ARA-DAC Weekly Analysis Result: 2373 (GFA)

Technical Report

GPS Week: 2373 (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

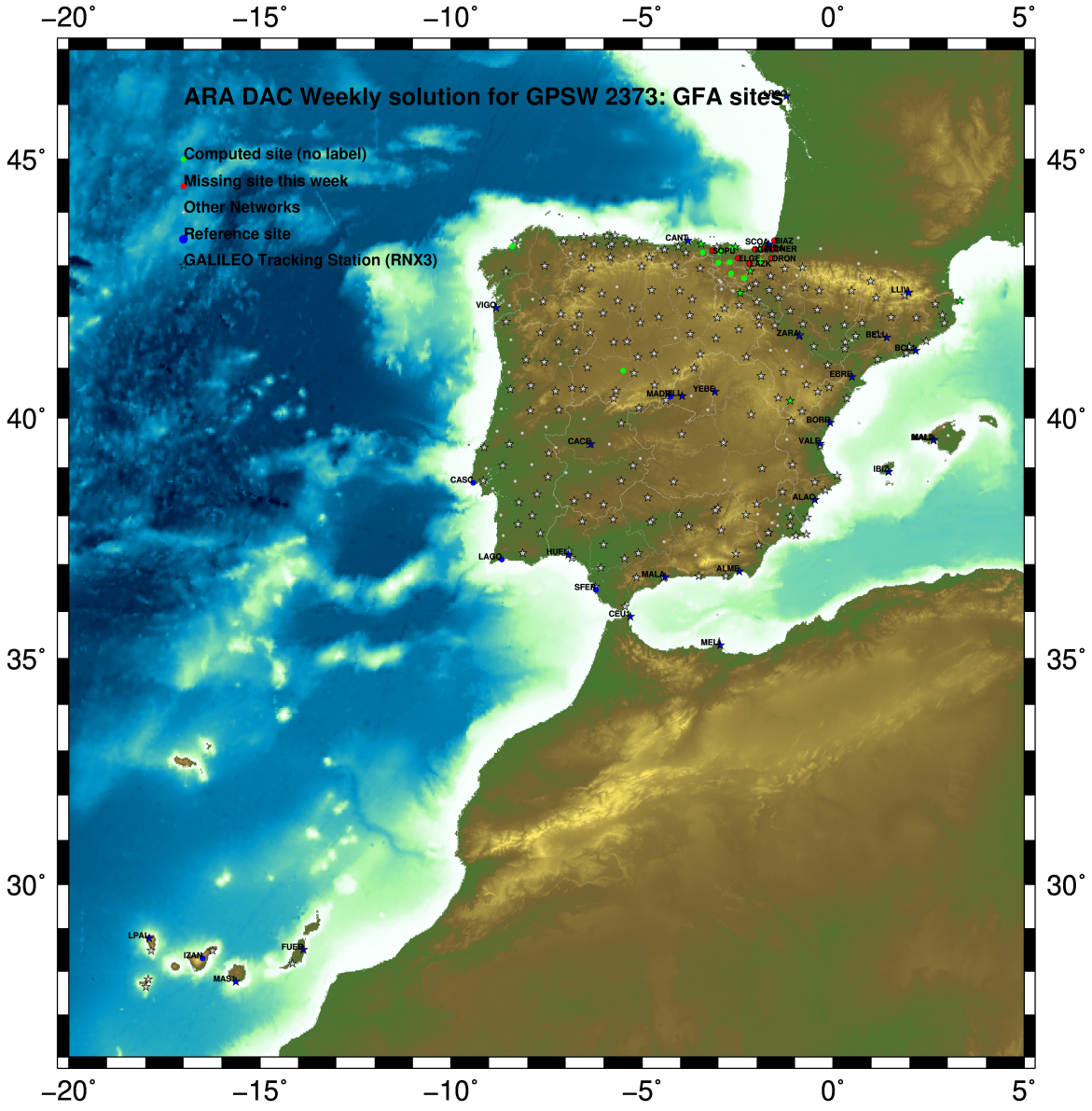

Fig.1: Computed Sites for GPS Week2373 (GFA)

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 observatione 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*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-JUL-25 13:09

LOCAL GEODETIC DATUM: IGS20 EPOCH: 2025-07-02 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.47284	-678367.25353	4357066.32521	A	G
39	ALDA 19383M001	4687280.09229	-190876.44802	4308107.02422	A	GR
50	ALSA 19419M001	4677250.76838	-176770.27784	4319079.94841	A	GRE
53	AMUR 19388M001	4661499.38382	-244591.13942	4332269.95231	A	GR
113	BRZR 19387M001	4662220.92545	-220769.78185	4333309.50813	A	GR
573	CACE 13447M001	4899866.45445	-544566.92016	4033770.28322	W	GRE
592	CANT 13438M001	4625924.25457	-307096.12121	4365771.63181	W	GRE
908	CREU 13432M001	4715420.05957	273178.17737	4271946.91358	A	GRE
135	EBRE 13410M001	4833519.92171	41537.51143	4147461.79000	W	GRE
182	EMAZ 17001M001	4645924.14687	-276949.75380	4347759.63927	A	GR
209	GERN 19389M001	4642811.25341	-217222.81046	4353278.94959	A	GR
257	HOND 15012M002	4640529.25235	-145675.86893	4358781.82811	A	GRE
240	ISPS 19484M001	4640596.41592	-206963.66237	4356391.98937	A	GRE
245	KAST 19499M001	4646949.00888	-240747.15085	4348015.06073	A	GR
252	LARE 19440M001	4632831.89554	-279026.03183	4360314.49883	A	GRE
261	LEIT 19428M001	4663520.87072	-155858.60417	4334519.95587	A	GR
345	PAS2 19351S001	4644908.99487	-156644.95339	4353623.14914	A	GRE
493	PASA 19351S001	4644908.99494	-156644.95339	4353623.14918	A	GRE
553	RIO1 13448M002	4708446.76341	-199490.16716	4284089.80675	A	GRE
558	SALA 13469M001	4803054.42570	-462130.95182	4158379.14853	A	GR
526	SCOA 10088M002	4639940.43670	-136224.82273	4359552.49852	W	GRE
443	TERU 13487M001	4867391.25538	-95523.22753	4108341.75479	A	GRE
493	VITO 19385M001	4679397.63409	-218436.38902	4314898.44139	A	GR
616	YEBE 13420M001	4848724.50888	-261631.80977	4123094.40370	W	GRE
655	ZARA 13462M001	4773803.10508	-73505.86739	4215454.16777	W	GRE

5.2 ETRF2000 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

CONVERT TO ETRF2000 22-JUL-25 13:09

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2025-07-02 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.82608	-678367.91046	4357065.83186	A	
39	ALDA 19383M001	4687280.50993	-190877.11559	4308106.52964	A	
50	ALSA 19419M001	4677251.18891	-176770.94411	4319079.45494	A	
53	AMUR 19388M001	4661499.79593	-244591.80391	4332269.45928	A	
113	BRZR 19387M001	4662221.34100	-220770.44637	4333309.01538	A	
573	CACE 13447M001	4899866.79945	-544567.61480	4033769.76420	W	
592	CANT 13438M001	4625924.66071	-307096.78140	4365771.14108	W	
908	CREU 13432M001	4715420.53921	273177.50796	4271946.42309	A	
135	EBRE 13410M001	4833520.35849	41536.82646	4147461.28553	W	
182	EMAZ 17001M001	4645924.55574	-276950.41643	4347759.14718	A	
209	GERN 19389M001	4642811.67112	-217223.47253	4353278.45864	A	
257	HOND 15012M002	4640529.68056	-145676.53052	4358781.33841	A	
240	ISPS 19484M001	4640596.83533	-206964.32414	4356391.49877	A	
245	KAST 19499M001	4646949.42285	-240747.81351	4348014.56907	A	
252	LARE 19440M001	4632832.30516	-279026.69282	4360314.00789	A	
261	LEIT 19428M001	4663521.29547	-155859.26867	4334519.46394	A	
345	PAS2 19351S001	4644909.42111	-156645.61556	4353622.65888	A	
493	PASA 19351S001	4644909.42118	-156645.61556	4353622.65892	A	
553	RIO1 13448M002	4708447.17783	-199490.83738	4284089.31013	A	
558	SALA 13469M001	4803054.79273	-462131.63439	4158378.63952	A	
526	SCOA 10088M002	4639940.86630	-136225.48422	4359552.00901	W	
443	TERU 13487M001	4867391.66967	-95523.91716	4108341.24528	A	
493	VITO 19385M001	4679398.04842	-218437.05568	4314897.94712	A	
616	YEBE 13420M001	4848724.90110	-261632.49756	4123093.89348	W	
655	ZARA 13462M001	4773803.53143	-73506.54536	4215453.66706	W	

5.3 ETRF2014 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2014 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

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CONVERT TO ETRF2014                                                  22-JUL-25 13:09
--------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2025-07-02 11:59:45

NUM  STATION NAME           X (M)          Y (M)          Z (M)     FLAG     SYSTEM

111  ACOR 13434M001    4594489.78651  -678367.94681  4357065.88493    A
 39  ALDA 19383M001    4687280.46775  -190877.15341  4308106.58257    A
 50  ALSA 19419M001    4677251.14679  -176770.98203  4319079.50791    A
 53  AMUR 19388M001    4661499.75424  -244591.84164  4332269.51227    A
113  BRZR 19387M001    4662221.29921  -220770.48419  4333309.06838    A
573  CACE 13447M001    4899866.75584  -544567.65024  4033769.81639    W
592  CANT 13438M001    4625924.61963  -307096.81906  4365771.19416    W
908  CREU 13432M001    4715420.49485   273177.46849  4271946.47629    A
135  EBRE 13410M001    4833520.31368    41536.78843  4147461.33818    W
182  EMAZ 17001M001    4645924.51434  -276950.45412  4347759.20020    A
209  GERN 19389M001    4642811.62954  -217223.51046  4353278.51171    A
257  HOND 15012M002    4640529.63875  -145676.56873  4358781.39152    A
240  ISPS 19484M001    4640596.79374  -206964.36212  4356391.55185    A
245  KAST 19499M001    4646949.38131  -240747.85132  4348014.62211    A
252  LARE 19440M001    4632832.26391  -279026.73055  4360314.06095    A
261  LEIT 19428M001    4663521.25344  -155859.30673  4334519.51697    A
345  PAS2 19351S001    4644909.37929  -156645.65371  4353622.71197    A
493  PASA 19351S001    4644909.37936  -156645.65371  4353622.71201    A
553  RIO1 13448M002    4708447.13543  -199490.87507  4284089.36300    A
558  SALA 13469M001    4803054.75007  -462131.67062  4158378.69199    A
526  SCOA 10088M002    4639940.82446  -136225.52247  4359552.06212    W
443  TERU 13487M001    4867391.62498   -95523.95450  4108341.29774    A
493  VITO 19385M001    4679398.00643  -218437.09343  4314898.00007    A
616  YEBE 13420M001    4848724.85724  -261632.53435  4123093.94590    W
655  ZARA 13462M001    4773803.48779   -73506.58323  4215453.71980    W
```

5.4 ETRF2020 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2020 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

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CONVERT TO ETRF2020                                                  22-JUL-25 13:09
--------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2020          EPOCH: 2025-07-02 11:59:45

NUM  STATION NAME           X (M)          Y (M)          Z (M)     FLAG     SYSTEM

111  ACOR 13434M001    4594489.78262  -678367.93209  4357065.89290    A
 39  ALDA 19383M001    4687280.46254  -190877.13820  4308106.59080    A
 50  ALSA 19419M001    4677251.14152  -176770.96685  4319079.51613    A
 53  AMUR 19388M001    4661499.74913  -244591.82653  4332269.52044    A
113  BRZR 19387M001    4662221.29403  -220770.46908  4333309.07656    A
573  CACE 13447M001    4899866.75237  -544567.63449  4033769.82490    W
592  CANT 13438M001    4625924.61463  -307096.80409  4365771.20226    W
908  CREU 13432M001    4715420.48834   273177.48399  4271946.48464    A
135  EBRE 13410M001    4833520.30818    41536.80421  4147461.34669    W
182  EMAZ 17001M001    4645924.50929  -276950.43907  4347759.20834    A
209  GERN 19389M001    4642811.62430  -217223.49540  4353278.51986    A
257  HOND 15012M002    4640529.63328  -145676.55365  4358781.39968    A
240  ISPS 19484M001    4640596.78846  -206964.34706  4356391.56000    A
245  KAST 19499M001    4646949.37615  -240747.83626  4348014.63026    A
252  LARE 19440M001    4632832.25884  -279026.71555  4360314.06907    A
261  LEIT 19428M001    4663521.24806  -155859.29159  4334519.52517    A
345  PAS2 19351S001    4644909.37386  -156645.63862  4353622.72014    A
493  PASA 19351S001    4644909.37393  -156645.63862  4353622.72018    A
553  RIO1 13448M002    4708447.13031  -199490.85980  4284089.37126    A
558  SALA 13469M001    4803054.74605  -462131.65515  4158378.70035    A
526  SCOA 10088M002    4639940.81896  -136225.50739  4359552.07028    W
443  TERU 13487M001    4867391.61999   -95523.93867  4108341.30628    A
493  VITO 19385M001    4679398.00129  -218437.07825  4314898.00828    A
616  YEBE 13420M001    4848724.85271  -261632.51865  4123093.95438    W
655  ZARA 13462M001    4773803.48246   -73506.56769  4215453.72819    W
```

6 Quality Control

6.1 Mean and Daily Repeatabilities

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

GFA FINAL WEEKLY COMBINATION: FINAL ORBITS 22-JUL-25 13:09

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	7	XXXXXXX	1.18	0.94	5.23
ALDA 19383M001	7	XXXXXXX	1.59	1.00	4.80
ALSA 19419M001	7	XXXXXXX	1.46	1.24	6.12
AMUR 19388M001	7	XXXXXXX	0.87	1.17	4.35
BRZR 19387M001	6	XXX XXX	0.82	1.22	3.19
CACE 13447M001	7	XXXXXXX	1.14	1.16	6.80
CANT 13438M001	7	XXXXXXX	0.69	0.63	2.85
CREU 13432M001	7	XXXXXXX	0.56	1.12	4.98
EBRE 13410M001	7	XXXXXXX	0.70	1.29	6.53
EMAZ 17001M001	6	XXXXXX	0.91	1.46	5.71
GERN 19389M001	7	XXXXXXX	0.82	0.67	3.52
HOND 15012M002	7	XXXXXXX	1.47	0.48	5.16
ISPS 19484M001	7	XXXXXXX	0.50	0.92	2.74
KAST 19499M001	6	XXX XXX	0.82	1.14	3.27
LARE 19440M001	7	XXXXXXX	0.54	0.79	2.72
LEIT 19428M001	7	XXXXXXX	1.71	1.23	6.64
PAS2 19351S001	7	XXXXXXX	0.72	0.67	4.73
PASA 19351S001	6	XX XXXX	0.74	0.70	5.20
RIO1 13448M002	7	XXXXXXX	1.14	0.92	6.32
SALA 13469M001	7	XXXXXXX	1.21	2.21	3.98
SCOA 10088M002	7	XXXXXXX	1.23	1.14	5.22
TERU 13487M001	7	XXXXXXX	1.13	1.03	4.62
VITO 19385M001	7	XXXXXXX	0.67	0.67	6.36
YEBE 13420M001	7	XXXXXXX	0.79	1.09	6.22
ZARA 13462M001	7	XXXXXXX	0.95	1.07	6.11

Comparison of individual solutions:

ACOR 13434M001	N	1.18	-0.04	-1.25	-0.31	1.36	-0.28	1.55	1.54
ACOR 13434M001	E	0.94	0.25	0.85	0.37	-0.71	-1.58	-0.44	-1.10
ACOR 13434M001	U	5.23	3.05	4.00	1.12	-8.37	-5.45	2.76	-5.49
ALDA 19383M001	N	1.59	-0.22	0.46	-2.57	2.51	-0.04	1.32	-0.51
ALDA 19383M001	E	1.00	-1.50	0.47	-1.70	-0.63	0.13	0.42	-0.07
ALDA 19383M001	U	4.80	-2.66	-1.86	1.89	10.33	0.66	3.59	2.09
ALSA 19419M001	N	1.46	1.49	0.44	-1.08	0.18	-0.61	1.63	-2.48
ALSA 19419M001	E	1.24	-1.08	0.12	1.15	-1.11	1.18	0.52	-1.97
ALSA 19419M001	U	6.12	-4.17	-2.85	-0.35	11.71	1.77	4.60	6.15
AMUR 19388M001	N	0.87	-0.80	-0.52	0.98	1.35	-0.39	-0.37	0.74
AMUR 19388M001	E	1.17	-0.27	0.23	2.07	-1.09	-0.19	0.55	-1.48
AMUR 19388M001	U	4.35	1.26	1.19	-0.14	8.21	5.93	0.45	-2.79
BRZR 19387M001	N	0.82	-0.57	1.12	0.68		0.27	-1.03	-0.46
BRZR 19387M001	E	1.22	-1.19	1.09	1.34		-1.61	-0.64	0.27
BRZR 19387M001	U	3.19	-3.36	1.24	0.65		6.13	0.18	0.01
CACE 13447M001	N	1.14	1.14	-2.00	0.61	-0.07	1.15	-0.23	0.90
CACE 13447M001	E	1.16	0.67	0.40	2.17	1.06	0.09	-0.23	-1.23
CACE 13447M001	U	6.80	4.39	2.44	-3.88	-9.40	-6.67	-9.41	4.00
CANT 13438M001	N	0.69	0.53	0.83	0.80	-0.24	-0.81	-0.01	-0.71
CANT 13438M001	E	0.63	-0.47	-0.05	0.25	0.84	-0.37	0.08	-1.12
CANT 13438M001	U	2.85	1.62	5.01	-1.28	1.15	-1.73	2.91	-2.56
CREU 13432M001	N	0.56	0.34	0.48	0.36	0.17	0.96	-0.49	-0.43
CREU 13432M001	E	1.12	-1.02	-0.45	1.81	-1.19	-0.81	-0.49	-0.86
CREU 13432M001	U	4.98	-3.20	3.45	5.41	4.07	0.07	-1.56	8.87
EBRE 13410M001	N	0.70	0.23	1.15	0.02	0.02	-0.87	0.61	0.68
EBRE 13410M001	E	1.29	-0.29	1.52	-0.68	0.68	-0.88	-0.39	-2.39
EBRE 13410M001	U	6.53	-2.86	-1.62	-5.97	7.03	4.46	7.39	9.26
EMAZ 17001M001	N	0.91		-0.55	1.66	0.03	-0.34	-0.11	-0.95
EMAZ 17001M001	E	1.46		1.65	-1.58	0.43	-2.29	-0.22	0.07
EMAZ 17001M001	U	5.71		-0.94	-4.10	9.44	0.23	2.01	-7.21
GERN 19389M001	N	0.82	-0.54	-0.49	1.52	0.83	-0.26	-0.60	0.31
GERN 19389M001	E	0.67	-0.65	0.32	0.74	-0.70	-0.72	0.41	-0.64
GERN 19389M001	U	3.52	-0.10	-1.62	-0.15	4.53	6.83	0.43	2.02
HOND 15012M002	N	1.47	0.15	-0.36	-0.19	-0.21	0.76	0.71	-3.41
HOND 15012M002	E	0.48	0.42	-0.41	0.01	-0.68	-0.50	-0.55	0.19
HOND 15012M002	U	5.16	-4.82	3.19	-1.26	8.83	2.95	5.49	2.86
ISPS 19484M001	N	0.50	0.41	0.31	0.26	0.79	-0.02	-0.61	-0.41
ISPS 19484M001	E	0.92	-0.41	0.66	1.04	-0.42	-0.41	0.10	-1.73
ISPS 19484M001	U	2.74	1.42	1.45	-1.06	3.68	3.62	3.51	-0.97
KAST 19499M001	N	0.82	-0.05	-0.96	-0.84		0.64	0.95	0.66
KAST 19499M001	E	1.14	-0.30	-0.28	1.16		-0.99	1.08	-1.66
KAST 19499M001	U	3.27	1.62	-2.08	2.83		3.51	3.44	-3.78
LARE 19440M001	N	0.54	0.43	-0.09	0.81	-0.45	0.28	-0.06	-0.78
LARE 19440M001	E	0.79	1.06	0.27	-0.61	-0.15	-0.90	0.54	-1.01
LARE 19440M001	U	2.72	0.30	2.58	-3.72	3.11	-2.91	1.64	-1.73
LEIT 19428M001	N	1.71	-1.72	0.92	-3.09	1.49	0.77	-0.46	-1.08
LEIT 19428M001	E	1.23	-2.19	-0.53	0.65	-0.38	1.14	-0.06	-1.45
LEIT 19428M001	U	6.64	-1.69	-5.83	1.06	11.34	2.36	5.68	7.76
PAS2 19351S001	N	0.72	-0.70	-0.82	-0.52	-0.63	0.05	-0.78	0.81
PAS2 19351S001	E	0.67	0.60	0.30	0.40	-0.85	-0.35	-0.68	-0.86
PAS2 19351S001	U	4.73	-3.39	1.52	-0.24	7.84	4.74	0.49	6.03
PASA 19351S001	N	0.74	-0.65	-0.81		-0.65	0.02	-0.84	0.73
PASA 19351S001	E	0.70	0.54	0.27		-0.90	-0.37	-0.69	-0.82
PASA 19351S001	U	5.20	-3.25	1.56		8.10	4.70	0.37	5.86
RIO1 13448M002	N	1.14	-0.18	1.47	0.53	1.10	-1.41	-0.15	-1.45
RIO1 13448M002	E	0.92	-1.51	-0.00	-0.26	-0.42	1.57	-0.15	-0.34
RIO1 13448M002	U	6.32	-3.95	10.58	0.66	10.37	-0.82	-1.86	-0.08
SALA 13469M001	N	1.21	-0.29	-0.73	0.11	-1.57	0.43	0.35	2.33
SALA 13469M001	E	2.21	0.28	-0.71	-0.34	2.99	-3.80	2.17	-0.64
SALA 13469M001	U	3.98	0.20	0.46	3.80	-2.40	-4.85	-3.24	-6.38
SCOA 10088M002	N	1.23	-2.01	-0.59	-0.97	0.63	1.58	-0.20	-0.88
SCOA 10088M002	E	1.14	-1.86	0.61	1.55	-0.71	-0.98	-0.03	-0.34
SCOA 10088M002	U	5.22	-5.05	3.21	-1.17	8.15	2.77	6.19	3.72
TERU 13487M001	N	1.13	0.77	1.39	1.60	0.19	0.85	-1.27	-0.41
TERU 13487M001	E	1.03	0.52	1.07	-1.67	0.13	0.31	-1.43	0.17
TERU 13487M001	U	4.62	-5.87	-4.58	-3.36	5.83	-0.27	5.14	1.05

VITO	19385M001	N	0.67	-0.17	0.44	0.15	1.03	-1.16	0.16	0.09
VITO	19385M001	E	0.67	0.33	0.14	0.98	-1.01	-0.09	-0.45	-0.61
VITO	19385M001	U	6.36	-4.32	-4.40	-1.00	12.67	3.82	4.17	3.40
YEBE	13420M001	N	0.79	-0.49	0.05	-0.39	-0.54	-0.87	1.51	0.10
YEBE	13420M001	E	1.09	0.63	0.78	1.08	0.10	-1.88	-1.21	-0.02
YEBE	13420M001	U	6.22	-0.87	-3.17	5.82	-2.07	-12.73	2.30	-3.99
ZARA	13462M001	N	0.95	-0.60	0.40	1.32	-0.77	-0.36	1.50	-0.48
ZARA	13462M001	E	1.07	-0.29	-0.82	1.71	-1.43	0.87	0.20	-0.65
ZARA	13462M001	U	6.11	-2.10	2.62	-5.47	9.29	9.27	-0.92	3.17

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	2.60	-0.87	1.26
3	ALME 13437M001	I W	-0.23	0.57	-1.69
4	BCL1 19482M001	I W	-0.19	-3.59	4.58
5	BELL 13431M001	I W	-0.61	0.30	-4.22
6	BORR 13480M001	I W	-4.36	-0.58	1.53
7	BRST 10004M004	I W	-1.37	-1.60	0.61
8	CACE 13447M001	I W	1.97	2.21	-2.88
9	CANT 13438M001	I W	1.23	1.82	-3.26
10	CASC 13909S001	I W	0.51	-1.33	15.03
11	CEU1 13449M002	I W	-0.92	2.37	-3.29
13	EBRE 13410M001	I W	-2.28	0.47	1.58
15	FLRS 31907M001	I W	-1.05	-2.13	-6.13
16	FUER 31330M001	I W	1.52	0.03	-1.24
18	HUEL 13451M001	I W	2.25	2.53	-5.57
19	IBIZ 13454S001	I W	-0.06	1.05	0.84
20	IZAN 31309M002	I W	0.02	-0.69	-2.98
21	LAGO 13903M001	I W	0.51	0.02	0.71
22	LLIV 13436M001	I W	-3.35	0.57	12.67
23	LPAL 81701M001	I W	2.94	0.48	-4.73
24	LROC 10023M001	I W	1.90	-0.41	1.06
25	MADR 13407S012	I W	1.81	3.00	-1.29
26	MAL1 13444M002	I W	5.59	-1.42	-6.01
27	MALA 13443M001	I W	1.30	0.72	3.42
28	MALL 13444M001	I W	-0.47	-0.80	0.84
29	MAS1 31303M002	I W	-0.38	-2.12	0.14
30	MELI 19379M001	I W	0.21	-1.08	-0.83
31	PDEL 31906M004	I W	-1.45	0.59	-0.63
32	SCOA 10088M002	I W	-6.67	-4.24	-12.97
33	SFER 13402M004	I W	-2.71	-3.07	4.52
34	VALE 13439M001	I W	-0.74	1.81	-4.49
35	VIGO 13450M001	I W	2.07	2.45	-0.38
36	VILL 13406M001	I W	-0.55	-0.52	3.99
37	YEBE 13420M001	I W	-0.32	-0.52	2.01
38	ZARA 13462M001	I W	0.52	-0.18	-2.93
39	ZIMM 14001M004	I W	-1.44	-1.14	8.94
	RMS / COMPONENT		2.24	1.74	5.25
	IQR		2.57	1.86	4.84
	MEAN		-0.06	-0.15	-0.05
	MEDIAN		-0.19	-0.18	-0.38
	MIN		-6.67	-4.24	-12.97
	MAX		5.59	3.00	15.03

OVERALL RMS/IQR/MAX(3D) 3.44 2.72 15.19 SCOA 10088M002 #SUM

ALL	RMS / COMPONENT		2.24	1.74	5.25		
ALL	IQR		2.57	1.86	4.84		
ALL	MEAN		-0.06	-0.15	-0.05		
ALL	MEDIAN		-0.19	-0.18	-0.38		
ALL	MIN		-6.67	-4.24	-12.97		
ALL	MAX		5.59	3.00	15.03		
ALL	OVERALL RMS/IQR/MAX(3D)		3.44	2.72	15.19	SCOA 10088M002	#SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 35
NUMBER OF COORDINATES : 105
RMS OF TRANSFORMATION : 3.44 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.58 MM
TRANSLATION IN Y : -0.00 +- 0.58 MM
TRANSLATION IN Z : 0.00 +- 0.58 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                      19437312
 NUMBER OF UNKNOWNS                            210727
 NUMBER OF DEGREES OF FREEDOM                19226585
 PHASE MEASUREMENTS SIGMA                     0.00100
 SAMPLING INTERVAL (SECONDS)                      180
 VARIANCE FACTOR                 2.588930001698500
```

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 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 ALDA  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 ALSA  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 AMUR  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 BRZR  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 CACE  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 CANT  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 CREU  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 EBRE  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 EMAZ  A    1 P 25:181:00000 25:186:86370 LEICA GR30           ----- ------------
 GERN  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 HOND  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 ISPS  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 KAST  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 LARE  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 LEIT  A    1 P 25:180:00000 25:186:86370 LEICA GRX1200GGPRO   ----- ------------
 PAS2  A    1 P 25:180:00000 25:186:86370 STONEX SC2200        ----- ------------
 PASA  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 RIO1  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 SALA  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 SCOA  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 TERU  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 VITO  A    1 P 25:180:00000 25:186:86370 LEICA GR30           ----- ------------
 YEBE  A    1 P 25:180:00000 25:186:86370 LEICA GR50           ----- ------------
 ZARA  A    1 P 25:180:00000 25:186:86370 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 25:180:00000 25:186:86370 LEIAT504         LEIS -----
 ALDA  A    1 P 25:180:00000 25:186:86370 LEIAS10          NONE -----
 ALSA  A    1 P 25:180:00000 25:186:86370 LEIAR10          NONE -----
 AMUR  A    1 P 25:180:00000 25:186:86370 LEIAS10          NONE -----
 BRZR  A    1 P 25:180:00000 25:186:86370 LEIAS10          NONE -----
 CACE  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 CANT  A    1 P 25:180:00000 25:186:86370 LEIAR25.R4       LEIT -----
 CREU  A    1 P 25:180:00000 25:186:86370 LEIAR25.R4       NONE -----
 EBRE  A    1 P 25:180:00000 25:186:86370 LEIAR25.R4       NONE -----
 EMAZ  A    1 P 25:181:00000 25:186:86370 LEIAS10          NONE -----
 GERN  A    1 P 25:180:00000 25:186:86370 LEIAS10          NONE -----
 HOND  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 ISPS  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 KAST  A    1 P 25:180:00000 25:186:86370 LEIAS10          NONE -----
 LARE  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 LEIT  A    1 P 25:180:00000 25:186:86370 LEIAR10          NONE -----
 PAS2  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 PASA  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 RIO1  A    1 P 25:180:00000 25:186:86370 LEIAR25.R4       LEIT -----
 SALA  A    1 P 25:180:00000 25:186:86370 LEIAR25          NONE -----
 SCOA  A    1 P 25:180:00000 25:186:86370 TRM55971.00      NONE -----
 TERU  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 VITO  A    1 P 25:180:00000 25:186:86370 LEIAS10          NONE -----
 YEBE  A    1 P 25:180:00000 25:186:86370 LEIAR20          LEIM -----
 ZARA  A    1 P 25:180:00000 25:186:86370 TRM29659.00      NONE -----
```

7.3 Eccentricities

```
*                                        UP______ NORTH___ EAST____
*SITE PT SOLN T DATA_START__ DATA_END____ AXE ARP->BENCHMARK(M)_________
 ACOR  A    1 P 25:180:00000 25:186:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 25:180:00000 25:186:86370 UNE   0.0771   0.0000   0.0000
```

```
CACE  A    1 P 25:180:00000 25:186:86370 UNE   0.0600   0.0000   0.0000
CANT  A    1 P 25:180:00000 25:186:86370 UNE   3.0490   0.0000   0.0000
CREU  A    1 P 25:180:00000 25:186:86370 UNE   0.0770   0.0000   0.0000
EBRE  A    1 P 25:180:00000 25:186:86370 UNE   0.0770   0.0000   0.0000
EMAZ  A    1 P 25:181:00000 25:186:86370 UNE   0.0350   0.0000   0.0000
GERN  A    1 P 25:180:00000 25:186:86370 UNE   0.0771   0.0000   0.0000
HOND  A    1 P 25:180:00000 25:186:86370 UNE   0.0771   0.0000   0.0000
ISPS  A    1 P 25:180:00000 25:186:86370 UNE   0.0350   0.0000   0.0000
KAST  A    1 P 25:180:00000 25:186:86370 UNE   0.0350   0.0000   0.0000
LARE  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
LEIT  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
PAS2  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
PASA  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
RIO1  A    1 P 25:180:00000 25:186:86370 UNE   0.0606   0.0000   0.0000
SALA  A    1 P 25:180:00000 25:186:86370 UNE   0.0600   0.0000   0.0000
SCOA  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
TERU  A    1 P 25:180:00000 25:186:86370 UNE   0.0600   0.0000   0.0000
VITO  A    1 P 25:180:00000 25:186:86370 UNE   0.0000   0.0000   0.0000
YEBE  A    1 P 25:180:00000 25:186:86370 UNE   0.0600   0.0000   0.0000
ZARA  A    1 P 25:180:00000 25:186:86370 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:

```
2025-07-20 03:21 UTC | CANT1800.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-20 03:21 UTC | CANT1800.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-20 07:30 UTC | CANT1810.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-20 07:30 UTC | CANT1810.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-20 11:29 UTC | CANT1820.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-20 11:29 UTC | CANT1820.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-20 16:08 UTC | CANT1830.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-20 16:08 UTC | CANT1830.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-20 19:32 UTC | CANT1840.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-20 19:32 UTC | CANT1840.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-21 02:37 UTC | CANT1850.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-21 02:37 UTC | CANT1850.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-21 06:05 UTC | CANT1860.25O | RECEIVER TYPE         |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-21 06:05 UTC | CANT1860.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-20 03:21 UTC | ISPS1800.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-20 07:30 UTC | ISPS1810.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-20 11:30 UTC | ISPS1820.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-20 16:08 UTC | ISPS1830.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-20 19:32 UTC | ISPS1840.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-21 02:37 UTC | ISPS1850.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-21 06:06 UTC | ISPS1860.25O | ANTENNA SER. NO.      |   -> 24238009 (source: isps00esp_20250114.log
2025-07-20 03:21 UTC | LEIT1800.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-20 07:30 UTC | LEIT1810.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-20 11:30 UTC | LEIT1820.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-20 16:08 UTC | LEIT1830.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-20 19:32 UTC | LEIT1840.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-21 02:37 UTC | LEIT1850.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-21 06:06 UTC | LEIT1860.25O | RECEIVER FIRM. VERS. | 8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-20 03:21 UTC | PAS21800.25O | ANTENNA DELTA UP     | 0.0180 -> 0.0000 (source: pas200esp_20231031.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

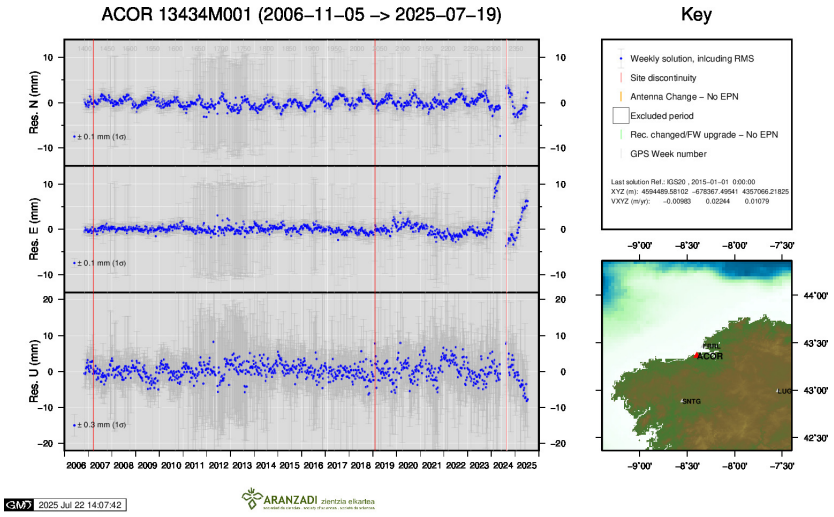
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres.* epncb.oma.be/$_d$*ocumentation/guidelines/guidelines*$_a$*nalysis*$_c$*entres.pdf*

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

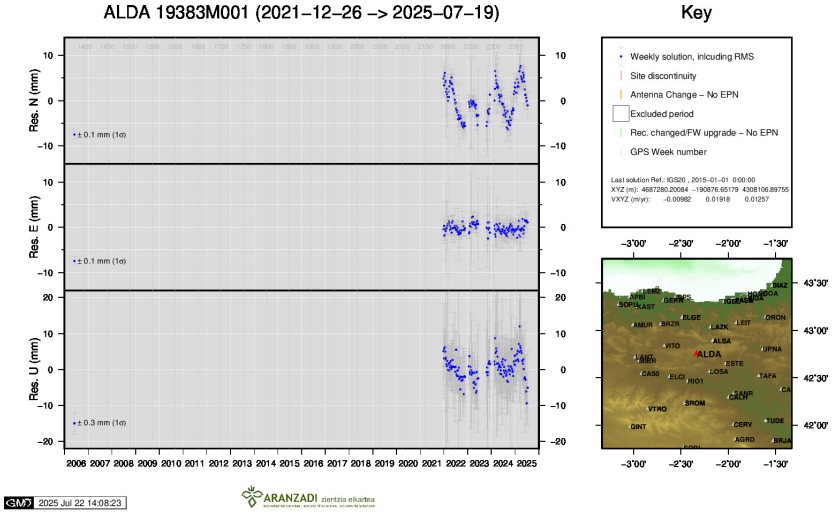
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

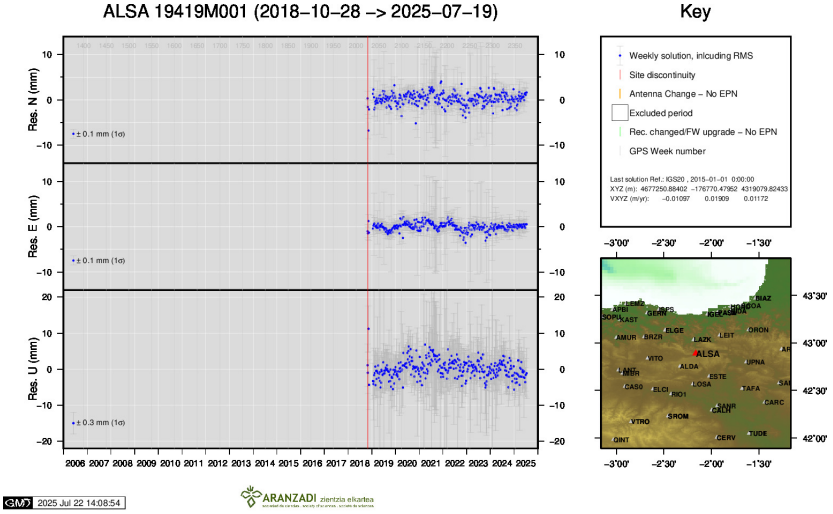
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



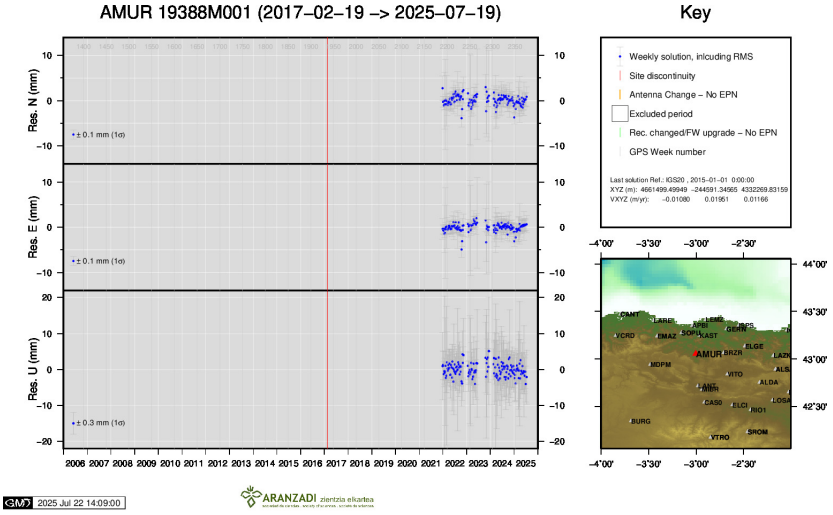
1) ACOR



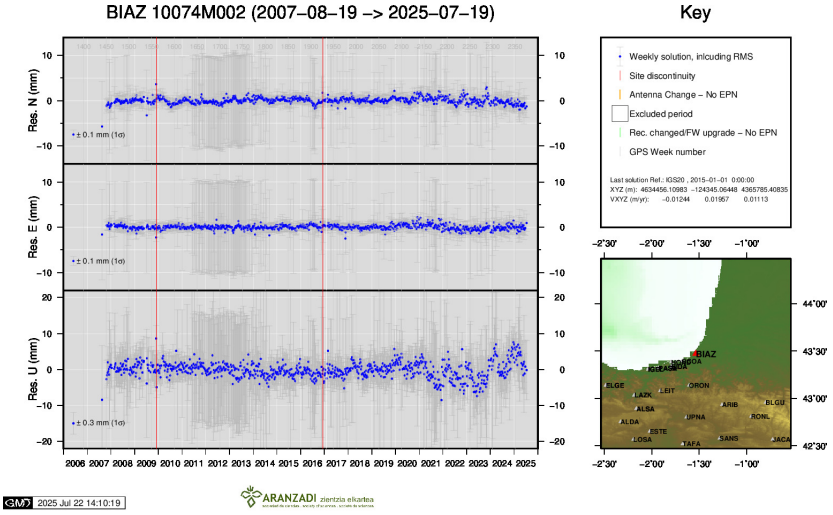
2) ALDA



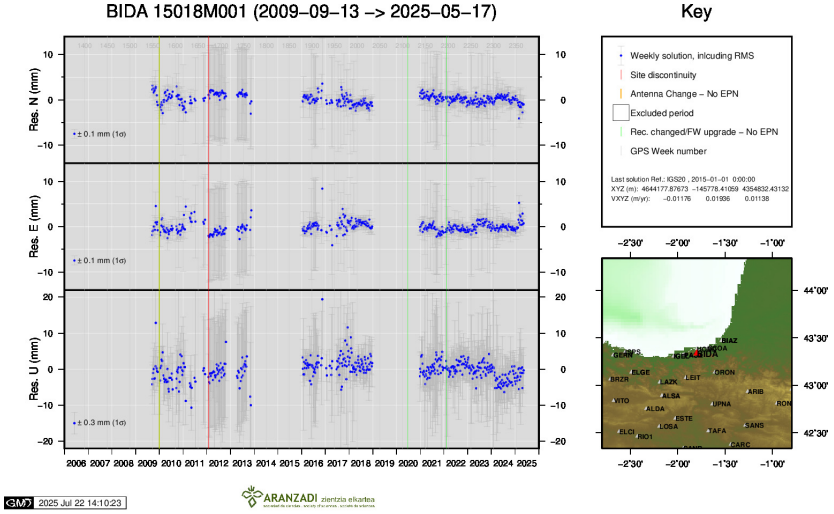
3) ALSA



4) AMUR



5) BIAZ



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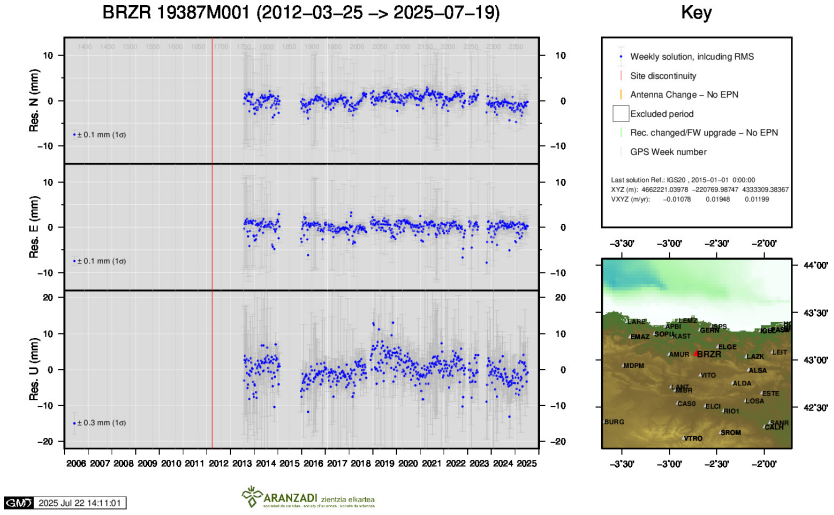

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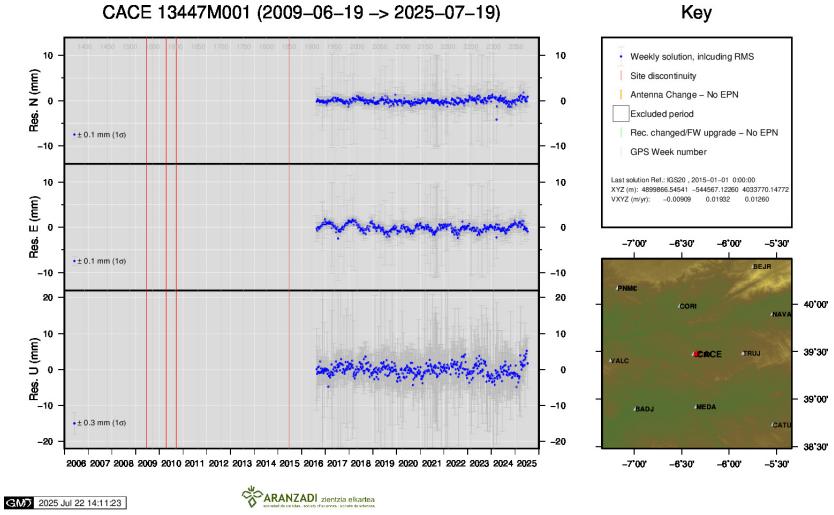

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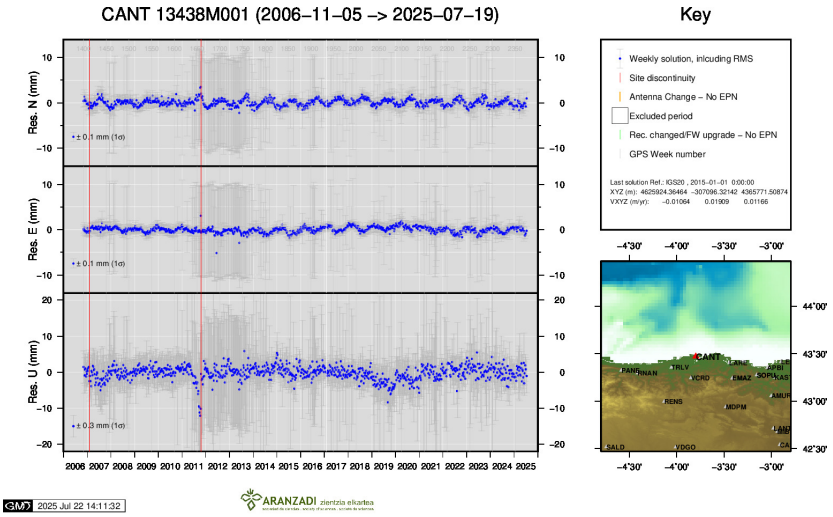

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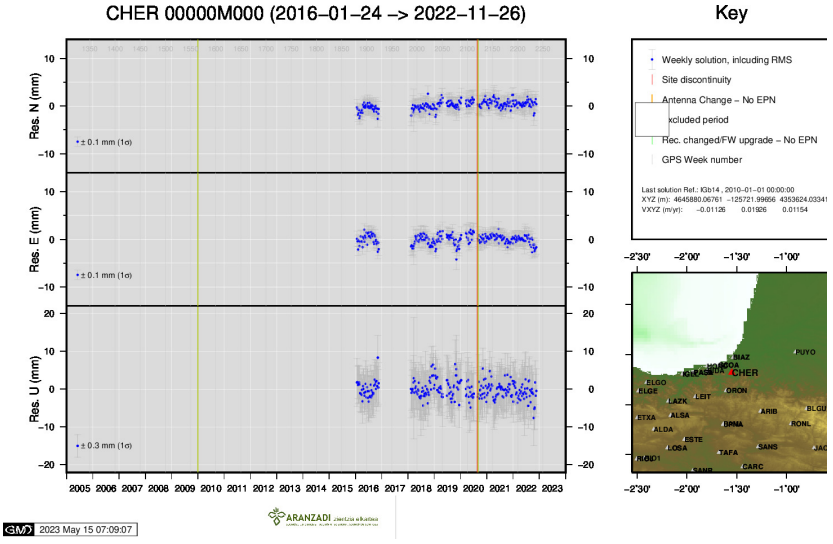

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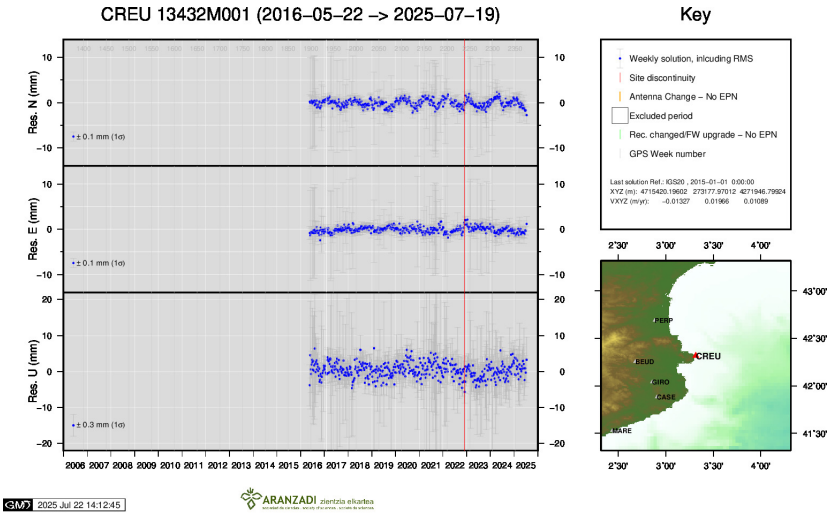

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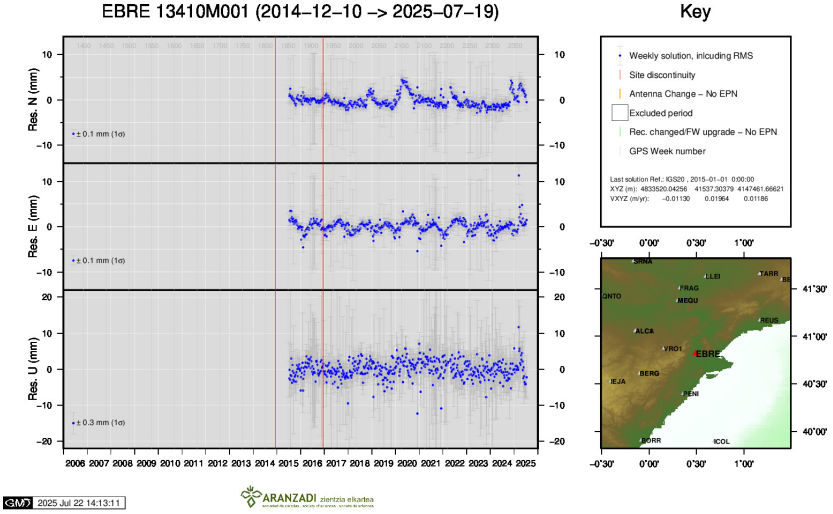

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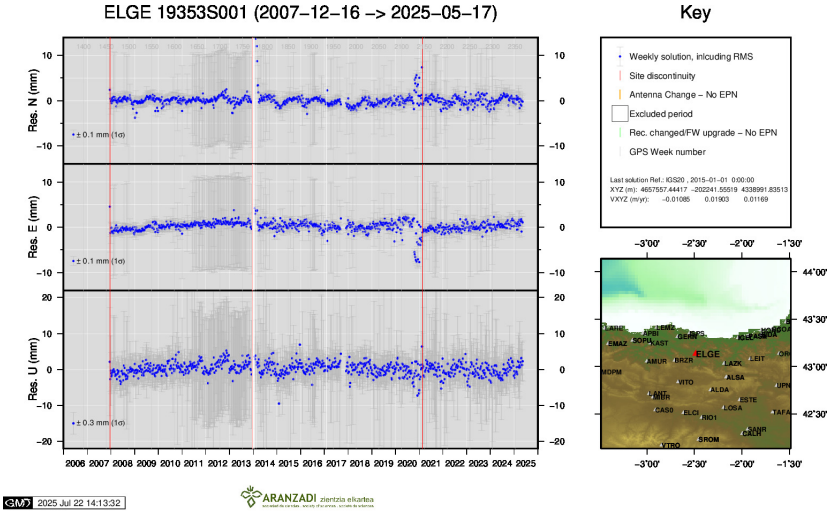

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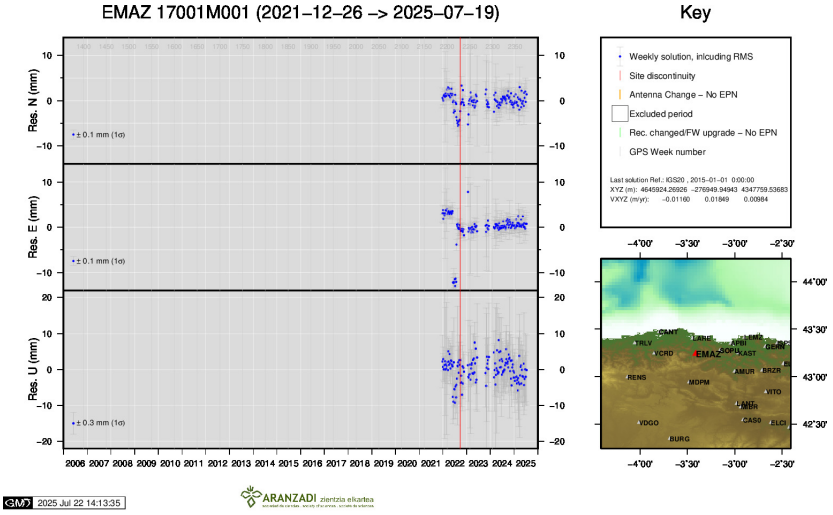

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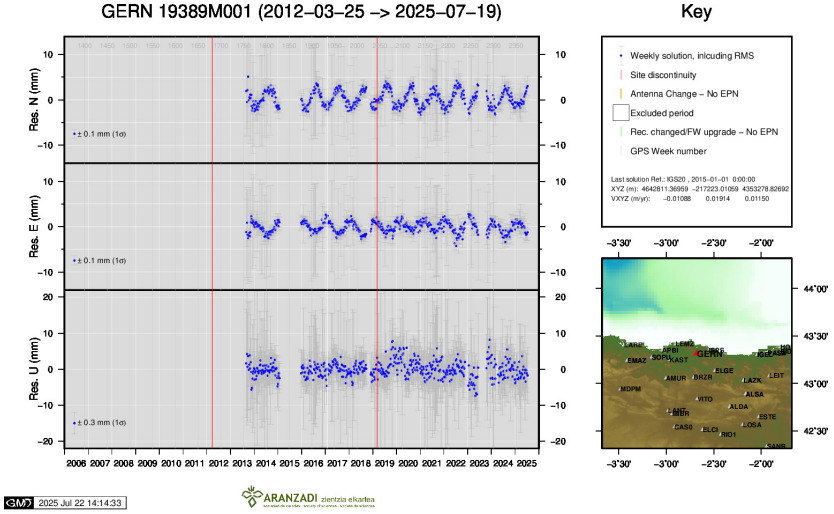

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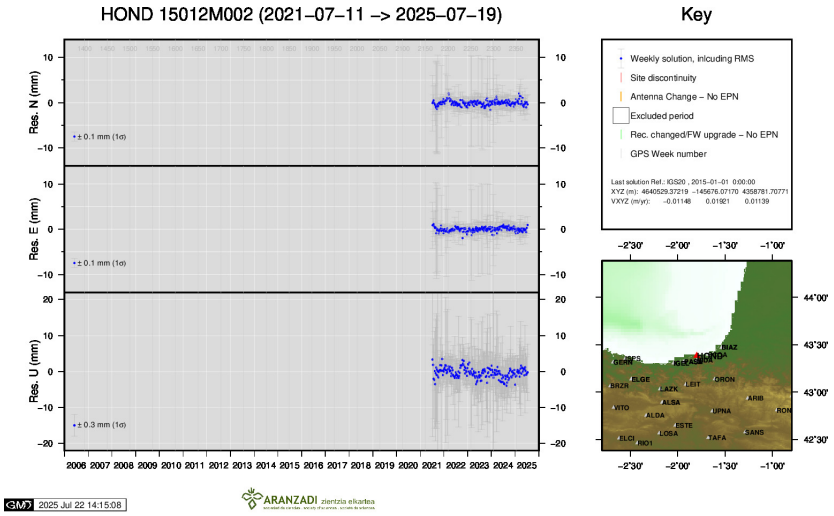

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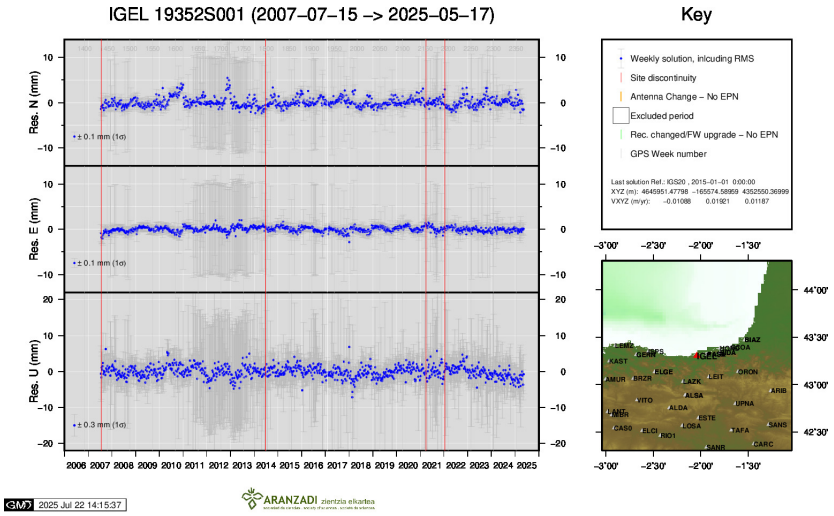

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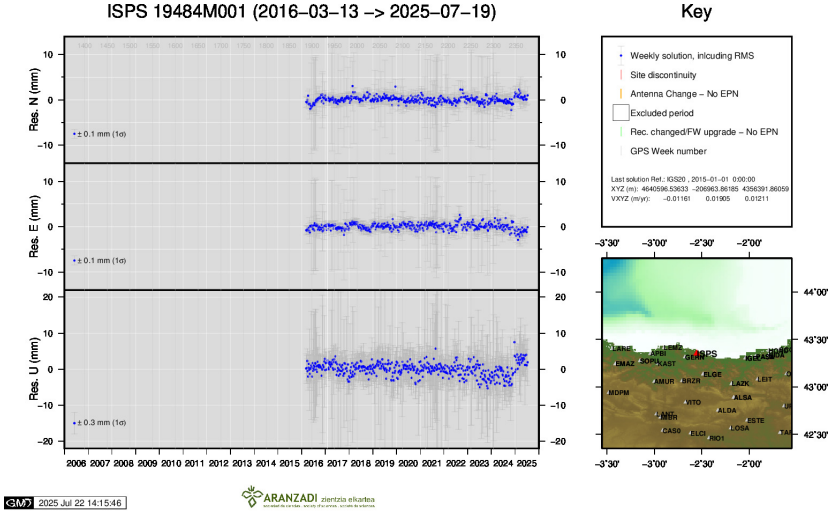

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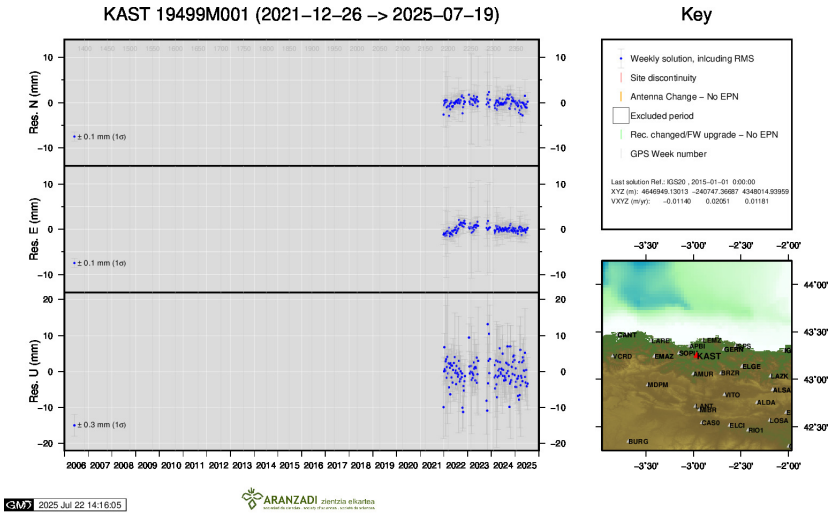

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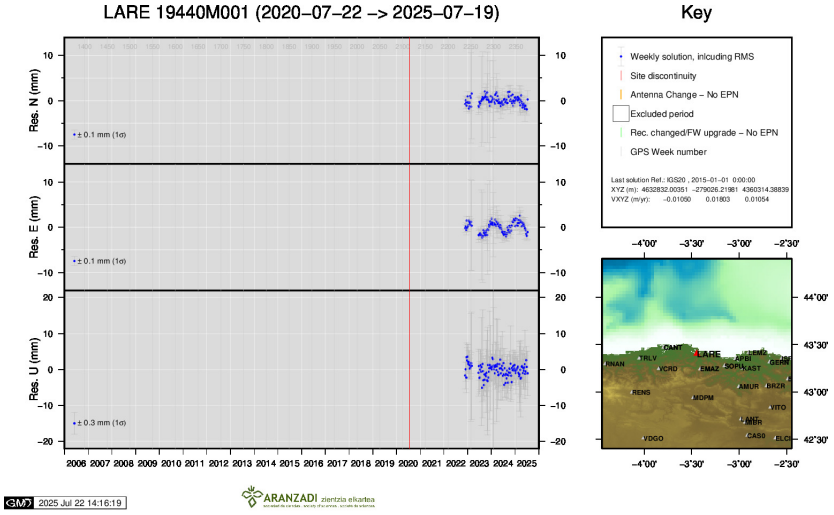

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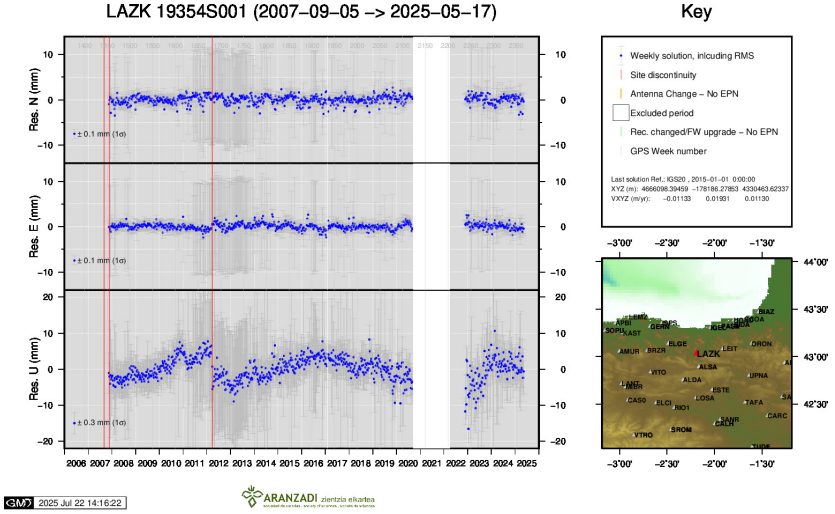

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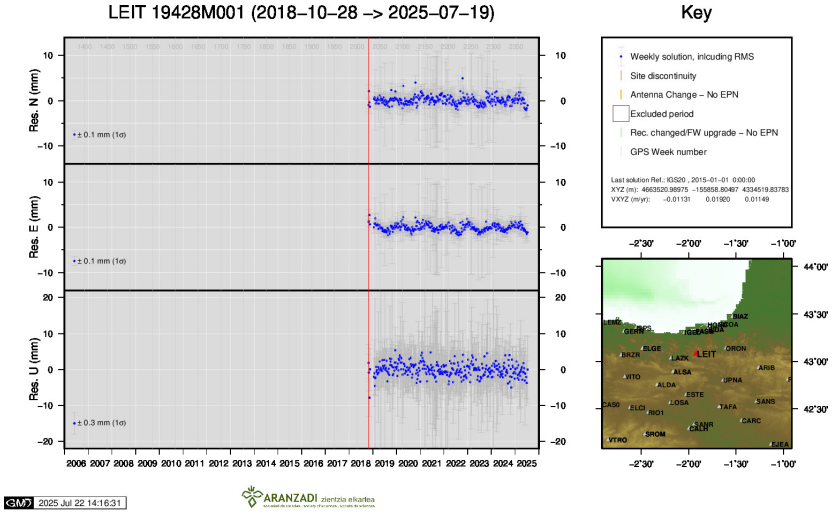

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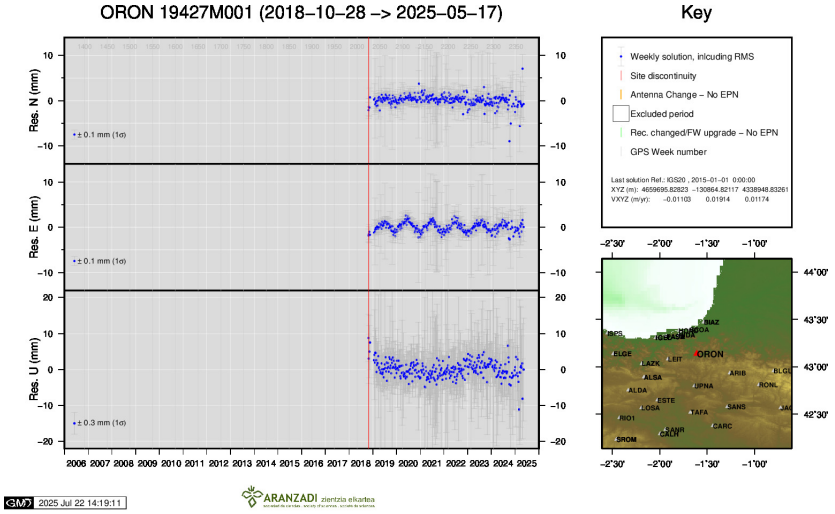

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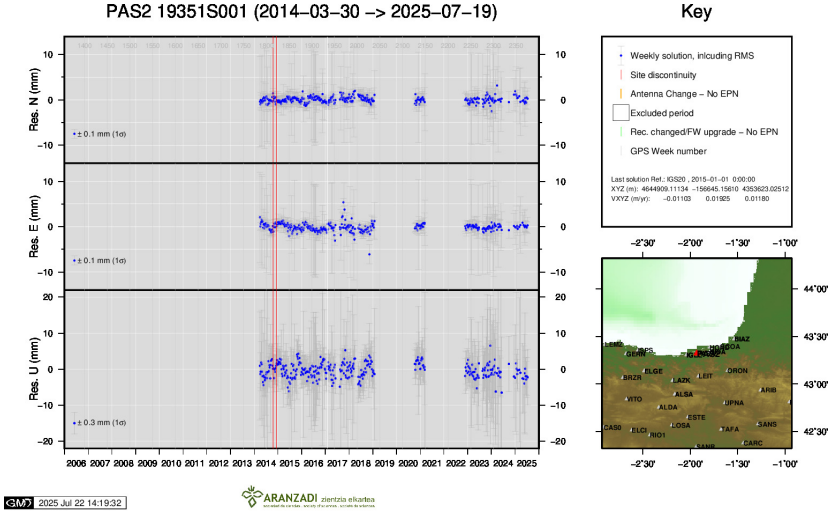

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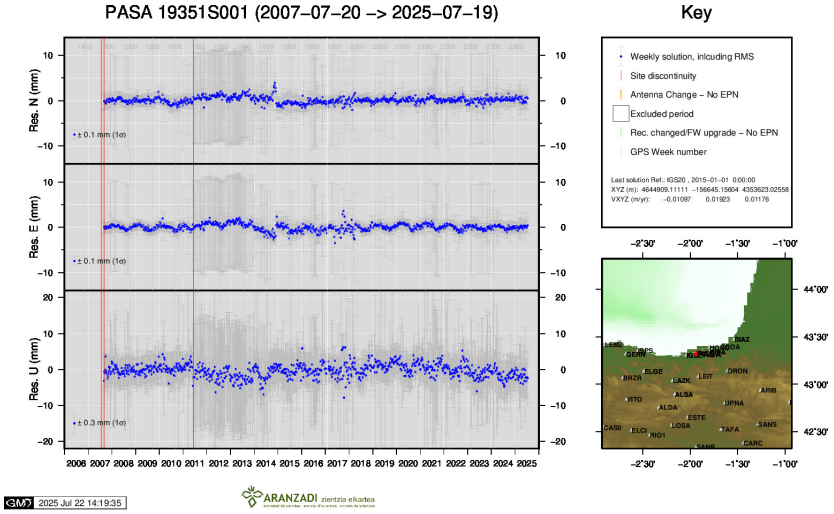

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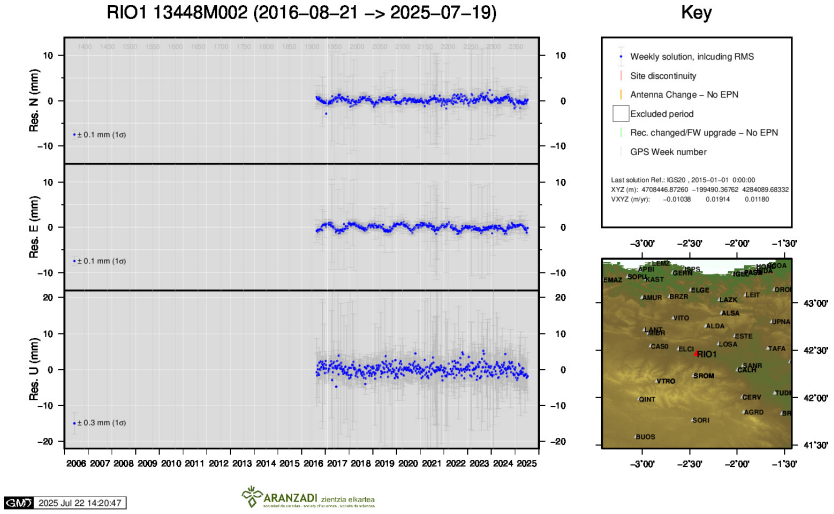

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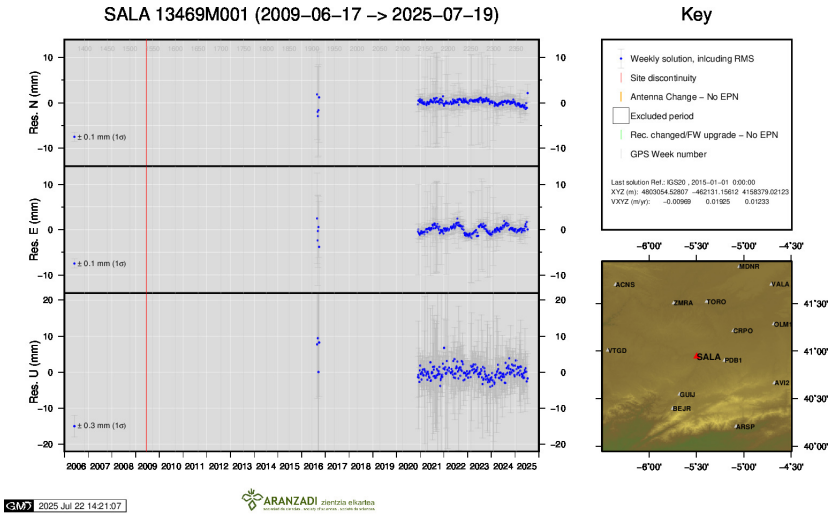

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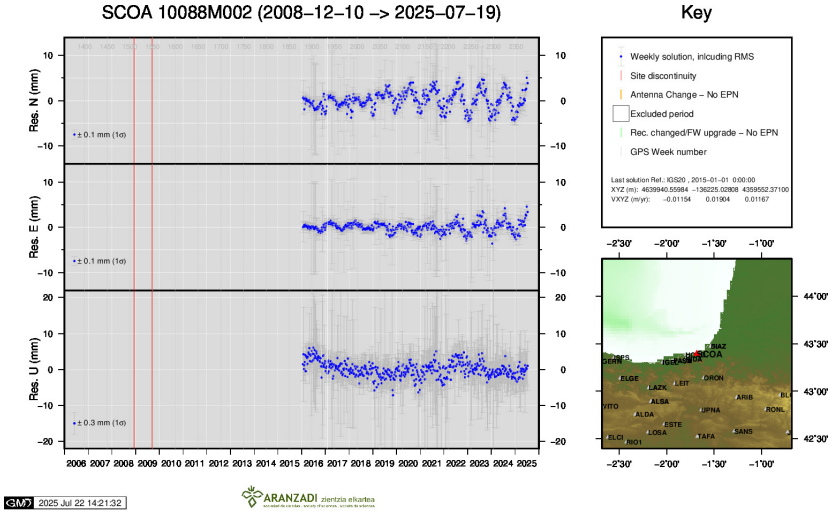

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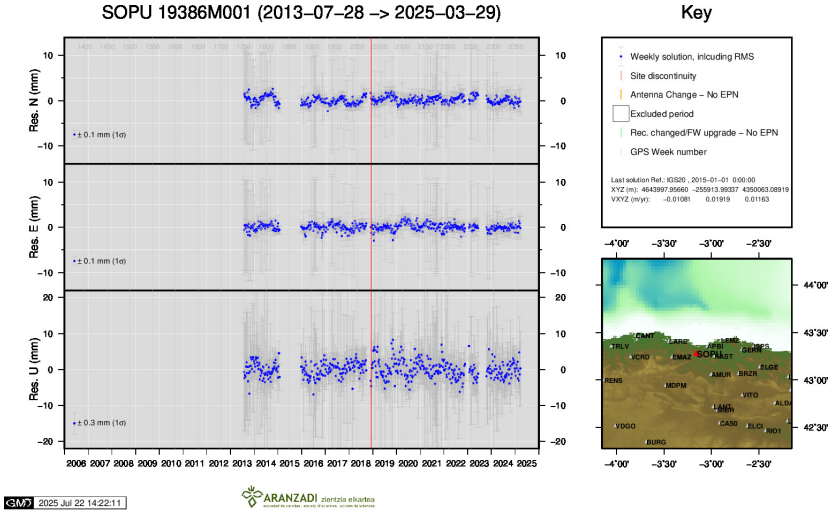

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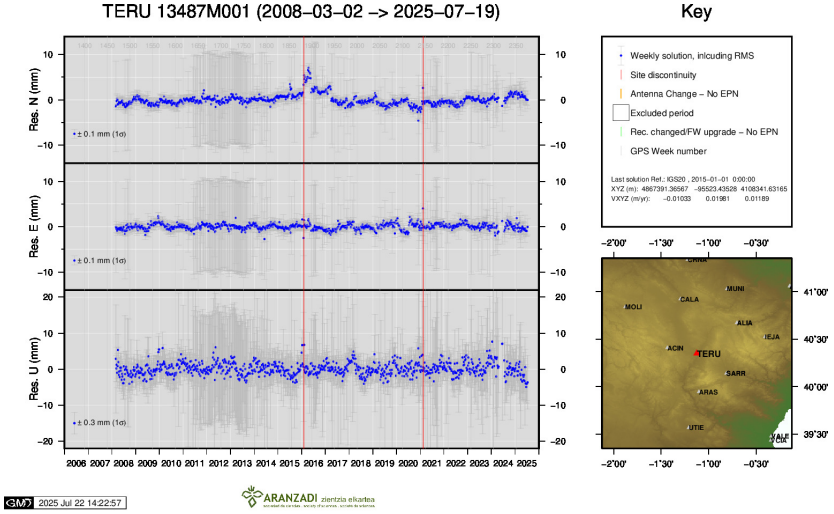

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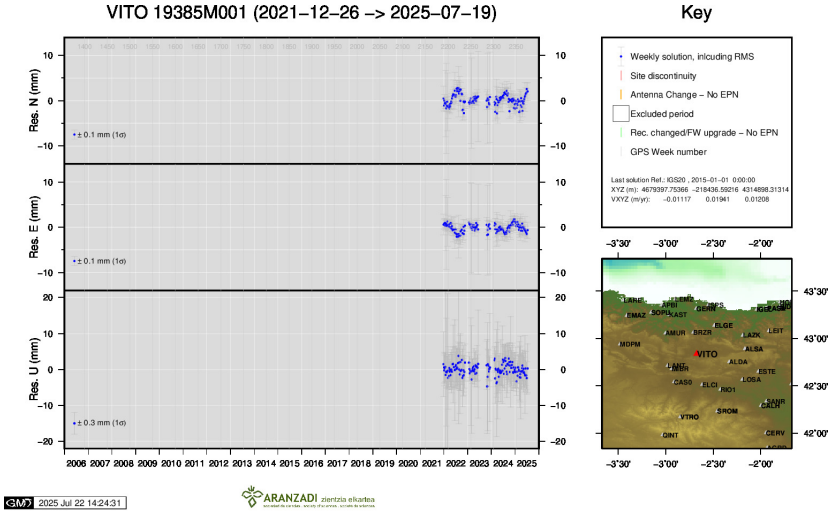

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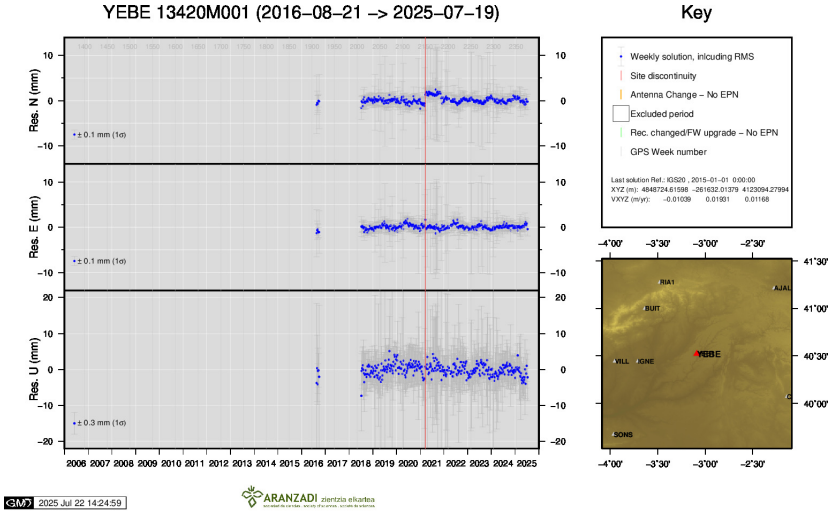

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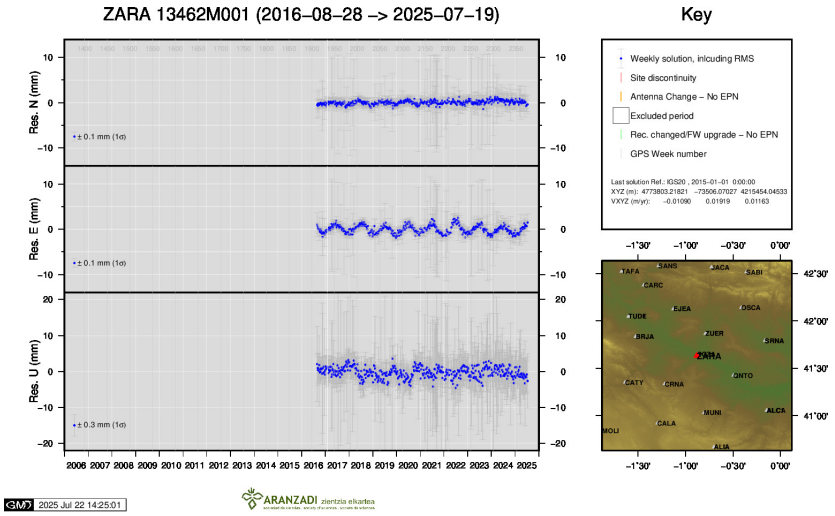
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Res. E (mm)
Res. U (mm)
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±0.1 mm (1σ)
±0.3 mm (1σ)
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Weekly solution, inlcuding RMS
Site discontinuity
Antenna Change – No EPN
Excluded period
Rec. changed/FW upgrade – No EPN
GPS Week number
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TAFA
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ZUER
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CATY
CRNA
GNTO
MUNI
ALCA
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MOLI
ALIA
2025 Jul 22 14:25:01
ARANZADI zientzia elkartea

33) ZARA