

ARA-DAC Weekly Analysis Result: 2375 (GFA)

Technical Report

GPS Week: 2375 (GFA)

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

ARA-DAC details:

Contact person: J. Zurutuza

Contact mail: geodesia@aranzadi.eus

Report generated on 2025/08/04 at 09:45:28



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

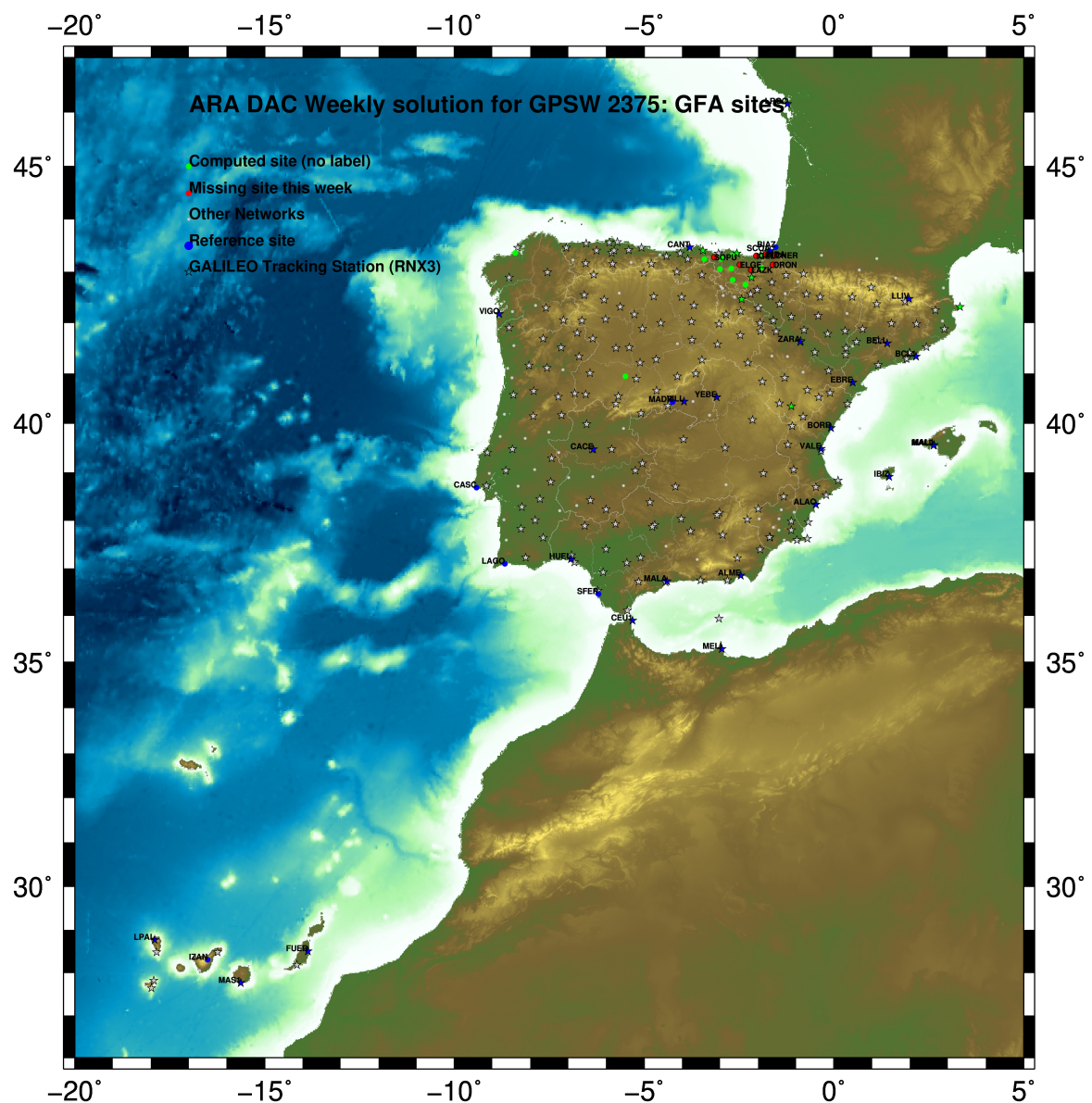


Fig.1: Computed Sites for GPS Week2375 (GFA)

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: 3σ 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						04-AUG-25 08:02
LOCAL GEODETIC DATUM: IGS20			EPOCH: 2025-07-16 11:59:45			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.47382	-678367.25179	4357066.32774	A	G
39	ALDA 19383M001	4687280.09589	-190876.44815	4308107.02766	A	GR
50	ALSA 19419M001	4677250.76758	-176770.27761	4319079.94974	A	GRE
53	AMUR 19388M001	4661499.38462	-244591.13906	4332269.95470	A	GR
384	BIAZ 10074M002	4634455.98060	-124344.85739	4365785.52595	W	GR
113	BRZR 19387M001	4662220.92627	-220769.78174	4333309.51005	A	GR
573	CACE 13447M001	4899866.45355	-544566.91963	4033770.28364	W	GRE
592	CANT 13438M001	4625924.25259	-307096.12017	4365771.63213	W	GRE
908	CREU 13432M001	4715420.05959	273178.17830	4271946.91552	A	GRE
135	EBRE 13410M001	4833519.92285	41537.51258	4147461.79154	W	GRE
182	EMAZ 17001M001	4645924.14754	-276949.75358	4347759.64168	A	GR
209	GERN 19389M001	4642811.25247	-217222.80983	4353278.95001	A	GR
257	HOND 15012M002	4640529.25265	-145676.86841	4358781.82885	A	GRE
240	ISPS 19484M001	4640596.41567	-206963.66121	4356391.99110	A	GRE
245	KAST 19499M001	4646949.00846	-240747.15013	4348015.06280	A	GR
252	LARE 19440M001	4632831.89341	-279026.03062	4360314.49930	A	GRE
261	LEIT 19428M001	4663520.87249	-155858.60377	4334519.95964	A	GR
345	PAS2 19351S001	4644908.99453	-156644.95299	4353623.14957	A	GRE
493	PASA 19351S001	4644908.99462	-156644.95301	4353623.14965	A	GRE
553	RID1 13448M002	4708446.76314	-199490.16584	4284089.80831	A	GRE
558	SALA 13469M001	4803054.42535	-462130.95212	4158379.15113	A	GR
526	SCDA 10088M002	4639940.43768	-136224.82403	4359552.49881	W	GRE
443	TERU 13487M001	4867391.25509	-95523.22624	4108341.75636	A	GRE
493	VITO 19385M001	4679397.63575	-218436.38790	4314898.44351	A	GR
616	YEBE 13420M001	4848724.50570	-261631.80929	4123094.40150	W	GRE
655	ZARA 13462M001	4773803.10187	-73505.86614	4215454.16724	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						04-AUG-25 08:02
LOCAL GEODETIC DATUM: ETRF2000			EPOCH: 2025-07-16 11:59:45			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.82738	-678367.90946	4357065.83391	A	
39	ALDA 19383M001	4687280.51391	-190877.11648	4308106.53261	A	
50	ALSA 19419M001	4677251.18850	-176770.94464	4319079.45580	A	
53	AMUR 19388M001	4661499.79712	-244591.80430	4332269.46120	A	
384	BIAZ 10074M002	4634456.41278	-124345.51890	4365785.03663	W	
113	BRZR 19387M001	4662221.34220	-220770.44701	4333309.01683	A	
573	CACE 13447M001	4899866.79886	-544567.61505	4033769.76412	W	
592	CANT 13438M001	4625924.65910	-307096.78111	4365771.14093	W	
908	CREU 13432M001	4715420.53968	273177.50813	4271946.42456	A	
135	EBRE 13410M001	4833520.36004	41536.82683	4147461.28658	W	
182	EMAZ 17001M001	4645924.55679	-276950.41696	4347759.14912	A	
209	GERN 19389M001	4642811.67057	-217223.47265	4353278.45859	A	
257	HOND 15012M002	4640529.68126	-145676.53075	4358781.33868	A	
240	ISPS 19484M001	4640596.83547	-206964.32373	4356391.50003	A	
245	KAST 19499M001	4646949.42281	-240747.81354	4348014.57067	A	
252	LARE 19440M001	4632832.30341	-279026.69236	4360314.00789	A	
261	LEIT 19428M001	4663521.29764	-155859.26902	4334519.46724	A	
345	PAS2 19351S001	4644909.42116	-156645.61591	4353622.65884	A	
493	PASA 19351S001	4644909.42125	-156645.61593	4353622.65892	A	
553	RID1 13448M002	4708447.17794	-199490.83682	4284089.31121	A	
558	SALA 13469M001	4803054.79271	-462131.63547	4158378.64162	A	
526	SCDA 10088M002	4639940.86768	-136225.48626	4359552.00882	W	
443	TERU 13487M001	4867391.66977	-95523.91664	4108341.24636	A	
493	VITO 19385M001	4679398.05047	-218437.05531	4314897.94877	A	
616	YEBE 13420M001	4848724.89829	-261632.49785	4123093.89079	W	
655	ZARA 13462M001	4773803.52861	-73506.54488	4215453.66604	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						04-AUG-25 08:02
LOCAL GEODETIC DATUM: ETRF2014						EPOCH: 2025-07-16 11:59:45
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.78782	-678367.94580	4357065.88700	A	
39	ALDA 19383M001	4687280.47174	-190877.15428	4308106.58556	A	
50	ALSA 19419M001	4677251.14639	-176770.98255	4319079.50879	A	
53	AMUR 19388M001	4661499.75543	-244591.84202	4332269.51420	A	
384	BIAZ 10074M002	4634456.37098	-124345.55721	4365785.08979	W	
113	BRZR 19387M001	4662221.30043	-220770.48482	4333309.06984	A	
573	CACE 13447M001	4899866.75526	-544567.65048	4033769.81633	W	
592	CANT 13438M001	4625924.61804	-307096.81875	4365771.19402	W	
908	CREU 13432M001	4715420.49533	273177.46868	4271946.47777	A	
135	EBRE 13410M001	4833520.31523	41536.78882	4147461.33925	W	
182	EMAZ 17001M001	4645924.51540	-276950.45463	4347759.20215	A	
209	GERN 19389M001	4642811.62900	-217223.51057	4353278.51167	A	
257	HOND 15012M002	4640529.63947	-145676.56895	4358781.39180	A	
240	ISPS 19484M001	4640596.79389	-206964.36170	4356391.55313	A	
245	KAST 19499M001	4646949.38128	-240747.85134	4348014.62372	A	
252	LARE 19440M001	4632832.26217	-279026.73007	4360314.06097	A	
261	LEIT 19428M001	4663521.25561	-155859.30707	4334519.52029	A	
345	PAS2 19351S001	4644909.37935	-156645.65404	4353622.71195	A	
493	PASA 19351S001	4644909.37944	-156645.65406	4353622.71203	A	
553	RI01 13448M002	4708447.13555	-199490.87449	4284089.36410	A	
558	SALA 13469M001	4803054.75007	-462131.67168	4158378.69411	A	
526	SC0A 10088M002	4639940.82585	-136225.52450	4359552.06196	W	
443	TERU 13487M001	4867391.62508	-95523.95397	4108341.29883	A	
493	VITO 19385M001	4679398.00849	-218437.09305	4314898.00173	A	
616	YEBE 13420M001	4848724.85443	-261632.53463	4123093.94322	W	
655	ZARA 13462M001	4773803.48498	-73506.58273	4215453.71880	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						04-AUG-25 08:02
LOCAL GEODETIC DATUM: ETRF2020						EPOCH: 2025-07-16 11:59:45
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.78393	-678367.93106	4357065.89497	A	
39	ALDA 19383M001	4687280.46653	-190877.13906	4308106.59379	A	
50	ALSA 19419M001	4677251.14111	-176770.96734	4319079.51701	A	
53	AMUR 19388M001	4661499.75031	-244591.82689	4332269.52238	A	
384	BIAZ 10074M002	4634456.36542	-124345.54213	4365785.09795	W	
113	BRZR 19387M001	4662221.29524	-220770.46969	4333309.07803	A	
573	CACE 13447M001	4899866.75178	-544567.63471	4033769.82483	W	
592	CANT 13438M001	4625924.61303	-307096.80377	4365771.20213	W	
908	CREU 13432M001	4715420.48881	273177.48419	4271946.48613	A	
135	EBRE 13410M001	4833520.30972	41536.80461	4147461.34776	W	
182	EMAZ 17001M001	4645924.51034	-276950.43957	4347759.21030	A	
209	GERN 19389M001	4642811.62375	-217223.49549	4353278.51983	A	
257	HOND 15012M002	4640529.63399	-145676.55385	4358781.39997	A	
240	ISPS 19484M001	4640596.78860	-206964.34662	4356391.56128	A	
245	KAST 19499M001	4646949.37612	-240747.83626	4348014.63188	A	
252	LARE 19440M001	4632832.25709	-279026.71506	4360314.06909	A	
261	LEIT 19428M001	4663521.25023	-155859.29191	4334519.52849	A	
345	PAS2 19351S001	4644909.37392	-156645.63894	4353622.72012	A	
493	PASA 19351S001	4644909.37401	-156645.63896	4353622.72020	A	
553	RI01 13448M002	4708447.13042	-199490.85920	4284089.37236	A	
558	SALA 13469M001	4803054.74604	-462131.65619	4158378.70248	A	
526	SC0A 10088M002	4639940.82034	-136225.50940	4359552.07012	W	
443	TERU 13487M001	4867391.62008	-95523.93813	4108341.30738	A	
493	VITO 19385M001	4679398.00334	-218437.07786	4314898.00994	A	
616	YEBE 13420M001	4848724.84989	-261632.51891	4123093.95171	W	
655	ZARA 13462M001	4773803.47965	-73506.56718	4215453.72720	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 04-AUG-25 08:02

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	1.22	0.98	5.81
ALDA 19383M001	6	X XXXXX	1.16	0.93	4.41
ALSA 19419M001	7	XXXXXX	4.17	1.53	5.02
AMUR 19388M001	7	XXXXXX	3.62	1.06	4.41
BLAZ 10074M002	7	XXXXXX	4.21	1.87	4.51
BRZR 19387M001	6	X XXXXX	1.25	0.64	5.28
CACE 13447M001	7	XXXXXX	1.97	1.05	7.29
CANT 13438M001	7	XXXXXX	2.80	0.74	4.11
CREU 13432M001	7	XXXXXX	3.75	2.15	5.25
EBRE 13410M001	6	X XXXXX	1.08	1.27	5.11
EMAZ 17001M001	7	XXXXXX	1.89	0.48	3.93
GERN 19389M001	7	XXXXXX	3.46	1.02	4.17
HOND 15012M002	5	X X XXX	1.56	0.72	4.42
ISPS 19484M001	7	XXXXXX	3.33	0.72	4.26
KAST 19499M001	7	XXXXXX	3.26	1.21	3.79
LARE 19440M001	7	XXXXXX	1.78	1.39	3.45
LEIT 19428M001	6	X XXXXX	1.71	1.17	3.72
PAS2 19351S001	6	X XXXXX	1.54	0.42	3.70
PASA 19351S001	6	X XXXXX	1.53	0.44	3.65
RI01 13448M002	6	X XXXXX	1.26	0.51	4.92
SALA 13469M001	5	X X XXX	2.58	1.20	6.27
SCOA 10088M002	6	X XXXXX	1.48	1.62	3.63
TERU 13487M001	7	XXXXXX	0.62	1.05	5.08
VITO 19385M001	7	XXXXXX	4.06	1.57	4.08
YEBE 13420M001	7	XXXXXX	1.31	0.76	2.78
ZARA 13462M001	6	X XXXXX	1.46	1.12	3.65

Comparison of individual solutions:

ACOR 13434M001	N	1.22	-1.43	2.33	-0.71	0.13	0.11	0.63	-0.78
ACOR 13434M001	E	0.98	-0.98	-0.41	-1.00	-0.94	0.66	-1.48	0.42
ACOR 13434M001	U	5.81	2.55	8.07	-0.08	-5.96	-3.34	-7.30	5.54
ALDA 19383M001	N	1.16	-2.28		0.03	0.66	0.92	0.48	-0.13
ALDA 19383M001	E	0.93	-1.67		-0.46	-1.03	0.01	0.44	0.32
ALDA 19383M001	U	4.41	1.41		7.46	0.55	5.71	0.19	-2.61
ALSA 19419M001	N	4.17	-2.59	9.68	-0.09	0.07	1.69	0.75	-0.53
ALSA 19419M001	E	1.53	-0.81	3.42	-0.40	-0.84	-0.47	0.38	0.64
ALSA 19419M001	U	5.02	3.45	-8.35	2.79	-3.65	3.30	6.11	0.35
AMUR 19388M001	N	3.62	-3.58	7.63	0.26	-1.33	0.53	1.61	1.65
AMUR 19388M001	E	1.06	-0.58	1.98	-0.49	-0.80	0.86	-0.73	0.57
AMUR 19388M001	U	4.41	7.15	-6.93	1.91	-1.30	0.29	3.43	0.47
BLAZ 10074M002	N	4.21	-2.91	9.75	-0.45	-0.46	0.37	-0.06	1.46
BLAZ 10074M002	E	1.87	-1.93	3.54	-1.23	-0.84	0.94	0.44	1.17
BLAZ 10074M002	U	4.51	5.22	-6.70	1.77	0.64	-4.35	1.19	5.10
BRZR 19387M001	N	1.25	-2.34		-0.52	0.92	0.95	0.56	0.16
BRZR 19387M001	E	0.64	-0.79		-0.55	-0.53	0.69	-0.22	-0.54
BRZR 19387M001	U	5.28	8.33		6.01	-2.14	-0.67	3.38	-4.15
CACE 13447M001	N	1.97	2.22	-3.89	-0.71	1.14	-1.14	-0.36	-0.18
CACE 13447M001	E	1.05	1.85	-1.56	0.14	0.60	-0.24	-0.58	-0.02
CACE 13447M001	U	7.29	-6.54	11.21	-1.19	-6.62	-0.08	-9.74	-3.18
CANT 13438M001	N	2.80	-2.15	6.19	-0.98	-0.46	0.92	0.32	1.41
CANT 13438M001	E	0.74	0.09	0.97	0.04	-1.37	0.37	0.49	-0.36
CANT 13438M001	U	4.11	1.29	-5.63	4.56	-2.33	-3.22	5.43	1.40
CREU 13432M001	N	3.75	-2.49	8.46	2.24	-0.90	0.38	0.67	-0.24
CREU 13432M001	E	2.15	-2.00	4.36	-0.86	-0.86	-0.32	0.85	1.59
CREU 13432M001	U	5.25	4.78	-5.75	8.68	-1.39	3.70	-2.66	-3.40
EBRE 13410M001	N	1.08	-0.45		1.44	-1.62	-0.73	0.10	0.65
EBRE 13410M001	E	1.27	-1.16		-0.57	-2.08	-0.03	0.77	1.20
EBRE 13410M001	U	5.11	5.24		-0.70	-5.85	1.64	6.90	4.26
EMAZ 17001M001	N	1.89	-1.92	3.70	-0.66	0.45	1.58	0.81	0.52
EMAZ 17001M001	E	0.48	0.30	-0.18	-0.36	0.12	0.63	-0.85	0.09
EMAZ 17001M001	U	3.93	-2.58	4.87	1.59	-5.36	-3.90	3.96	0.11
GERN 19389M001	N	3.46	-2.01	7.98	-1.01	-0.92	0.51	-0.09	1.45
GERN 19389M001	E	1.02	-0.53	1.86	0.46	-0.46	0.29	0.52	-1.31
GERN 19389M001	U	4.17	5.72	-6.32	3.88	1.15	-0.39	2.81	-2.71
HOND 15012M002	N	1.56	-2.53		-0.25		-0.40	0.02	1.76
HOND 15012M002	E	0.72	-0.27		-0.63		0.60	0.62	-0.92
HOND 15012M002	U	4.42	3.35		3.68		-1.34	6.83	-2.24
ISPS 19484M001	N	3.33	-2.13	7.81	-0.53	-0.41	0.36	0.23	0.60
ISPS 19484M001	E	0.72	-0.50	1.40	0.28	-0.33	-0.04	0.56	-0.62
ISPS 19484M001	U	4.26	7.69	-5.82	3.17	1.47	-0.48	-0.01	-1.82
KAST 19499M001	N	3.26	-2.76	7.39	-0.21	0.02	0.49	-0.13	1.07
KAST 19499M001	E	1.21	-0.97	2.73	-0.52	-0.31	-0.01	0.01	-0.14
KAST 19499M001	U	3.79	6.05	-5.16	3.36	-0.26	-0.49	2.67	-2.10
LARE 19440M001	N	1.78	-2.50	2.98	0.69	0.85	0.83	1.38	0.13
LARE 19440M001	E	1.39	-1.88	1.65	1.92	-0.13	-1.17	-0.41	-0.30
LARE 19440M001	U	3.45	3.24	2.41	0.82	-2.27	0.62	-6.88	1.18
LEIT 19428M001	N	1.71	-2.63		0.95	-1.64	0.86	1.21	1.35
LEIT 19428M001	E	1.17	-2.33		0.10	1.06	0.41	0.21	-0.04
LEIT 19428M001	U	3.72	6.76		0.27	3.82	1.01	2.51	1.16
PAS2 19351S001	N	1.54	-3.24		-0.48	0.23	0.21	0.92	0.47
PAS2 19351S001	E	0.42	-0.17		-0.32	-0.59	0.48	-0.09	-0.43
PAS2 19351S001	U	3.70	4.90		4.74	1.43	0.03	2.81	-3.45
PASA 19351S001	N	1.53	-3.21		-0.48	0.18	0.17	0.96	0.49
PASA 19351S001	E	0.44	-0.16		-0.31	-0.65	0.49	-0.05	-0.42
PASA 19351S001	U	3.65	4.84		4.72	1.30	0.20	2.81	-3.39
RI01 13448M002	N	1.26	-2.15		0.02	-0.22	1.48	-0.47	0.93
RI01 13448M002	E	0.51	-0.93		-0.28	0.06	-0.13	0.35	-0.49
RI01 13448M002	U	4.92	-2.32		7.43	-3.12	0.73	6.65	2.41
SALA 13469M001	N	2.58	4.91		-1.23		-0.48	-0.65	0.59
SALA 13469M001	E	1.20	1.76		0.82		0.08	-1.41	0.11
SALA 13469M001	U	6.27	-11.32		-0.89		0.50	4.23	3.16
SCOA 10088M002	N	1.48	-1.14		-1.28	-1.21	-1.06	2.35	0.06
SCOA 10088M002	E	1.62	1.21		-2.26	-0.08	0.81	0.68	-2.34

SCDA 10088M002	U	3.63	4.66		3.39	0.38	-2.07	5.23	-0.95
TERU 13487M001	N	0.62	-0.03	-0.32	0.15	-0.78	1.22	0.31	0.15
TERU 13487M001	E	1.05	1.06	-0.59	-0.57	-1.00	-1.02	0.39	1.63
TERU 13487M001	U	5.08	-1.90	5.13	-9.18	6.19	-0.39	-1.22	-0.73
VITO 19385M001	N	4.06	-2.83	9.42	0.08	0.12	1.01	0.22	0.95
VITO 19385M001	E	1.57	-1.53	3.50	-0.30	-0.11	0.24	-0.13	-0.03
VITO 19385M001	U	4.08	5.61	-6.77	2.90	-1.74	-0.43	1.90	2.68
YEBE 13420M001	N	1.31	-1.36	2.56	-0.52	-0.30	1.10	0.35	0.41
YEBE 13420M001	E	0.76	1.50	0.25	0.09	0.46	-0.64	-0.70	-0.14
YEBE 13420M001	U	2.78	3.03	3.17	-0.57	-3.74	-1.86	-0.90	2.93
ZARA 13462M001	N	1.46	-2.73		0.54	-0.04	1.37	-0.81	0.59
ZARA 13462M001	E	1.12	-1.10		-1.19	-0.59	1.50	-0.98	0.32
ZARA 13462M001	U	3.65	0.76		4.31	3.63	-4.59	3.33	1.49

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	2.18	-1.09	-1.28		
3	ALME 13437M001	I W	-0.81	0.90	-1.12		
4	BCL1 19482M001	I W	-0.51	-2.76	5.76		
5	BELL 13431M001	I W	-0.99	-0.85	1.87		
6	BIAZ 10074M002	I W	1.46	0.08	-3.30		
7	BORR 13480M001	I W	-5.06	0.03	0.06		
8	BRST 10004M004	I W	-1.08	-0.70	-0.62		
9	CACE 13447M001	I W	1.70	2.50	-2.41		
10	CANT 13438M001	I W	0.23	1.63	-2.01		
11	CASC 13909S001	I W	2.33	-0.81	4.25		
12	CEU1 13449M002	I W	0.43	0.64	-5.62		
14	EBRE 13410M001	I W	-2.07	0.10	-0.31		
16	FLRS 31907M001	I W	0.75	-4.33	-6.25		
17	FUER 31330M001	I W	1.04	-0.81	2.55		
19	HUEL 13451M001	I W	2.03	3.89	-8.82		
20	IBIZ 13454S001	I W	-0.34	1.34	3.91		
21	IZAN 31309M002	I W	-0.29	-1.09	0.73		
22	LAGO 13903M001	I W	1.23	0.35	-2.77		
23	LLIV 13436M001	I W	-3.44	1.15	7.37		
24	LPAL 81701M001	I W	2.01	1.40	-3.45		
25	LROC 10023M001	I W	1.76	0.18	-1.35		
26	MADR 13407S012	I W	1.54	2.34	0.66		
27	MAL1 13444M002	I W	5.58	-1.18	-3.32		
28	MALA 13443M001	I W	1.44	-0.57	5.14		
29	MALL 13444M001	I W	-0.40	-0.57	6.60		
30	MAS1 31303M002	I W	-0.91	-1.92	1.98		
31	MELI 19379M001	I W	-0.06	-0.40	2.16		
32	PDEL 31906M004	I W	-1.18	-0.25	2.31		
33	SCOA 10088M002	I W	-5.55	-2.25	-13.97		
34	SFER 13402M004	I W	-2.09	-4.19	2.17		
35	VALE 13439M001	I W	-0.61	1.77	-6.47		
36	VIGO 13450M001	I W	1.41	2.58	1.40		
37	VILL 13406M001	I W	-0.47	0.16	3.74		
38	YEBE 13420M001	I W	-0.11	-0.10	5.88		
39	ZARA 13462M001	I W	-0.61	-0.64	-0.18		
40	ZIMM 14001M004	I W	-1.10	-1.16	4.67		
	RMS / COMPONENT		2.09	1.75	4.58		
	IQR		2.40	2.00	5.73		
	MEAN		-0.01	-0.13	-0.00		
	MEDIAN		-0.20	-0.17	0.36		
	MIN		-5.55	-4.33	-13.97		
	MAX		5.58	3.89	7.37		
OVERALL RMS/IQR/MAX(3D)			3.08	2.77	15.20	SCOA 10088M002	#SUM
ALL	RMS / COMPONENT		2.09	1.75	4.58		
ALL	IQR		2.40	2.00	5.73		
ALL	MEAN		-0.01	-0.13	-0.00		
ALL	MEDIAN		-0.20	-0.17	0.36		
ALL	MIN		-5.55	-4.33	-13.97		
ALL	MAX		5.58	3.89	7.37		
ALL	OVERALL RMS/IQR/MAX(3D)		3.08	2.77	15.20	SCOA 10088M002	#SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 36
NUMBER OF COORDINATES : 108
RMS OF TRANSFORMATION : 3.08 MM

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 36
NUMBER OF COORDINATES : 108
RMS OF TRANSFORMATION : 3.08 MM

PARAMETERS:

TRANSLATION IN X : -0.01 +- 0.51 MM
TRANSLATION IN Y : -0.01 +- 0.51 MM
TRANSLATION IN Z : -0.01 +- 0.51 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                20022103
NUMBER OF UNKNOWNNS                   208709
NUMBER OF DEGREES OF FREEDOM          19813394
PHASE MEASUREMENTS SIGMA              0.00100
SAMPLING INTERVAL (SECONDS)           180
VARIANCE FACTOR                       9.953709744932631
```

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 25:194:00000 25:200:86370 LEICA GR50 -----
ALDA A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
ALSA A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
AMUR A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
BIAZ A 1 P 25:194:00000 25:200:86370 SPECTRA SP90M -----
BRZR A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
CACE A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
CANT A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
CREU A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
EBRE A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
EMAZ A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
GERN A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
HOND A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
ISPS A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
KAST A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
LARE A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
LEIT A 1 P 25:194:00000 25:200:86370 LEICA GRX1200GGPRO -----
PAS2 A 1 P 25:194:00000 25:200:86370 STONEX SC2200 -----
PASA A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
RI01 A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
SALA A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
SCDA A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
TERU A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
VITO A 1 P 25:194:00000 25:200:86370 LEICA GR30 -----
YEBE A 1 P 25:194:00000 25:200:86370 LEICA GR50 -----
ZARA A 1 P 25:194:00000 25:200:86370 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 25:194:00000 25:200:86370 LEIAT504 LEIS -----
ALDA A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
ALSA A 1 P 25:194:00000 25:200:86370 LEIAR10 NONE -----
AMUR A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
BIAZ A 1 P 25:194:00000 25:200:86370 LEIAR25 LEIT -----
BRZR A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
CACE A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
CANT A 1 P 25:194:00000 25:200:86370 LEIAR25.R4 LEIT -----
CREU A 1 P 25:194:00000 25:200:86370 LEIAR25.R4 NONE -----
EBRE A 1 P 25:194:00000 25:200:86370 LEIAR25.R4 NONE -----
EMAZ A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
GERN A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
HOND A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
ISPS A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
KAST A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
LARE A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
LEIT A 1 P 25:194:00000 25:200:86370 LEIAR10 NONE -----
PAS2 A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
PASA A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
RI01 A 1 P 25:194:00000 25:200:86370 LEIAR25.R4 LEIT -----
SALA A 1 P 25:194:00000 25:200:86370 LEIAR25 NONE -----
SCDA A 1 P 25:194:00000 25:200:86370 TRM55971.00 NONE -----
TERU A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
VITO A 1 P 25:194:00000 25:200:86370 LEIAS10 NONE -----
YEBE A 1 P 25:194:00000 25:200:86370 LEIAR20 LEIM -----
ZARA A 1 P 25:194:00000 25:200:86370 TRM29659.00 NONE -----
```

7.3 Eccentricities

```
*
*SITE PT SOLN T DATA_START__ DATA_END_____ AXE ARP-->BENCHMARK(M)-----
ACOR A 1 P 25:194:00000 25:200:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 25:194:00000 25:200:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 25:194:00000 25:200:86370 UNE 0.0000 0.0000 0.0000
```

AMUR	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
BLAZ	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	25:194:00000	25:200:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	25:194:00000	25:200:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	25:194:00000	25:200:86370	UNE	3.0490	0.0000	0.0000
CREU	A	1	P	25:194:00000	25:200:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	25:194:00000	25:200:86370	UNE	0.0770	0.0000	0.0000
EMAZ	A	1	P	25:194:00000	25:200:86370	UNE	0.0350	0.0000	0.0000
GERN	A	1	P	25:194:00000	25:200:86370	UNE	0.0771	0.0000	0.0000
HOND	A	1	P	25:194:00000	25:200:86370	UNE	0.0771	0.0000	0.0000
ISPS	A	1	P	25:194:00000	25:200:86370	UNE	0.0350	0.0000	0.0000
KAST	A	1	P	25:194:00000	25:200:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
PAS2	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
RID1	A	1	P	25:194:00000	25:200:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	25:194:00000	25:200:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
TERU	A	1	P	25:194:00000	25:200:86370	UNE	0.0600	0.0000	0.0000
VITO	A	1	P	25:194:00000	25:200:86370	UNE	0.0000	0.0000	0.0000
YEBE	A	1	P	25:194:00000	25:200:86370	UNE	0.0600	0.0000	0.0000
ZARA	A	1	P	25:194:00000	25:200:86370	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:

2025-08-03 03:22 UTC	CANT1940.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-03 03:22 UTC	CANT1940.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-03 06:44 UTC	CANT1950.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-03 06:44 UTC	CANT1950.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-03 10:03 UTC	CANT1960.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-03 10:03 UTC	CANT1960.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-03 13:55 UTC	CANT1970.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-03 13:55 UTC	CANT1970.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-03 17:09 UTC	CANT1980.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-03 17:09 UTC	CANT1980.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-03 22:06 UTC	CANT1990.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-03 22:06 UTC	CANT1990.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-04 04:06 UTC	CANT2000.250	RECEIVER TYPE	VERS.	LEICA GR10	LEICA GR50	(source: cant00esp_20250509.log
2025-08-04 04:06 UTC	CANT2000.250	RECEIVER FIRM.	VERS.	4.00/6.713	4.80/7.900	(source: cant00esp_20250509.log
2025-08-03 03:22 UTC	ISPS1940.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-03 06:44 UTC	ISPS1950.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-03 10:03 UTC	ISPS1960.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-03 13:55 UTC	ISPS1970.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-03 17:09 UTC	ISPS1980.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-03 22:06 UTC	ISPS1990.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-04 04:06 UTC	ISPS2000.250	ANTENNA SER. NO.		24238009		(source: isps00esp_20250114.log
2025-08-03 03:22 UTC	LEIT1940.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.log
2025-08-03 06:44 UTC	LEIT1950.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.log
2025-08-03 10:03 UTC	LEIT1960.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.log
2025-08-03 13:55 UTC	LEIT1970.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.log
2025-08-03 17:09 UTC	LEIT1980.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.log
2025-08-03 22:06 UTC	LEIT1990.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.log
2025-08-04 04:06 UTC	LEIT2000.250	RECEIVER FIRM. VERS.		8.20/3.054	8.20	(source: leit00esp_20250623.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

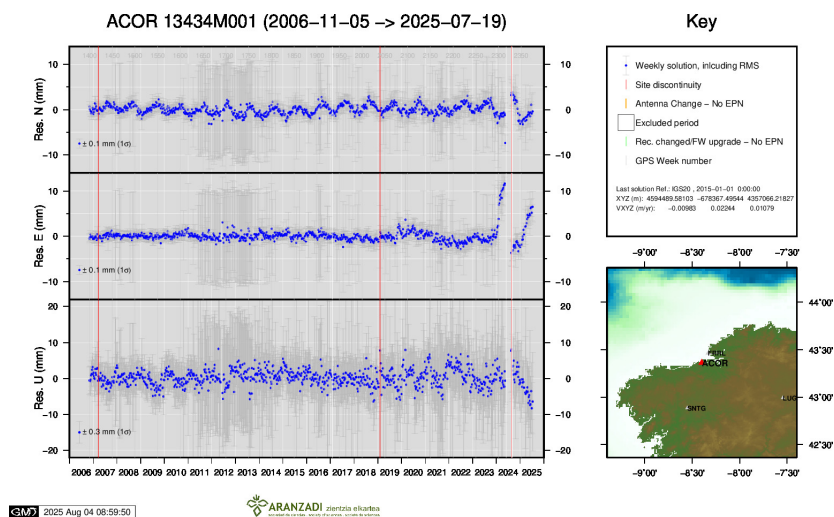
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

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

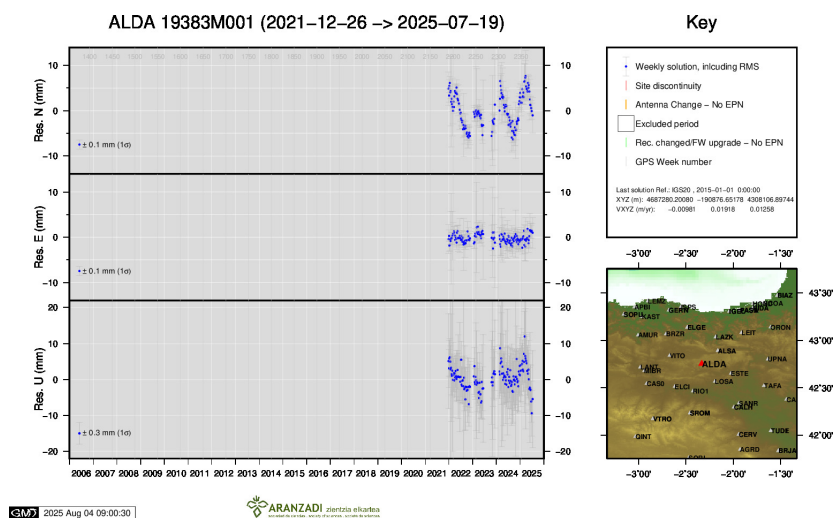
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

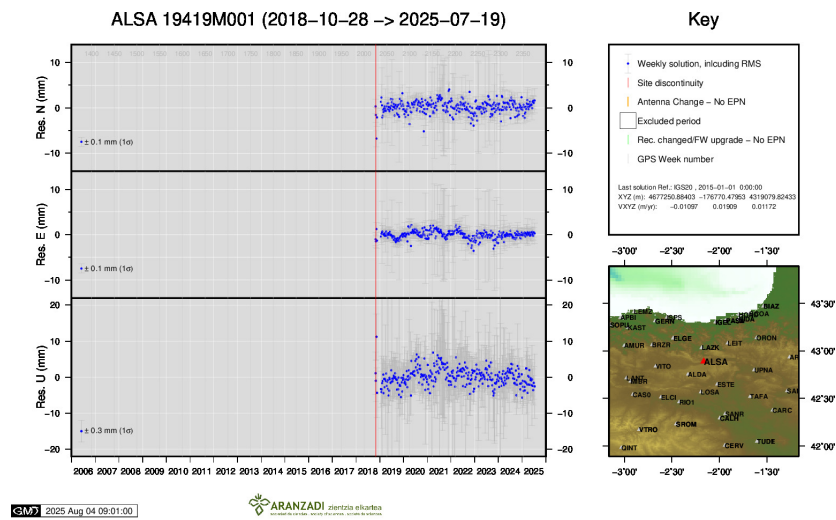
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



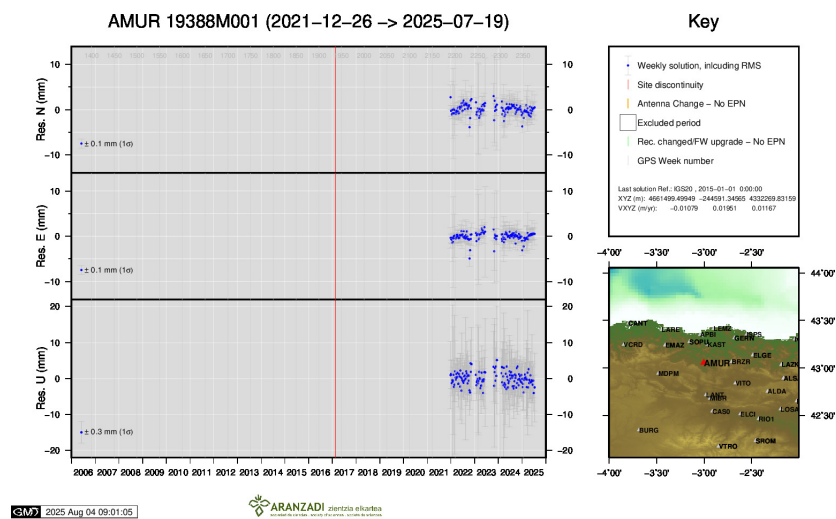
1) ACOR



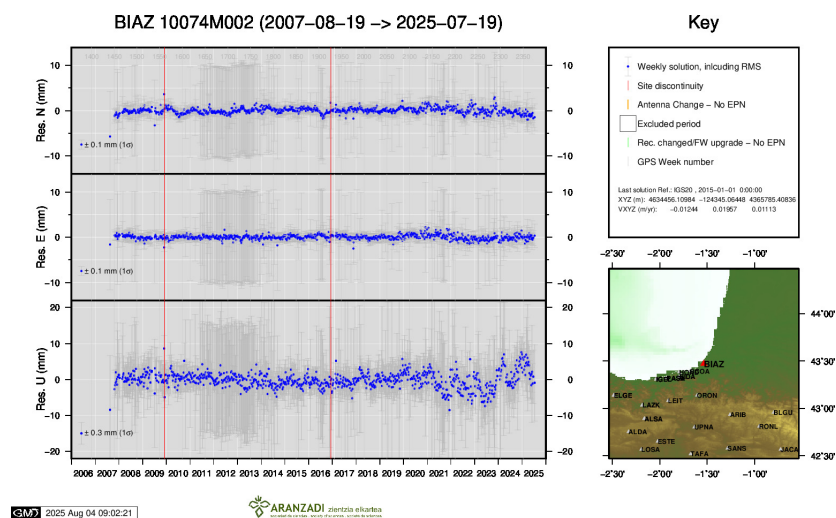
2) ALDA



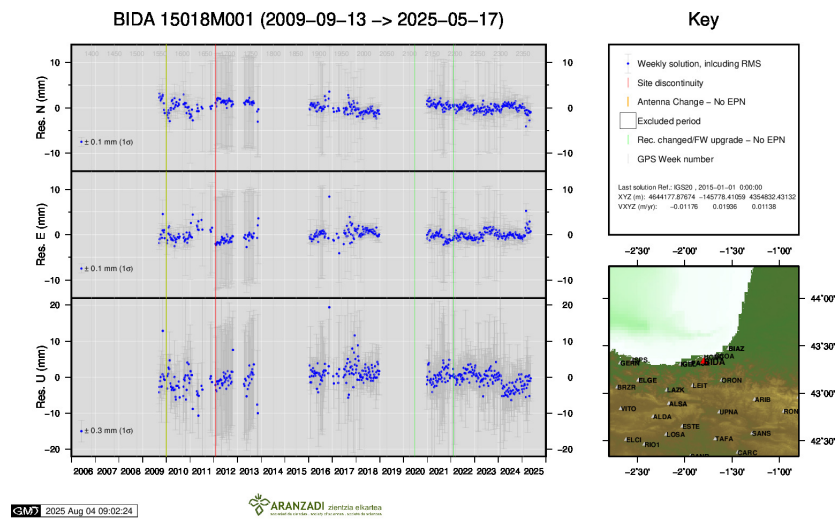
3) ALSA



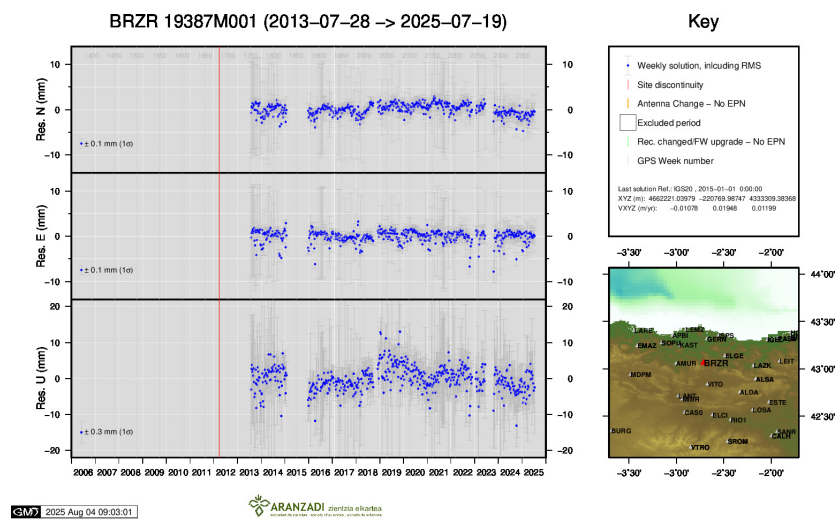
4) AMUR



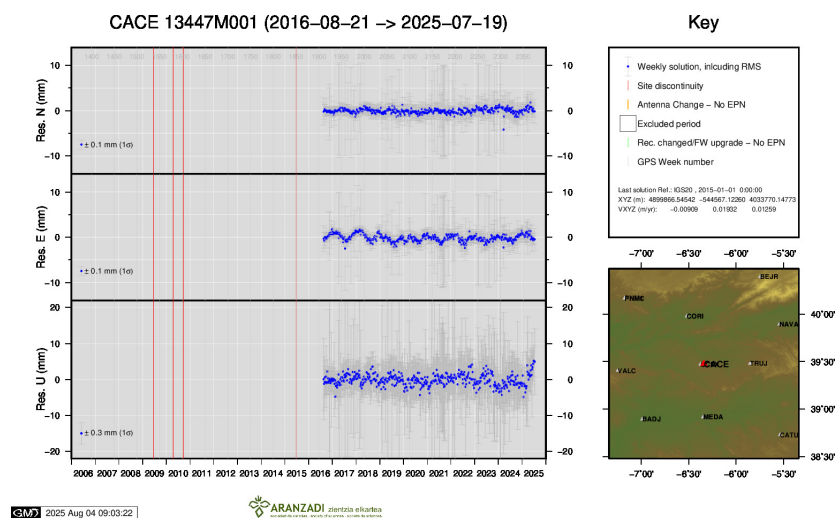
5) BIAZ



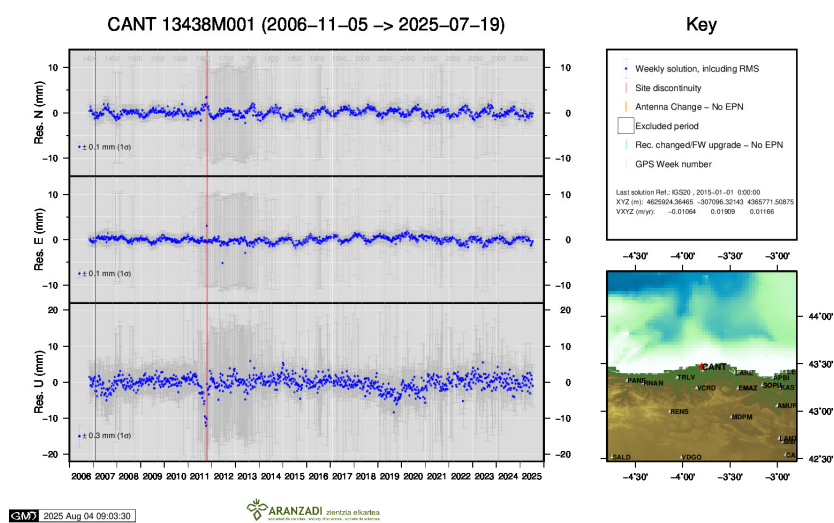
6) BIDA



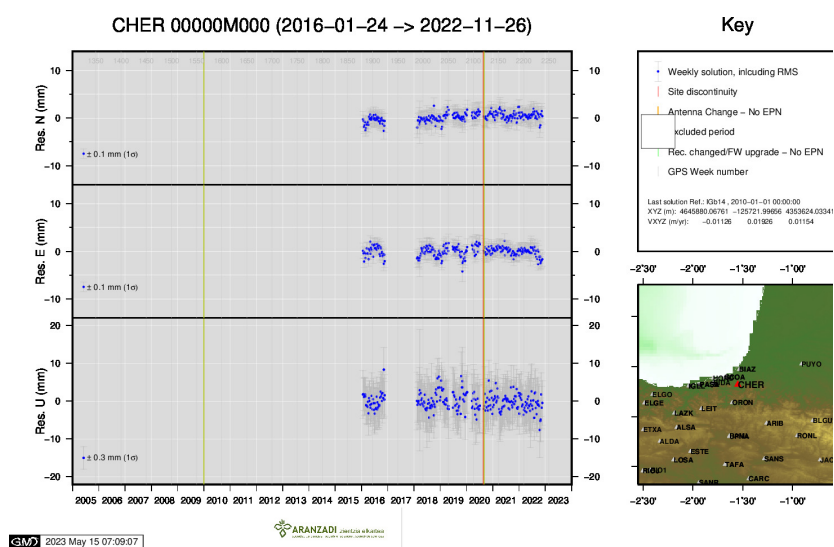
7) BRZR



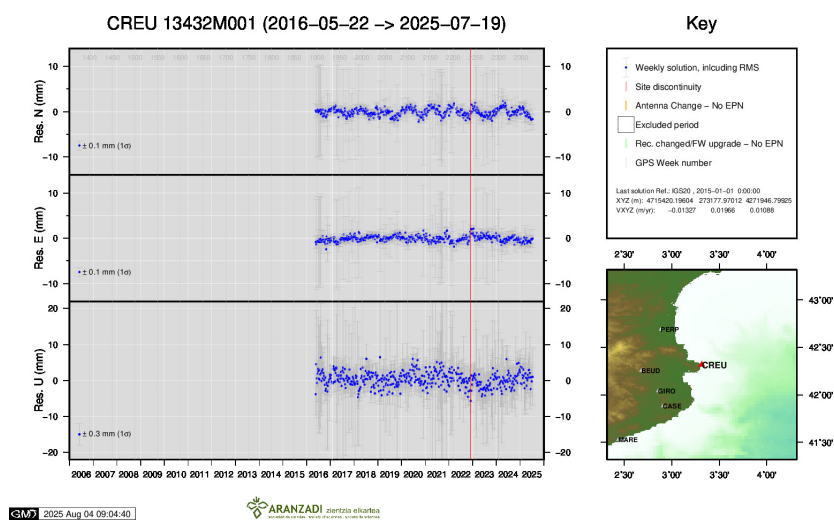
8) CACE



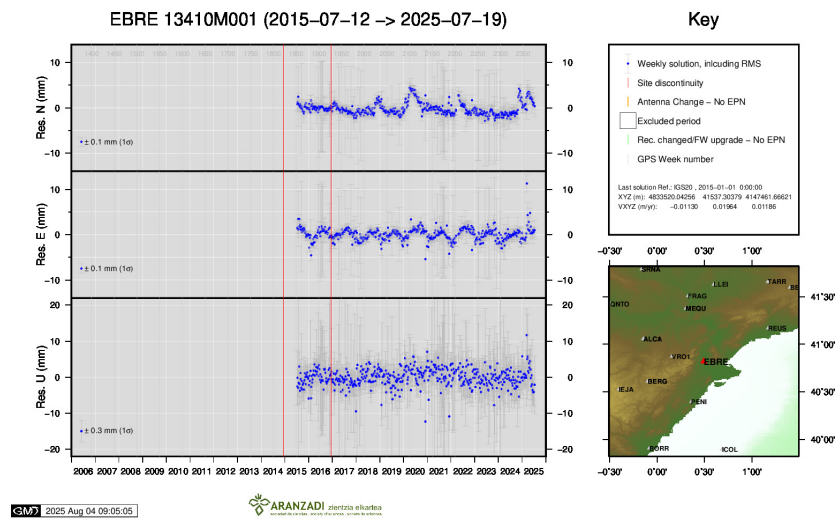
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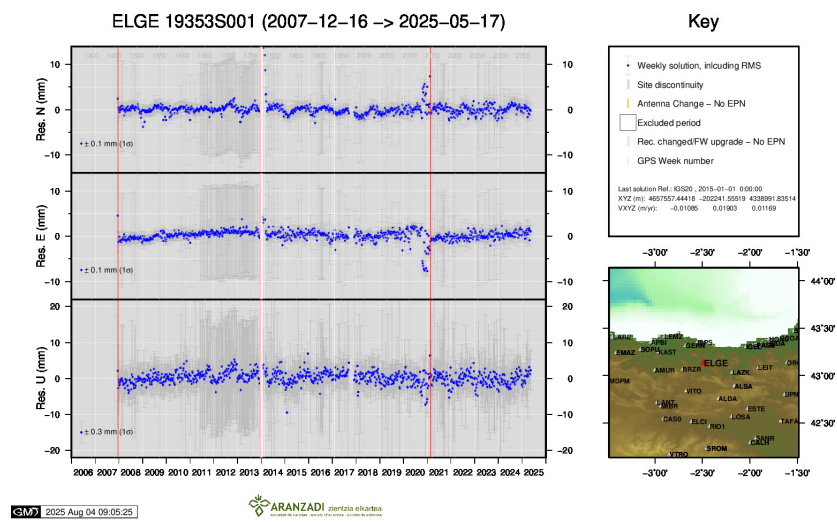
10) CHER



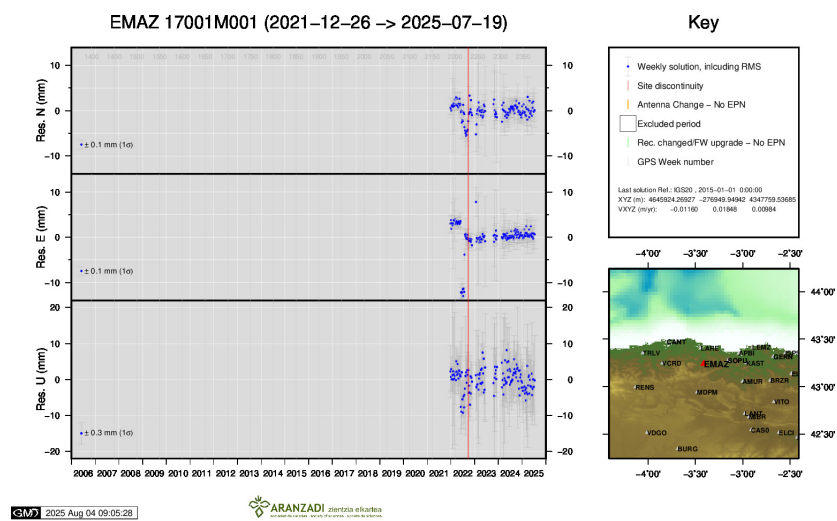
11) CREU



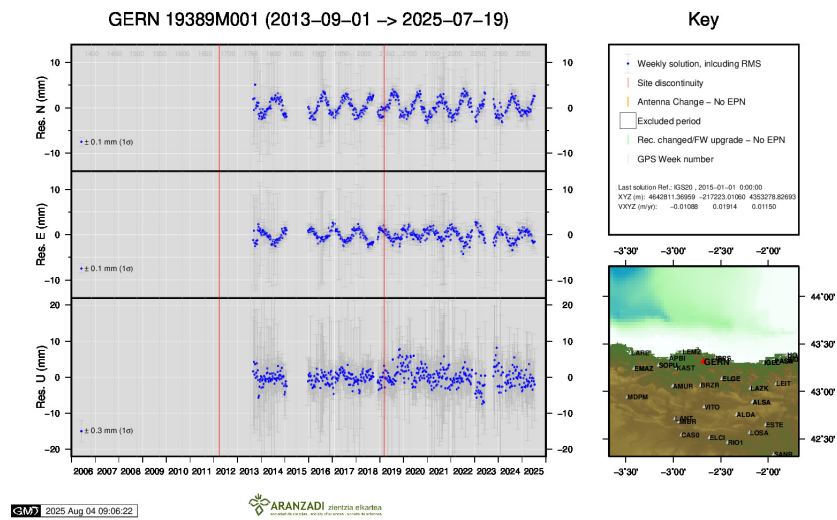
12) EBRE



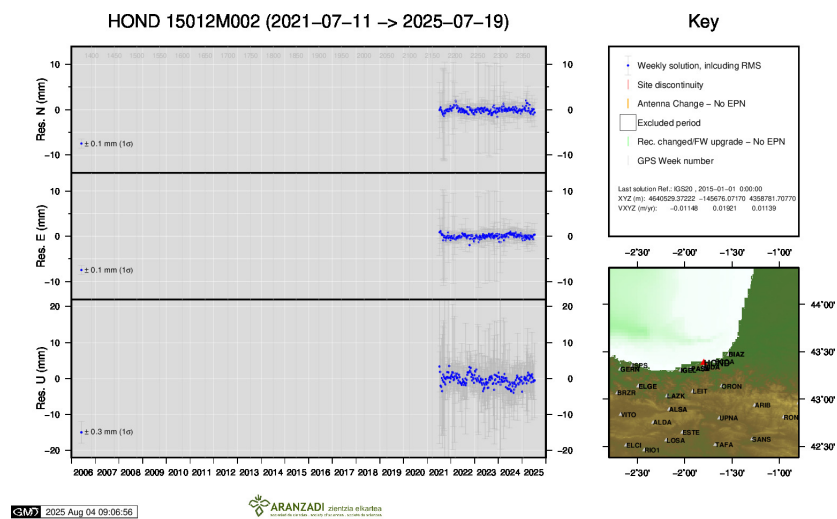
13) ELGE



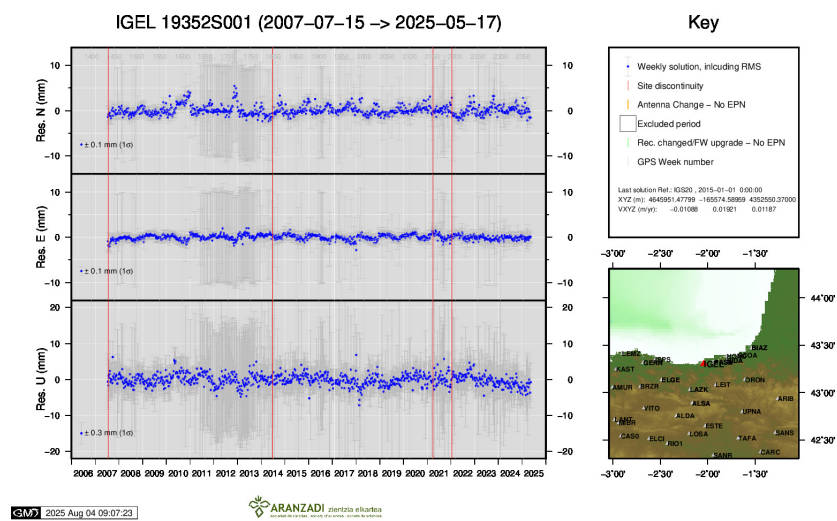
14) EMAZ



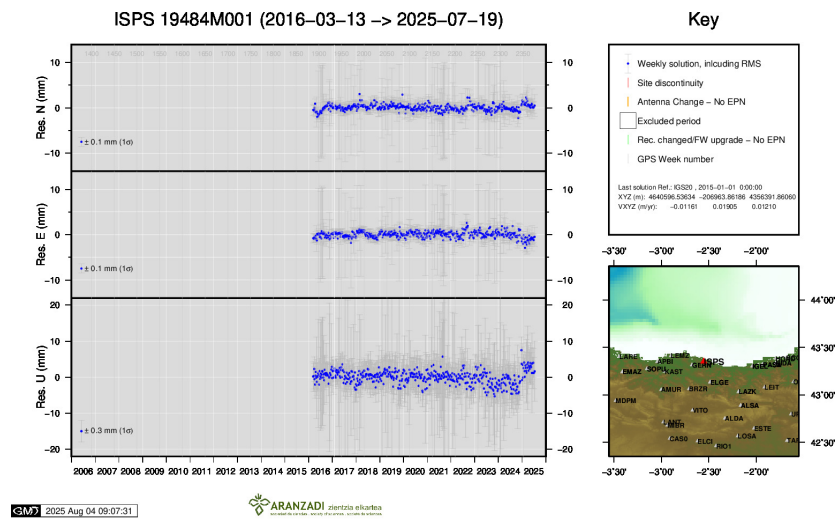
15) GERN



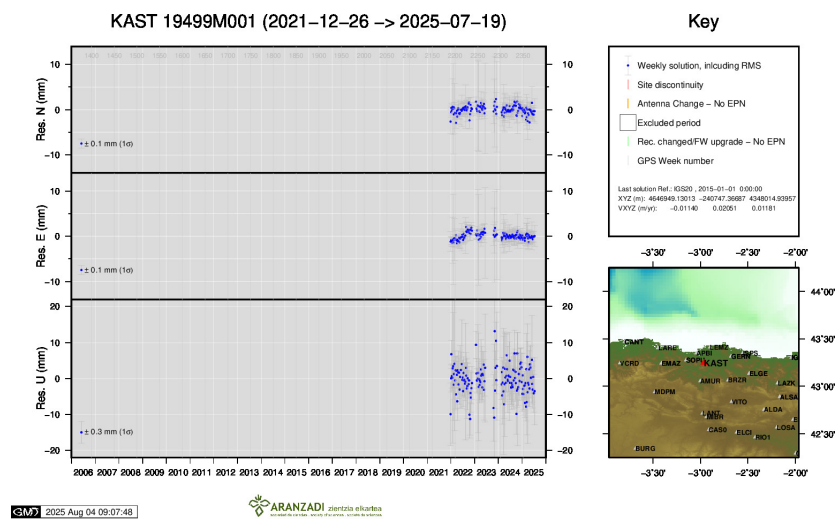
16) HOND



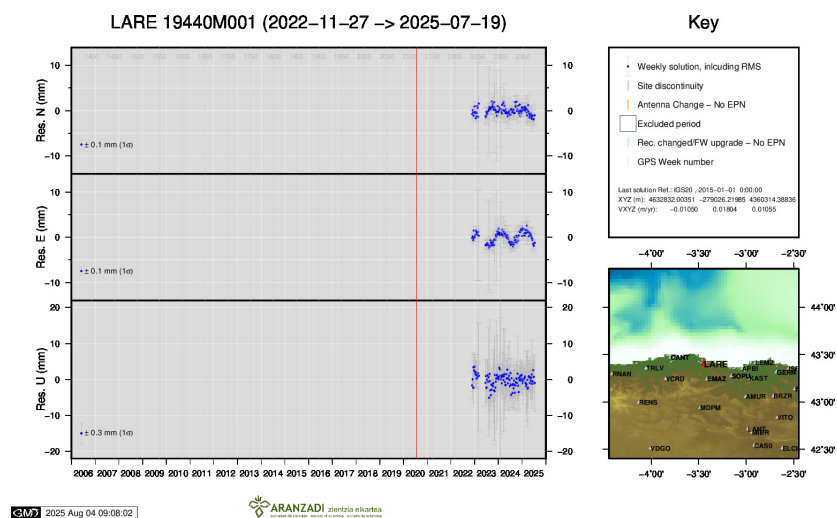
17) IGEL



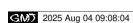
18) ISPS



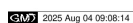
19) KAST



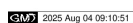
20) LARE



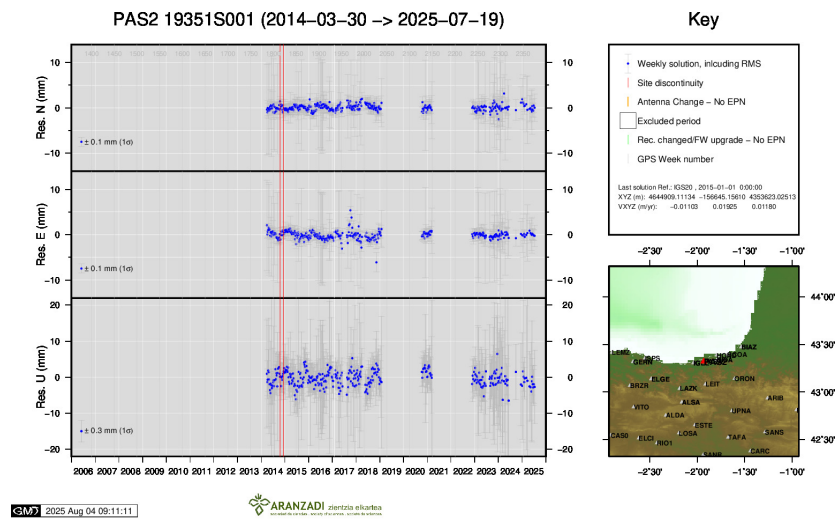
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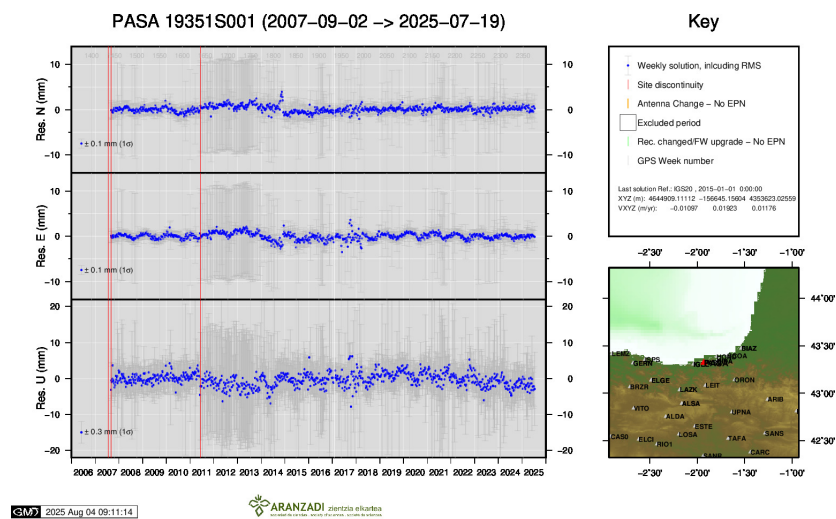
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sustentazioa, erakundeak, erakundeak, erakundeak



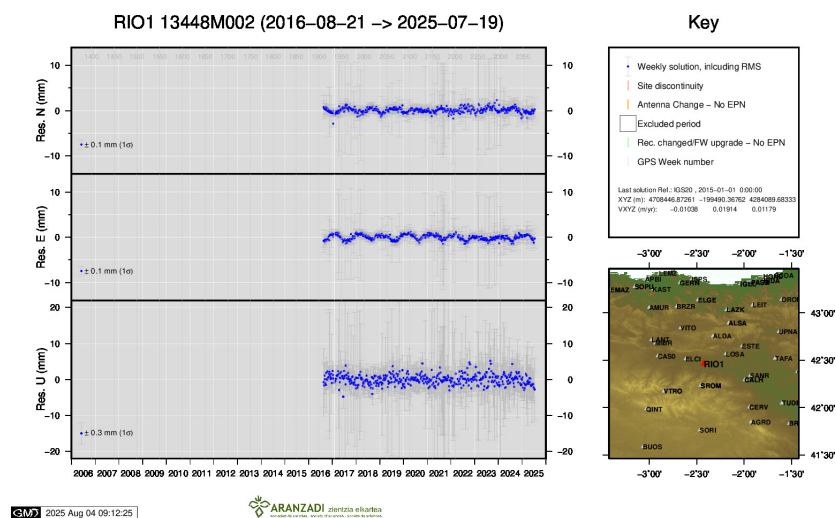
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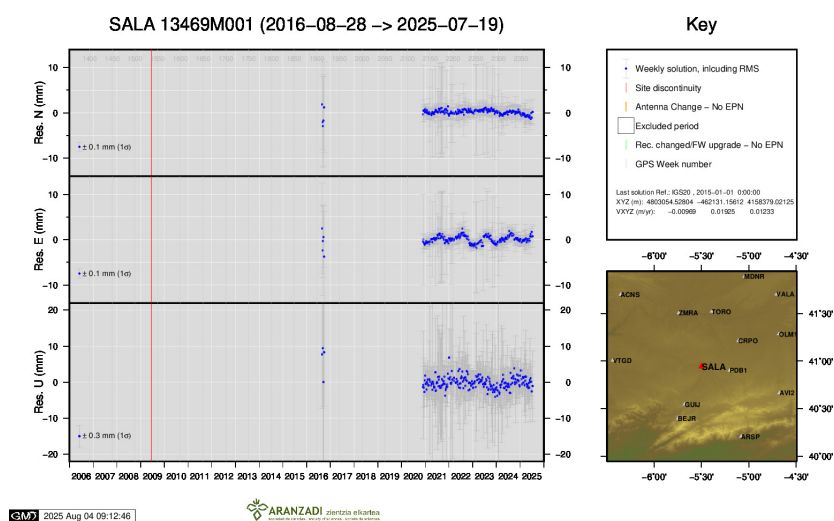
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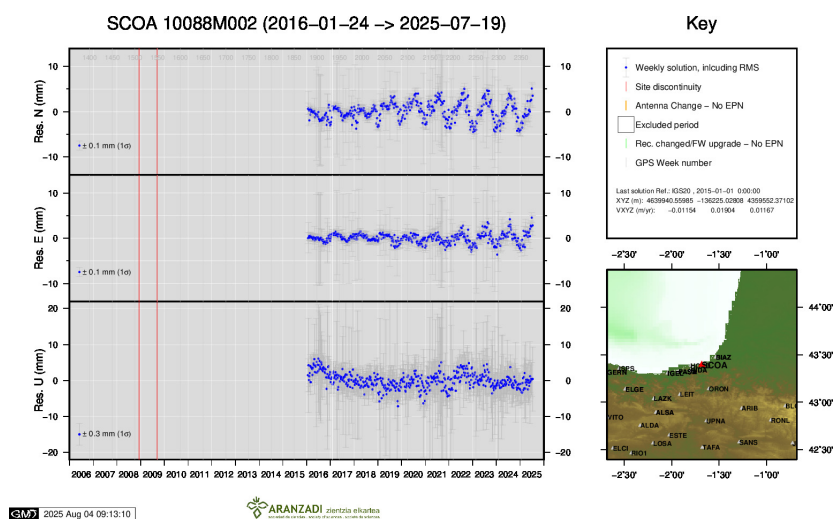
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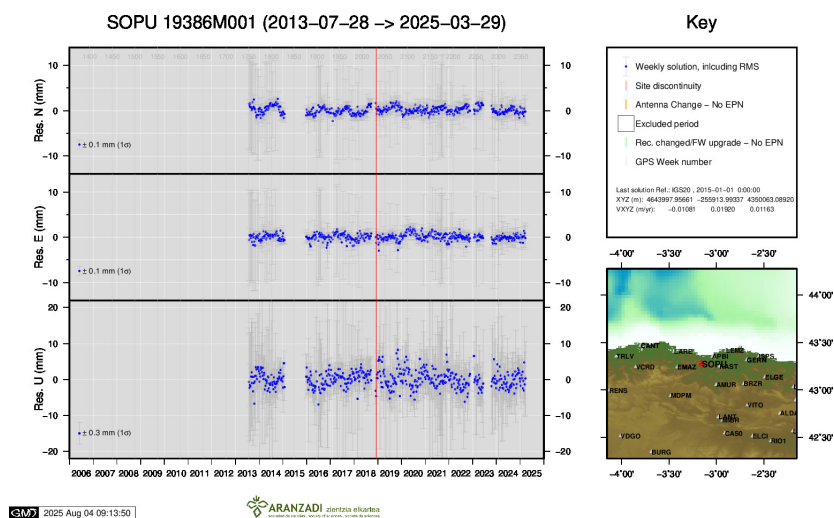
26) RIO1



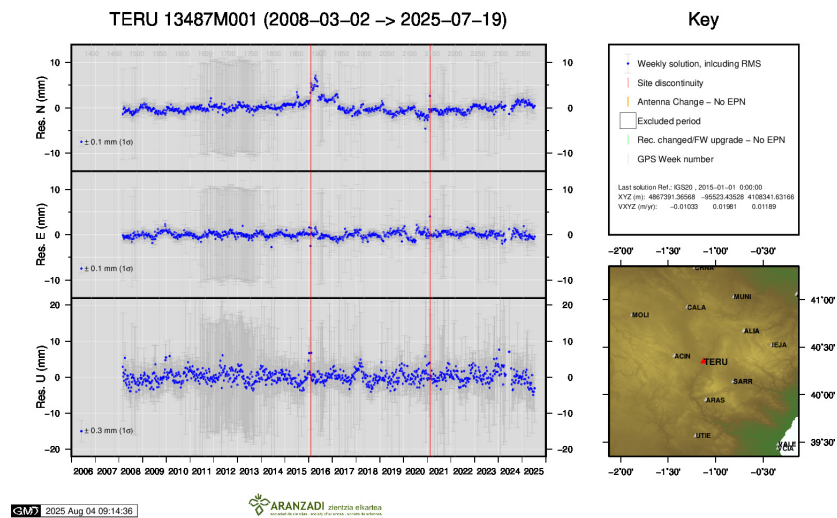
27) SALA



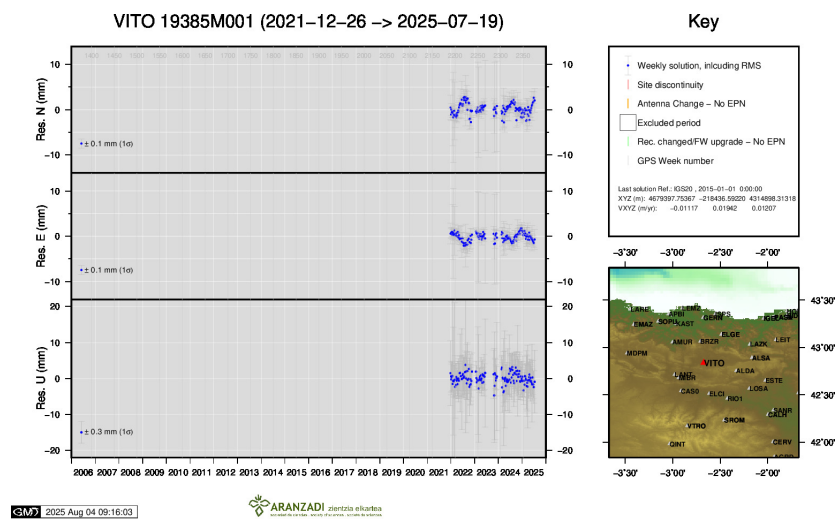
28) SCOA



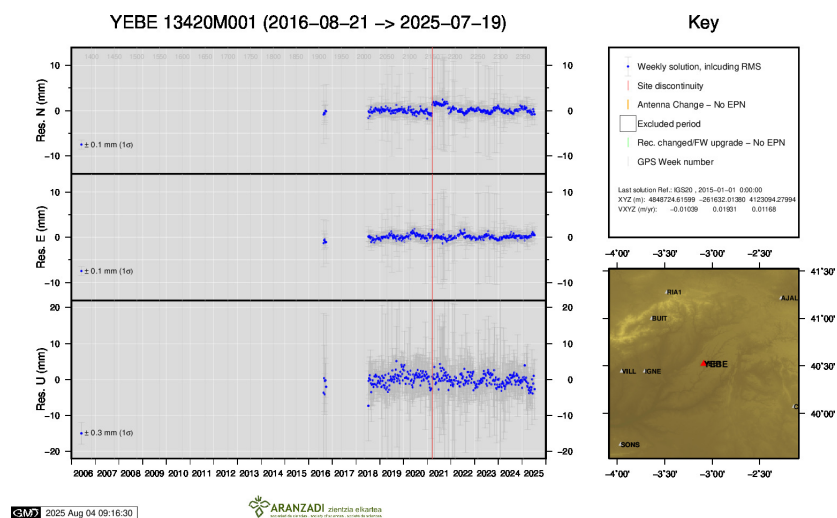
29) SOPU



30) TERU



31) VITO



32) YEBE

