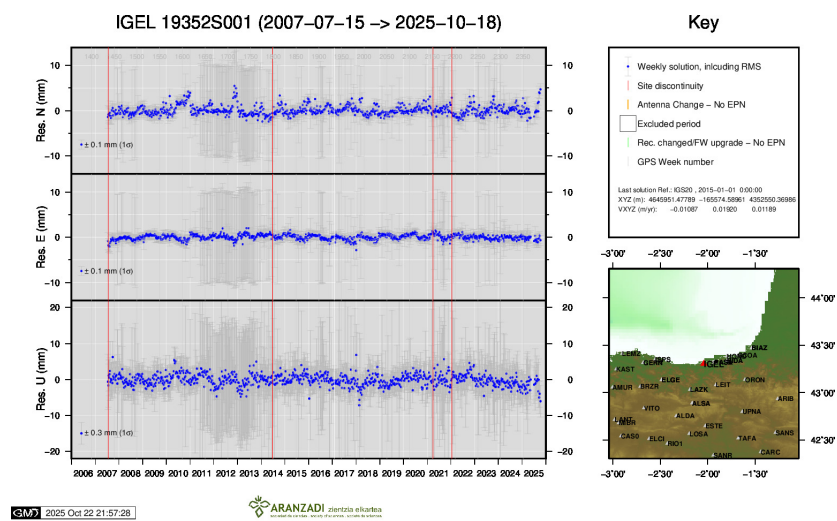
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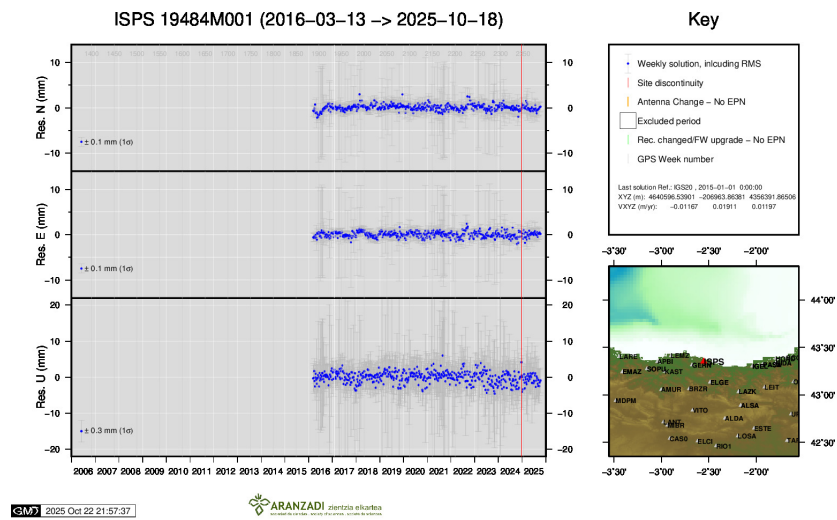
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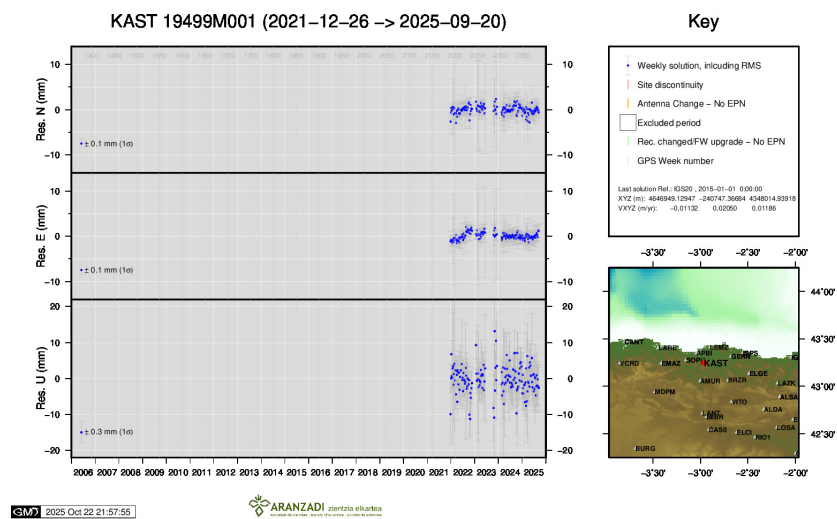
16) HOND



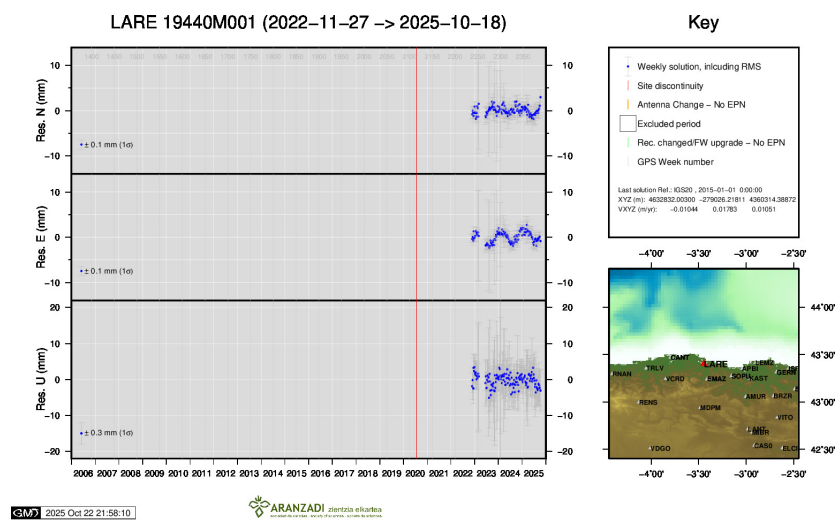
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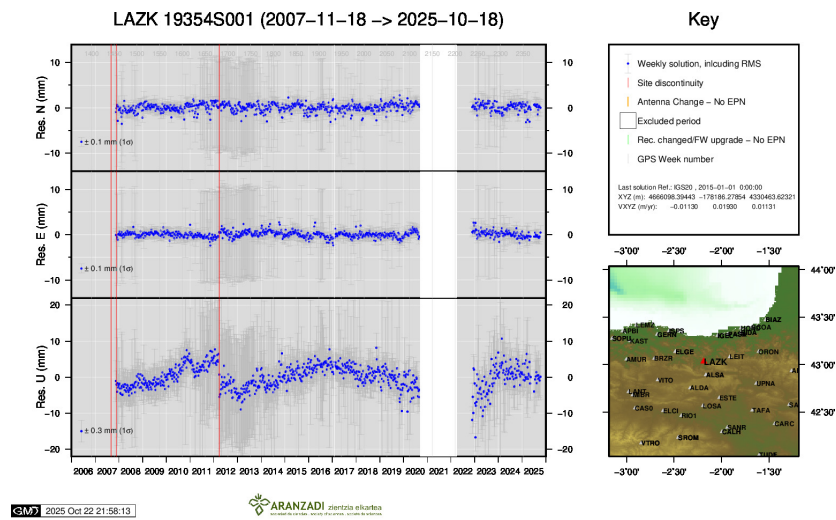
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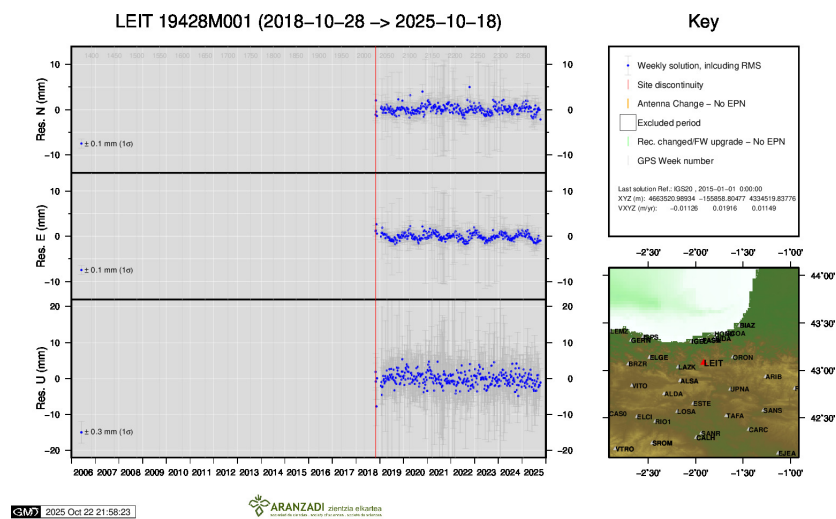
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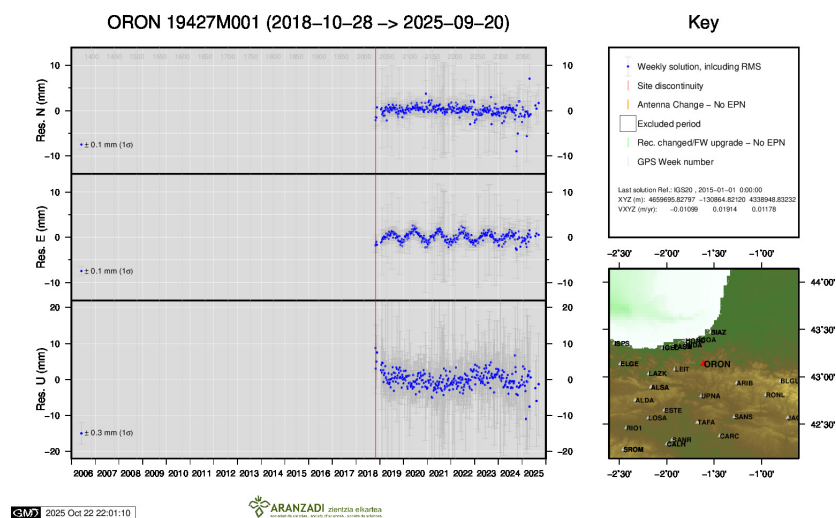
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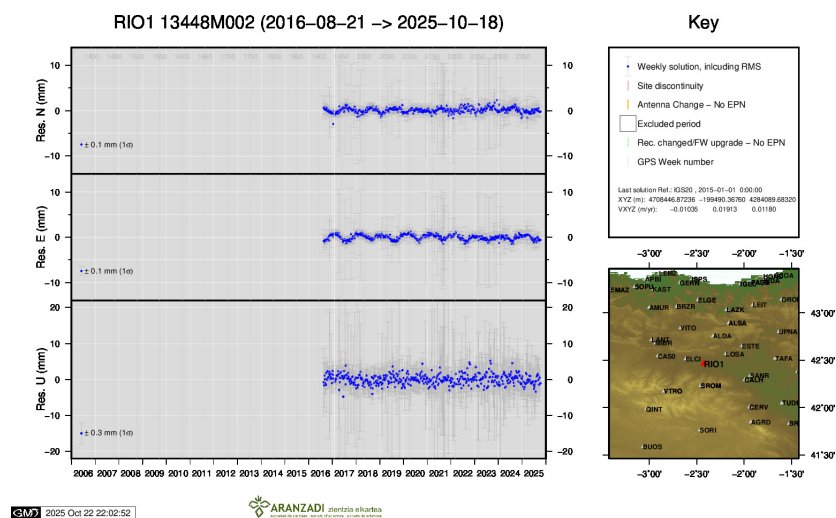
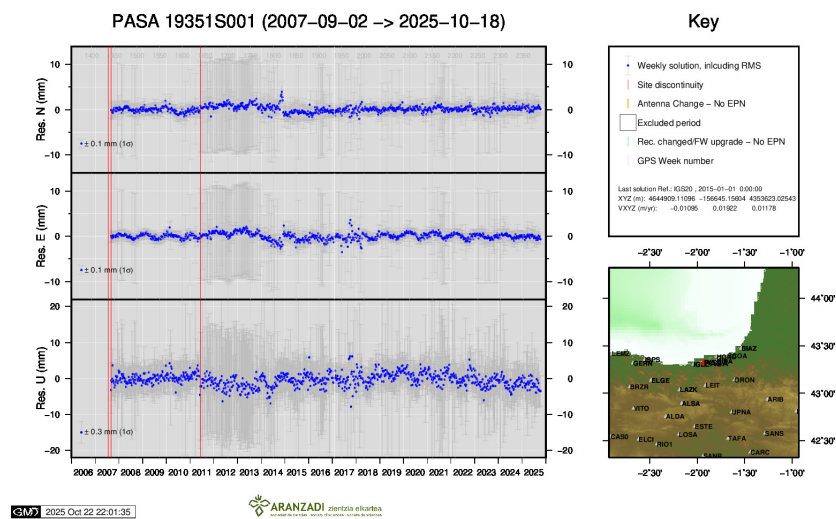
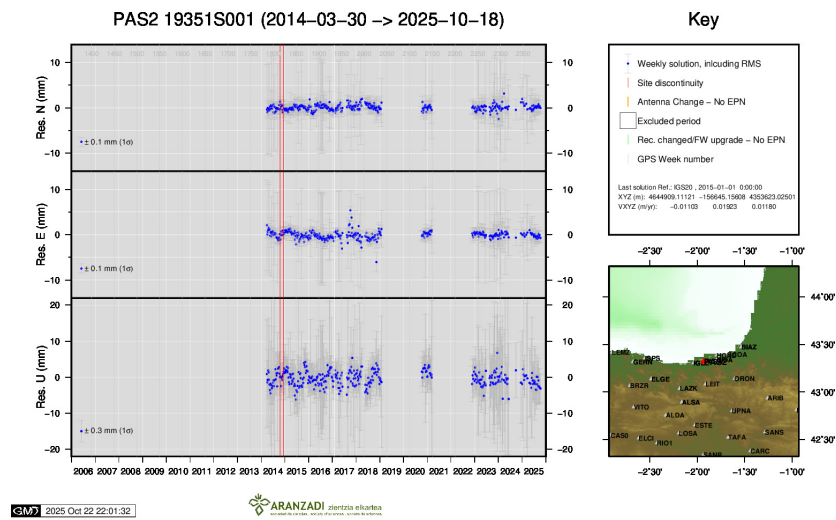
21) LAZK

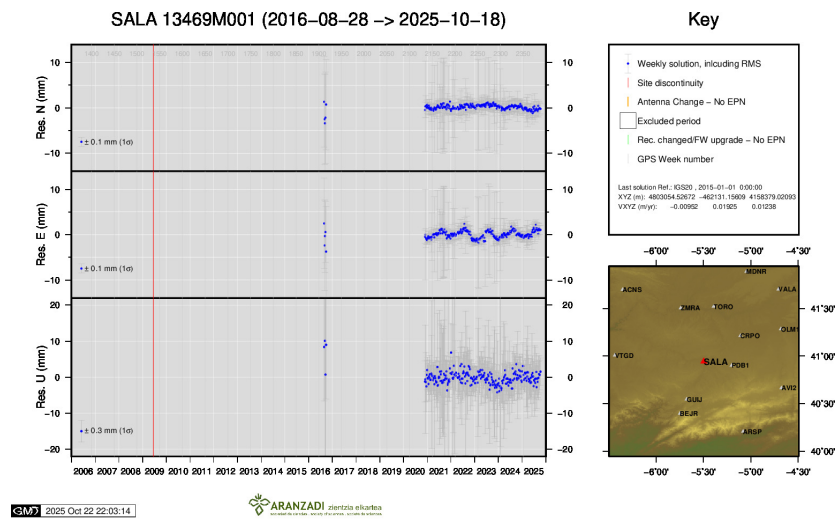


22) LEIT

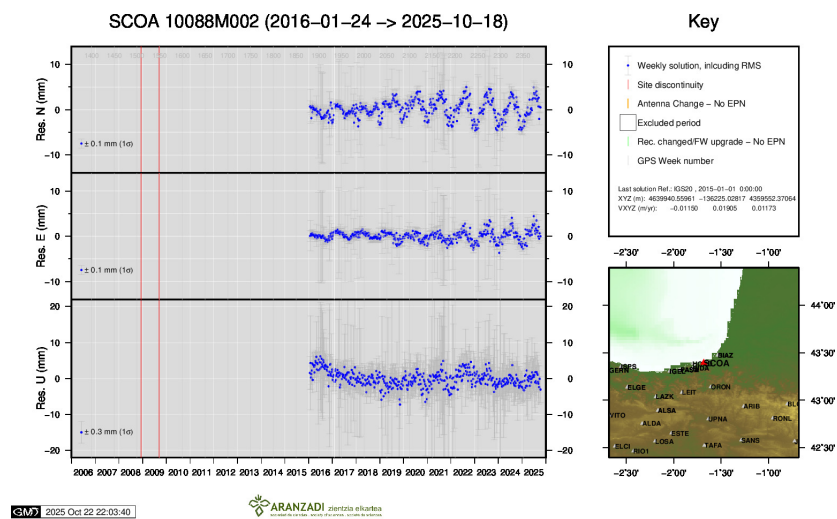


23) ORON

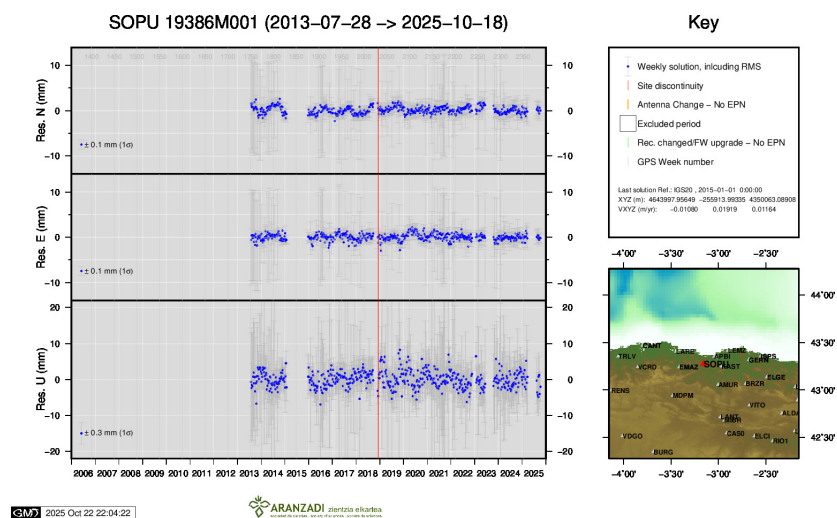




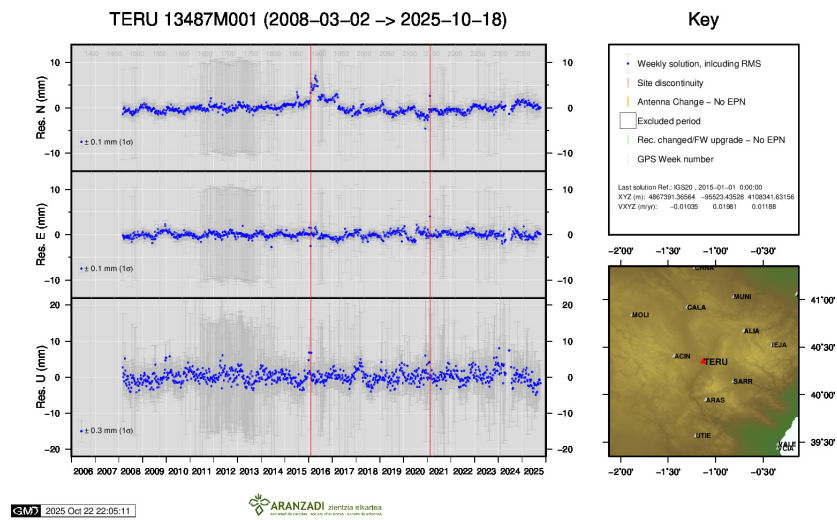
27) SALA



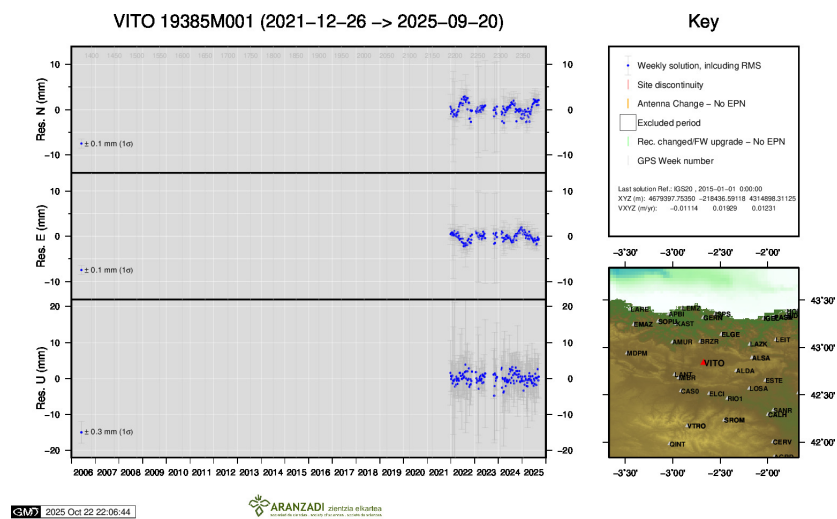
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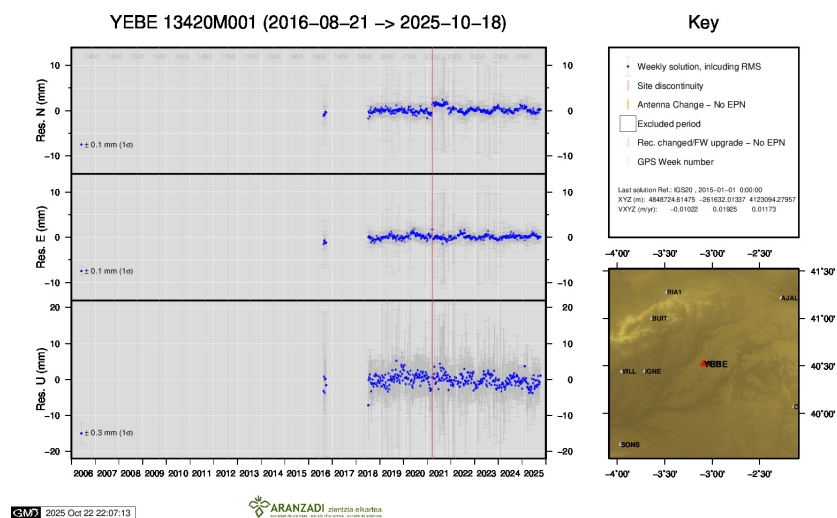
29) SOPU



30) TERU



31) VITO



32) YEBE

