ARA-DAC Weekly Analysis Result: 2372 (GFA)

Technical Report

GPS Week: 2372 (GFA)

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

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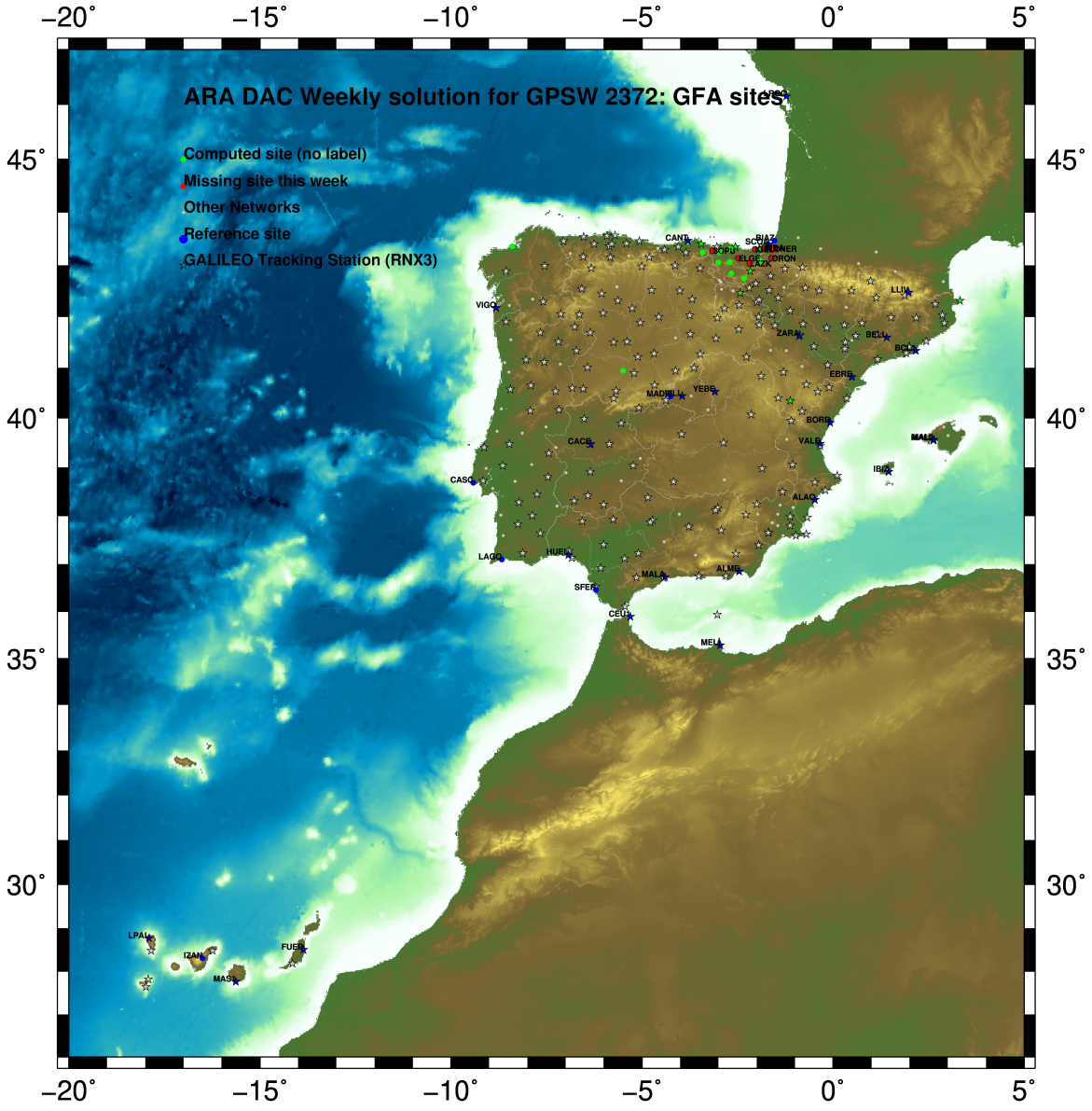
1 Introduction

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



GMT 2025 Jul 14 07:36:31

Fig.1: Computed Sites for GPS Week2372 (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                      14-JUL-25 05:52
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: IGS20             EPOCH: 2025-06-25 11:59:45

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

111  ACOR 13434M001    4594489.47548  -678367.25287  4357066.32976    A      G
 39  ALDA 19383M001    4687280.09422  -190876.44860  4308107.02654    A      GR
 50  ALSA 19419M001    4677250.76660  -176770.27890  4319079.94698    A      GRE
 53  AMUR 19388M001    4661499.38658  -244591.14002  4332269.95442    A      GR
384  BIAZ 10074M002    4634455.98238  -124344.85893  4365785.52533    W      GR
113  BRZR 19387M001    4662220.92753  -220769.78296  4333309.50855    A      GR
573  CACE 13447M001    4899866.45324  -544566.92054  4033770.28282    W      GRE
592  CANT 13438M001    4625924.25518  -307096.12199  4365771.63284    W      GRE
908  CREU 13432M001    4715420.06045   273178.17696  4271946.91402    A      GRE
135  EBRE 13410M001    4833519.92176    41537.51144  4147461.78925    W      GRE
182  EMAZ 17001M001    4645924.14714  -276949.75538  4347759.64208    A      GR
209  GERN 19389M001    4642811.25471  -217222.81098  4353278.94943    A      GR
257  HOND 15012M002    4640529.25301  -145675.87025  4358781.82683    A      GRE
240  ISPS 19484M001    4640596.41831  -206963.66231  4356391.99102    A      GRE
245  KAST 19499M001    4646949.01192  -240747.15133  4348015.06420    A      GR
252  LARE 19440M001    4632831.89714  -279026.03181  4360314.50003    A      GRE
261  LEIT 19428M001    4663520.87227  -155858.60415  4334519.95646    A      GR
345  PAS2 19351S001    4644908.99518  -156644.95362  4353623.14747    A      GRE
493  PASA 19351S001    4644908.99518  -156644.95361  4353623.14741    A      GRE
553  RIO1 13448M002    4708446.76445  -199490.16701  4284089.80667    A      GRE
558  SALA 13469M001    4803054.42699  -462130.95316  4158379.15081    A      GR
526  SCOA 10088M002    4639940.43868  -136224.82516  4359552.49662    W      GRE
443  TERU 13487M001    4867391.25454   -95523.22778  4108341.75375    A      GRE
493  VITO 19385M001    4679397.63527  -218436.38910  4314898.44079    A      GR
616  YERE 13420M001    4848724.50678  -261631.81027  4123094.40242    W      GRE
655  ZARA 13462M001    4773803.10462   -73505.86781  4215454.16676    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                                             14-JUL-25 05:52
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2000          EPOCH: 2025-06-25 11:59:45

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

111  ACOR 13434M001    4594489.82856  -678367.90942  4357065.83665    A
 39  ALDA 19383M001    4687280.51166  -190877.11579  4308106.53220    A
 50  ALSA 19419M001    4677251.18693  -176770.94480  4319079.45375    A
 53  AMUR 19388M001    4661499.79850  -244591.80413  4332269.46163    A
384  BIAZ 10074M002    4634456.41396  -124345.51932  4365785.03672    W
113  BRZR 19387M001    4662221.34288  -220770.44710  4333309.01604    A
573  CACE 13447M001    4899866.79808  -544567.61479  4033769.76406    W
592  CANT 13438M001    4625924.66113  -307096.78181  4365771.14235    W
908  CREU 13432M001    4715420.53986   273177.50792  4271946.42377    A
135  EBRE 13410M001    4833520.35833    41536.82685  4147461.28502    W
182  EMAZ 17001M001    4645924.55582  -276950.41764  4347759.15023    A
209  GERN 19389M001    4642811.67222  -217223.47268  4353278.45872    A
257  HOND 15012M002    4640529.68102  -145676.53146  4358781.33736    A
240  ISPS 19484M001    4640596.83752  -206964.32371  4356391.50066    A
245  KAST 19499M001    4646949.42570  -240747.81361  4348014.57278    A
252  LARE 19440M001    4632832.30657  -279026.69242  4360314.00932    A
261  LEIT 19428M001    4663521.29683  -155859.26827  4334519.46477    A
345  PAS2 19351S001    4644909.42122  -156645.61541  4353622.65745    A
493  PASA 19351S001    4644909.42122  -156645.61540  4353622.65739    A
553  RIO1 13448M002    4708447.17868  -199490.83685  4284089.31029    A
558  SALA 13469M001    4803054.79385  -462131.63535  4158378.64204    A
526  SCOA 10088M002    4639940.86807  -136225.48627  4359552.00734    W
443  TERU 13487M001    4867391.66864   -95523.91702  4108341.24449    A
493  VITO 19385M001    4679398.04941  -218437.05538  4314897.94676    A
616  YERE 13420M001    4848724.89882  -261632.49767  4123093.89245    W
655  ZARA 13462M001    4773803.53077   -73506.54540  4215453.66629    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).

```
CONVERT TO ETRF2014                                                  14-JUL-25 05:52
--------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2025-06-25 11:59:45

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

111  ACOR 13434M001    4594489.78898  -678367.94578  4357065.88971    A
 39  ALDA 19383M001    4687280.46948  -190877.15362  4308106.58512    A
 50  ALSA 19419M001    4677251.14481  -176770.98272  4319079.50671    A
 53  AMUR 19388M001    4661499.75680  -244591.84187  4332269.51461    A
384  BIAZ 10074M002    4634456.37214  -124345.55765  4365785.08985    W
113  BRZR 19387M001    4662221.30109  -220770.48493  4333309.06903    A
573  CACE 13447M001    4899866.75447  -544567.65024  4033769.81624    W
592  CANT 13438M001    4625924.62005  -307096.81947  4365771.19541    W
908  CREU 13432M001    4715420.49550   273177.46846  4271946.47695    A
135  EBRE 13410M001    4833520.31352    41536.78882  4147461.33766    W
182  EMAZ 17001M001    4645924.51442  -276950.45533  4347759.20324    A
209  GERN 19389M001    4642811.63064  -217223.51061  4353278.51178    A
257  HOND 15012M002    4640529.63920  -145676.56968  4358781.39046    A
240  ISPS 19484M001    4640596.79593  -206964.36169  4356391.55373    A
245  KAST 19499M001    4646949.38415  -240747.85144  4348014.62581    A
252  LARE 19440M001    4632832.26532  -279026.73016  4360314.06238    A
261  LEIT 19428M001    4663521.25479  -155859.30634  4334519.51779    A
345  PAS2 19351S001    4644909.37939  -156645.65357  4353622.71053    A
493  PASA 19351S001    4644909.37939  -156645.65356  4353622.71047    A
553  RIO1 13448M002    4708447.13627  -199490.87455  4284089.36315    A
558  SALA 13469M001    4803054.75119  -462131.67158  4158378.69450    A
526  SCOA 10088M002    4639940.82623  -136225.52453  4359552.06045    W
443  TERU 13487M001    4867391.62395   -95523.95437  4108341.29694    A
493  VITO 19385M001    4679398.00741  -218437.09314  4314897.99970    A
616  YEBE 13420M001    4848724.85496  -261632.53447  4123093.94485    W
655  ZARA 13462M001    4773803.48712   -73506.58327  4215453.71902    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).

```
CONVERT TO ETRF2020                                                  14-JUL-25 05:52
--------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2020          EPOCH: 2025-06-25 11:59:45

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

111  ACOR 13434M001    4594489.78510  -678367.93107  4357065.89767    A
 39  ALDA 19383M001    4687280.46428  -190877.13842  4308106.59335    A
 50  ALSA 19419M001    4677251.13954  -176770.96755  4319079.51493    A
 53  AMUR 19388M001    4661499.75170  -244591.82677  4332269.52278    A
384  BIAZ 10074M002    4634456.36659  -124345.54259  4365785.09800    W
113  BRZR 19387M001    4662221.29592  -220770.46982  4333309.07721    A
573  CACE 13447M001    4899866.75100  -544567.63450  4033769.82474    W
592  CANT 13438M001    4625924.61505  -307096.80451  4365771.20352    W
908  CREU 13432M001    4715420.48899   273177.48394  4271946.48531    A
135  EBRE 13410M001    4833520.30802    41536.80459  4147461.34617    W
182  EMAZ 17001M001    4645924.50937  -276950.44029  4347759.21138    A
209  GERN 19389M001    4642811.62540  -217223.49556  4353278.51992    A
257  HOND 15012M002    4640529.63374  -145676.55461  4358781.39862    A
240  ISPS 19484M001    4640596.79066  -206964.34665  4356391.56187    A
245  KAST 19499M001    4646949.37900  -240747.83638  4348014.63396    A
252  LARE 19440M001    4632832.26025  -279026.71517  4360314.07050    A
261  LEIT 19428M001    4663521.24941  -155859.29121  4334519.52599    A
345  PAS2 19351S001    4644909.37397  -156645.63849  4353622.71869    A
493  PASA 19351S001    4644909.37397  -156645.63848  4353622.71863    A
553  RIO1 13448M002    4708447.13115  -199490.85928  4284089.37141    A
558  SALA 13469M001    4803054.74717  -462131.65612  4158378.70287    A
526  SCOA 10088M002    4639940.82074  -136225.50946  4359552.06861    W
443  TERU 13487M001    4867391.61896   -95523.93855  4108341.30548    A
493  VITO 19385M001    4679398.00228  -218437.07797  4314898.00791    A
616  YEBE 13420M001    4848724.85043  -261632.51878  4123093.95333    W
655  ZARA 13462M001    4773803.48180   -73506.56774  4215453.72741    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 14-JUL-25 05:52

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	6	XXXXXX	1.57	1.15	4.85
ALDA 19383M001	7	XXXXXXX	0.96	0.97	4.35
ALSA 19419M001	7	XXXXXXX	0.99	1.57	2.33
AMUR 19388M001	7	XXXXXXX	1.15	0.54	5.81
BIAZ 10074M002	3	XXX	1.80	1.00	5.22
BRZR 19387M001	7	XXXXXXX	0.85	0.76	4.86
CACE 13447M001	7	XXXXXXX	0.78	0.64	5.35
CANT 13438M001	7	XXXXXXX	0.79	1.02	4.66
CREU 13432M001	7	XXXXXXX	1.32	0.35	2.76
EBRE 13410M001	7	XXXXXXX	0.94	0.98	3.44
EMAZ 17001M001	2	XX	2.36	0.39	6.04
GERN 19389M001	7	XXXXXXX	1.37	0.87	3.02
HOND 15012M002	7	XXXXXXX	1.12	0.86	4.14
ISPS 19484M001	7	XXXXXXX	1.02	1.25	3.39
KAST 19499M001	7	XXXXXXX	0.59	0.62	5.64
LARE 19440M001	7	XXXXXXX	0.83	1.02	2.96
LEIT 19428M001	6	XXXXXX	0.68	0.62	4.68
PAS2 19351S001	7	XXXXXXX	1.25	0.62	4.78
PASA 19351S001	7	XXXXXXX	1.24	0.63	4.72
RIO1 13448M002	7	XXXXXXX	0.76	0.87	3.67
SALA 13469M001	7	XXXXXXX	1.01	0.60	2.85
SCOA 10088M002	7	XXXXXXX	0.93	0.66	3.82
TERU 13487M001	7	XXXXXXX	1.15	0.86	3.73
VITO 19385M001	7	XXXXXXX	0.73	0.61	3.35
YEBE 13420M001	7	XXXXXXX	0.90	0.72	2.46
ZARA 13462M001	7	XXXXXXX	1.14	0.57	4.01

Comparison of individual solutions:

ACOR 13434M001	N	1.57		-1.61	0.80	0.26	-1.95	-1.41	1.80
ACOR 13434M001	E	1.15		-1.12	-0.60	-1.07	0.18	0.41	1.91
ACOR 13434M001	U	4.85		-0.08	-2.08	-6.82	-2.79	3.67	6.74
ALDA 19383M001	N	0.96	-0.62	0.38	-0.66	0.88	1.57	-0.63	0.97
ALDA 19383M001	E	0.97	1.17	1.38	0.35	0.57	0.32	-0.82	-1.09
ALDA 19383M001	U	4.35	3.96	-0.09	8.55	-4.36	1.80	-1.28	0.98
ALSA 19419M001	N	0.99	-1.24	-0.49	0.04	1.27	0.87	-0.06	1.30
ALSA 19419M001	E	1.57	1.25	1.94	0.22	-2.63	1.51	-0.16	-0.37
ALSA 19419M001	U	2.33	-1.28	-0.26	3.03	1.95	3.80	0.59	1.74
AMUR 19388M001	N	1.15	0.60	0.64	1.68	-0.41	0.45	-1.95	0.37
AMUR 19388M001	E	0.54	0.03	0.45	0.71	-0.72	0.21	-0.67	0.22
AMUR 19388M001	U	5.81	0.37	-4.72	12.06	4.25	0.44	2.47	-3.21
BIAZ 10074M002	N	1.80	0.39	0.69	2.42				
BIAZ 10074M002	E	1.00	0.03	1.41	-0.20				
BIAZ 10074M002	U	5.22	-1.19	7.28	-0.00				
BRZR 19387M001	N	0.85	-1.31	-0.30	0.15	0.71	0.72	1.20	0.24
BRZR 19387M001	E	0.76	0.36	0.63	1.19	-1.02	-0.53	0.21	-0.34
BRZR 19387M001	U	4.86	2.05	-0.15	11.52	-1.03	-0.93	-0.02	1.72
CACE 13447M001	N	0.78	-0.28	0.32	-1.25	-0.87	0.48	-0.88	-0.34
CACE 13447M001	E	0.64	0.46	-0.17	-0.34	-0.74	0.03	-1.21	-0.25
CACE 13447M001	U	5.35	3.50	-2.51	9.06	-1.26	-1.73	2.47	-7.78
CANT 13438M001	N	0.79	0.46	-1.32	0.73	-0.14	0.61	-0.87	0.32
CANT 13438M001	E	1.02	-0.06	1.08	1.26	-1.56	0.97	-0.30	0.08
CANT 13438M001	U	4.66	-5.05	-0.92	-6.27	6.56	3.36	-0.94	-3.08
CREU 13432M001	N	1.32	2.08	0.51	0.46	-0.86	2.01	-0.32	-0.92
CREU 13432M001	E	0.35	0.52	-0.07	0.40	-0.21	-0.22	-0.32	-0.36
CREU 13432M001	U	2.76	4.45	1.94	4.01	0.77	-1.32	-1.64	-1.04
EBRE 13410M001	N	0.94	0.69	0.91	1.89	0.21	-0.58	-0.29	0.11
EBRE 13410M001	E	0.98	1.56	-0.72	0.65	0.45	-1.07	0.02	-1.04
EBRE 13410M001	U	3.44	-2.41	-1.37	-2.81	4.07	5.73	2.31	0.87
EMAZ 17001M001	N	2.36	-0.06	-2.36					
EMAZ 17001M001	E	0.39	-0.09	0.38					
EMAZ 17001M001	U	6.04	-3.65	-4.81					
GERN 19389M001	N	1.37	1.74	-0.16	-1.40	1.61	0.08	-1.90	-0.18
GERN 19389M001	E	0.87	0.13	0.28	0.67	-1.80	-0.31	0.41	0.69
GERN 19389M001	U	3.02	2.32	-4.61	-2.42	-0.04	-0.71	2.57	3.89
HOND 15012M002	N	1.12	0.09	1.41	2.07	-1.08	0.01	-0.08	0.28
HOND 15012M002	E	0.86	-0.10	1.52	0.80	-0.98	0.69	-0.29	-0.04
HOND 15012M002	U	4.14	-1.32	0.51	8.64	3.49	2.50	-1.15	-2.51
ISPS 19484M001	N	1.02	1.28	0.71	-1.23	-0.04	0.45	-1.53	0.10
ISPS 19484M001	E	1.25	-0.54	0.25	-0.13	-2.10	-0.31	1.88	1.00
ISPS 19484M001	U	3.39	-0.52	-2.21	-2.94	-4.10	2.38	3.56	4.46
KAST 19499M001	N	0.59	0.68	-0.21	0.19	-0.39	-0.56	-0.62	0.83
KAST 19499M001	E	0.62	-0.66	0.27	1.12	0.31	-0.10	-0.70	0.03
KAST 19499M001	U	5.64	3.96	-8.08	8.58	4.72	-2.82	-2.38	-0.68
LARE 19440M001	N	0.83	-1.76	-0.67	0.35	0.68	0.16	0.06	-0.17
LARE 19440M001	E	1.02	-0.17	0.49	-1.29	-0.30	1.28	0.34	1.57
LARE 19440M001	U	2.96	-5.36	-3.14	1.80	0.64	2.23	-1.98	-1.16
LEIT 19428M001	N	0.68		1.11	0.46	0.38	0.54	-0.62	-0.24
LEIT 19428M001	E	0.62		1.07	-0.02	-0.27	0.03	-0.50	0.67
LEIT 19428M001	U	4.68		-3.29	-0.35	8.55	0.70	4.99	-0.27
PAS2 19351S001	N	1.25	0.34	0.73	1.98	-1.25	0.85	-1.24	0.97
PAS2 19351S001	E	0.62	-0.16	0.70	0.91	-0.26	0.37	-0.72	0.46
PAS2 19351S001	U	4.78	-1.17	1.15	10.18	3.93	1.63	-0.64	-3.46
PASA 19351S001	N	1.24	0.37	0.70	1.97	-1.27	0.90	-1.22	0.92
PASA 19351S001	E	0.63	-0.13	0.74	0.93	-0.26	0.36	-0.75	0.42
PASA 19351S001	U	4.72	-1.12	1.12	10.09	3.84	1.66	-0.56	-3.44
RIO1 13448M002	N	0.76	0.35	0.04	1.06	1.13	-0.82	-0.50	-0.05
RIO1 13448M002	E	0.87	0.82	1.49	-0.18	-0.87	0.82	0.21	-0.39
RIO1 13448M002	U	3.67	5.28	-2.76	2.50	1.83	5.60	-2.03	-0.55
SALA 13469M001	N	1.01	-0.92	-0.81	-0.51	0.60	-0.44	0.96	-1.70
SALA 13469M001	E	0.60	0.35	-0.56	0.21	-0.55	0.61	0.26	0.95
SALA 13469M001	U	2.85	-1.02	2.16	2.96	-1.87	-0.72	0.56	-5.48
SCOA 10088M002	N	0.93	0.73	1.18	1.08	0.21	-0.36	-1.21	0.72
SCOA 10088M002	E	0.66	-0.52	0.41	0.74	1.24	-0.05	-0.13	-0.33

SCOA	10088M002	U	3.82	0.17	3.53	2.73	7.26	1.60	-2.93	-1.92
TERU	13487M001	N	1.15	-1.15	-0.27	1.62	1.01	1.47	0.59	-0.61
TERU	13487M001	E	0.86	0.50	0.87	-0.84	-0.14	0.53	-0.23	-1.55
TERU	13487M001	U	3.73	5.59	-2.40	3.73	-5.28	-2.08	-0.47	-0.06
VITO	19385M001	N	0.73	0.55	0.49	0.86	-1.32	0.23	-0.41	-0.09
VITO	19385M001	E	0.61	-0.18	0.91	0.21	-0.94	0.64	0.17	-0.00
VITO	19385M001	U	3.35	-3.25	-1.12	5.70	0.45	4.18	1.27	1.96
YEBE	13420M001	N	0.90	1.22	-0.47	-1.14	-1.02	-0.78	-0.33	0.31
YEBE	13420M001	E	0.72	0.09	0.45	0.86	-0.78	0.81	-0.41	0.85
YEBE	13420M001	U	2.46	1.48	-0.54	1.08	-1.33	-0.80	-5.51	-0.24
ZARA	13462M001	N	1.14	-0.74	0.54	1.29	1.78	0.68	0.91	-0.94
ZARA	13462M001	E	0.57	-0.01	0.70	1.04	0.38	-0.08	0.40	-0.30
ZARA	13462M001	U	4.01	3.15	-4.36	6.28	-0.67	-1.74	1.21	4.81

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 |       1.86     -1.23      0.68 |   |
|   3 | ALME 13437M001   | I W |      -0.78      0.68      1.48 |   |
|   4 | BCL1 19482M001   | I W |      -0.44     -1.53      5.92 |   |
|   5 | BELL 13431M001   | I W |      -0.38     -0.28      2.44 |   |
|   6 | BIAZ 10074M002   | I W |       2.17      0.45     -4.09 |   |
|   7 | BORR 13480M001   | I W |      -4.51     -0.24     -1.79 |   |
|   8 | BRST 10004M004   | I W |      -0.94     -1.18      0.74 |   |
|   9 | CACE 13447M001   | I W |       1.21      2.36     -1.72 |   |
|  10 | CANT 13438M001   | I W |       0.61      2.20     -4.43 |   |
|  11 | CASC 13909S001   | I W |      -0.85     -1.31     15.67 |   |
|  12 | CEU1 13449M002   | I W |       0.64      0.19     -2.94 |   |
|  14 | EBRE 13410M001   | I W |      -1.99      0.07      2.04 |   |
|  16 | FLRS 31907M001   | I W |       0.05      0.61     -5.63 |   |
|  17 | FUER 31330M001   | I W |       0.61     -1.12      0.97 |   |
|  19 | HUEL 13451M001   | I W |       1.13      3.27     -8.49 |   |
|  20 | IBIZ 13454S001   | I W |      -0.21      1.64      1.56 |   |
|  21 | IZAN 31309M002   | I W |      -0.31     -1.34     -4.81 |   |
|  22 | LAGO 13903M001   | I W |       0.77     -0.16     -0.11 |   |
|  23 | LLIV 13436M001   | I W |      -2.43      1.89      2.57 |   |
|  24 | LPAL 81701M001   | I W |       1.35      0.22     -6.13 |   |
|  25 | LROC 10023M001   | I W |       1.95     -0.24     -0.69 |   |
|  26 | MADR 13407S012   | I W |       1.13      2.08      0.01 |   |
|  27 | MAL1 13444M002   | I W |       5.30     -1.68     -4.54 |   |
|  28 | MALA 13443M001   | I W |       1.34     -0.59      8.48 |   |
|  29 | MALL 13444M001   | I W |      -0.21     -0.82      3.84 |   |
|  30 | MAS1 31303M002   | I W |      -1.02     -2.16     -0.39 |   |
|  31 | MELI 19379M001   | I W |       0.29     -1.77      1.24 |   |
|  32 | PDEL 31906M004   | I W |      -0.94     -1.64     -1.08 |   |
|  33 | SCOA 10088M002   | I W |      -4.20     -2.24    -13.12 |   |
|  34 | SFER 13402M004   | I W |      -2.19     -4.01      2.58 |   |
|  35 | VALE 13439M001   | I W |      -0.58      1.59     -6.83 |   |
|  36 | VIGO 13450M001   | I W |       2.07      2.35      3.30 |   |
|  37 | VILL 13406M001   | I W |      -0.90     -0.16      3.49 |   |
|  38 | YEBE 13420M001   | I W |      -1.01     -0.27      4.42 |   |
|  39 | ZARA 13462M001   | I W |       0.66     -0.12     -1.91 |   |
|  40 | ZIMM 14001M004   | I W |      -1.04     -0.32      6.83 |   |
|     |                  |     |                                |   |
-----------------------------------------------------------------------
|     | RMS / COMPONENT  |     |       1.81      1.57      5.21 |   |
|     | IQR              |     |       2.06      1.91      6.08 |   |
|     | MEAN             |     |      -0.05     -0.13     -0.01 |   |
|     | MEDIAN           |     |      -0.21     -0.24      0.34 |   |
|     | MIN              |     |      -4.51     -4.01    -13.12 |   |
|     | MAX              |     |       5.30      3.27     15.67 |   |
-----------------------------------------------------------------------
        OVERALL RMS/IQR/MAX(3D)        3.31      2.69     15.75       CASC 13909S001      #SUM
-----------------------------------------------------------------------
| ALL | RMS / COMPONENT  |     |       1.81      1.57      5.21 |   |
| ALL | IQR              |     |       2.06      1.91      6.08 |   |
| ALL | MEAN             |     |      -0.05     -0.13     -0.01 |   |
| ALL | MEDIAN           |     |      -0.21     -0.24      0.34 |   |
| ALL | MIN              |     |      -4.51     -4.01    -13.12 |   |
| ALL | MAX              |     |       5.30      3.27     15.67 |   |
-----------------------------------------------------------------------
  ALL   OVERALL RMS/IQR/MAX(3D)        3.31      2.69     15.75       CASC 13909S001      #SUM_ALL


NUMBER OF PARAMETERS  :     3
NUMBER OF STATIONS    :    36
NUMBER OF COORDINATES :   108
RMS OF TRANSFORMATION :    3.31 MM


PARAMETERS:

TRANSLATION IN  X     :          -0.00     +-  0.55    MM
TRANSLATION IN  Y     :           0.01     +-  0.55    MM
TRANSLATION IN  Z     :           0.00     +-  0.55    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                      19357777
 NUMBER OF UNKNOWNS                            205278
 NUMBER OF DEGREES OF FREEDOM                19152499
 PHASE MEASUREMENTS SIGMA                     0.00100
 SAMPLING INTERVAL (SECONDS)                      180
 VARIANCE FACTOR                  2.386120380932870
```

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 25:174:00000 25:179:86370 LEICA GR50           ----- -----------
 ALDA  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 ALSA  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 BIAZ  A    1 P 25:173:00000 25:175:86370 SPECTRA SP90M        ----- -----------
 BRZR  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 CANT  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 CREU  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 EMAZ  A    1 P 25:173:00000 25:174:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 HOND  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 ISPS  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 KAST  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 LARE  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 LEIT  A    1 P 25:174:00000 25:179:86370 LEICA GRX1200GGPRO   ----- -----------
 PAS2  A    1 P 25:173:00000 25:179:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 SALA  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 SCOA  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 TERU  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 VITO  A    1 P 25:173:00000 25:179:86370 LEICA GR30           ----- -----------
 YEBE  A    1 P 25:173:00000 25:179:86370 LEICA GR50           ----- -----------
 ZARA  A    1 P 25:173:00000 25:179:86370 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 25:174:00000 25:179:86370 LEIAT504          LEIS -----
 ALDA  A    1 P 25:173:00000 25:179:86370 LEIAS10           NONE -----
 ALSA  A    1 P 25:173:00000 25:179:86370 LEIAR10           NONE -----
 AMUR  A    1 P 25:173:00000 25:179:86370 LEIAS10           NONE -----
 BIAZ  A    1 P 25:173:00000 25:175:86370 LEIAR25           LEIT -----
 BRZR  A    1 P 25:173:00000 25:179:86370 LEIAS10           NONE -----
 CACE  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 CANT  A    1 P 25:173:00000 25:179:86370 LEIAR25.R4        LEIT -----
 CREU  A    1 P 25:173:00000 25:179:86370 LEIAR25.R4        NONE -----
 EBRE  A    1 P 25:173:00000 25:179:86370 LEIAR25.R4        NONE -----
 EMAZ  A    1 P 25:173:00000 25:174:86370 LEIAS10           NONE -----
 GERN  A    1 P 25:173:00000 25:179:86370 LEIAS10           NONE -----
 HOND  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 ISPS  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 KAST  A    1 P 25:173:00000 25:179:86370 LEIAS10           NONE -----
 LARE  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 LEIT  A    1 P 25:174:00000 25:179:86370 LEIAR10           NONE -----
 PAS2  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 PASA  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 RIO1  A    1 P 25:173:00000 25:179:86370 LEIAR25.R4        LEIT -----
 SALA  A    1 P 25:173:00000 25:179:86370 LEIAR25           NONE -----
 SCOA  A    1 P 25:173:00000 25:179:86370 TRM55971.00       NONE -----
 TERU  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 VITO  A    1 P 25:173:00000 25:179:86370 LEIAS10           NONE -----
 YEBE  A    1 P 25:173:00000 25:179:86370 LEIAR20           LEIM -----
 ZARA  A    1 P 25:173:00000 25:179:86370 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 25:174:00000 25:179:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
```

```
AMUR  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
BIAZ  A    1 P 25:173:00000 25:175:86370 UNE   0.0000   0.0000   0.0000
BRZR  A    1 P 25:173:00000 25:179:86370 UNE   0.0771   0.0000   0.0000
CACE  A    1 P 25:173:00000 25:179:86370 UNE   0.0600   0.0000   0.0000
CANT  A    1 P 25:173:00000 25:179:86370 UNE   3.0490   0.0000   0.0000
CREU  A    1 P 25:173:00000 25:179:86370 UNE   0.0770   0.0000   0.0000
EBRE  A    1 P 25:173:00000 25:179:86370 UNE   0.0770   0.0000   0.0000
EMAZ  A    1 P 25:173:00000 25:174:86370 UNE   0.0350   0.0000   0.0000
GERN  A    1 P 25:173:00000 25:179:86370 UNE   0.0771   0.0000   0.0000
HOND  A    1 P 25:173:00000 25:179:86370 UNE   0.0771   0.0000   0.0000
ISPS  A    1 P 25:173:00000 25:179:86370 UNE   0.0350   0.0000   0.0000
KAST  A    1 P 25:173:00000 25:179:86370 UNE   0.0350   0.0000   0.0000
LARE  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
LEIT  A    1 P 25:174:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
PAS2  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
PASA  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
RIO1  A    1 P 25:173:00000 25:179:86370 UNE   0.0606   0.0000   0.0000
SALA  A    1 P 25:173:00000 25:179:86370 UNE   0.0600   0.0000   0.0000
SCOA  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
TERU  A    1 P 25:173:00000 25:179:86370 UNE   0.0600   0.0000   0.0000
VITO  A    1 P 25:173:00000 25:179:86370 UNE   0.0000   0.0000   0.0000
YEBE  A    1 P 25:173:00000 25:179:86370 UNE   0.0600   0.0000   0.0000
ZARA  A    1 P 25:173:00000 25:179:86370 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:

```
2025-07-13 03:19 UTC | CANT1730.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-13 03:19 UTC | CANT1730.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-13 06:36 UTC | CANT1740.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-13 06:36 UTC | CANT1740.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-13 09:55 UTC | CANT1750.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-13 09:55 UTC | CANT1750.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-13 13:14 UTC | CANT1760.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-13 13:14 UTC | CANT1760.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-13 16:39 UTC | CANT1770.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-13 16:39 UTC | CANT1770.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-13 20:03 UTC | CANT1780.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-13 20:03 UTC | CANT1780.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-14 01:44 UTC | CANT1790.25O | RECEIVER TYPE        |  LEICA GR10 -> LEICA GR50 (source: cant00esp_20250509.log
2025-07-14 01:44 UTC | CANT1790.25O | RECEIVER FIRM. VERS. |  4.00/6.713 -> 4.80/7.900 (source: cant00esp_20250509.log
2025-07-13 03:19 UTC | ISPS1730.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-13 06:36 UTC | ISPS1740.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-13 09:55 UTC | ISPS1750.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-13 13:14 UTC | ISPS1760.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-13 16:39 UTC | ISPS1770.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-13 20:03 UTC | ISPS1780.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-14 01:44 UTC | ISPS1790.25O | ANTENNA SER. NO.     |   -> 24238009 (source: isps00esp_20250114.log
2025-07-13 06:36 UTC | LEIT1740.25O | RECEIVER FIRM. VERS. |  8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-13 09:55 UTC | LEIT1750.25O | RECEIVER FIRM. VERS. |  8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-13 13:14 UTC | LEIT1760.25O | RECEIVER FIRM. VERS. |  8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-13 16:39 UTC | LEIT1770.25O | RECEIVER FIRM. VERS. |  8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-13 20:03 UTC | LEIT1780.25O | RECEIVER FIRM. VERS. |  8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-14 01:44 UTC | LEIT1790.25O | RECEIVER FIRM. VERS. |  8.20/3.054 -> 8.20 (source: leit00esp_20250623.log
2025-07-13 03:19 UTC | PAS21730.25O | ANTENNA DELTA UP     |  0.0180 -> 0.0000 (source: pas200esp_20231031.log
2025-07-13 13:14 UTC | PAS21760.25O | ANTENNA DELTA UP     |  0.0180 -> 0.0000 (source: pas200esp_20231031.log
2025-07-13 16:39 UTC | PAS21770.25O | 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*

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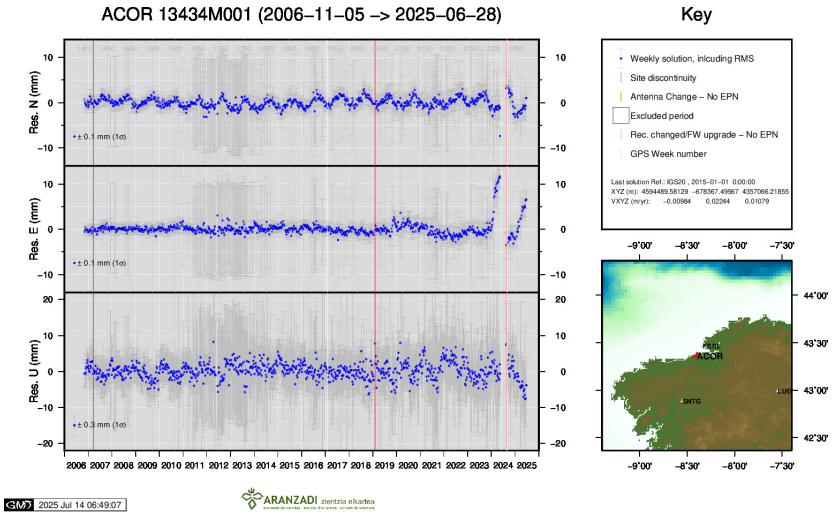
10 Cumulative Time Series

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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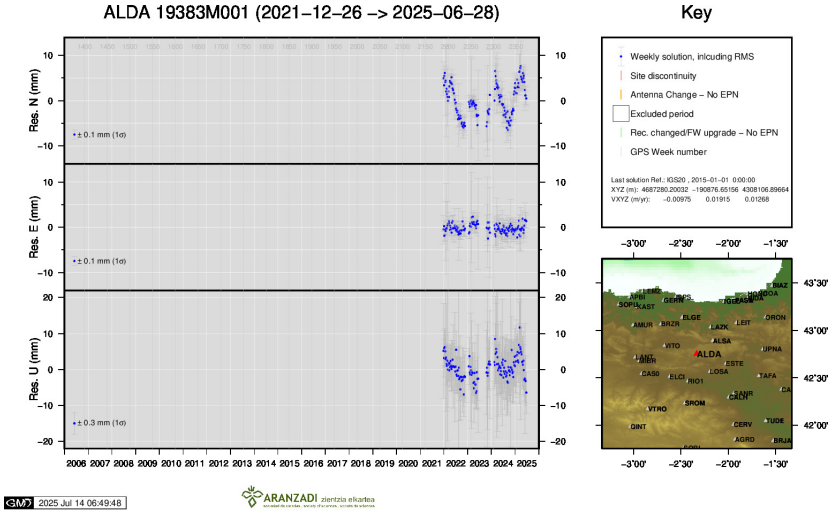

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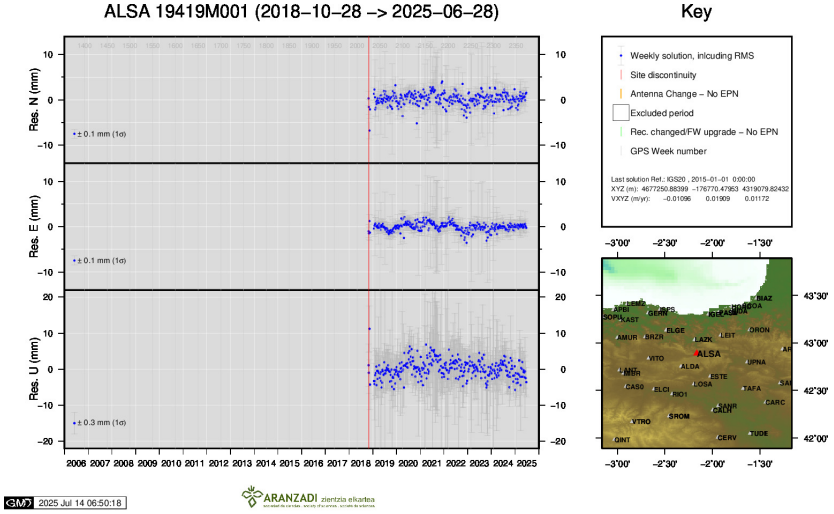

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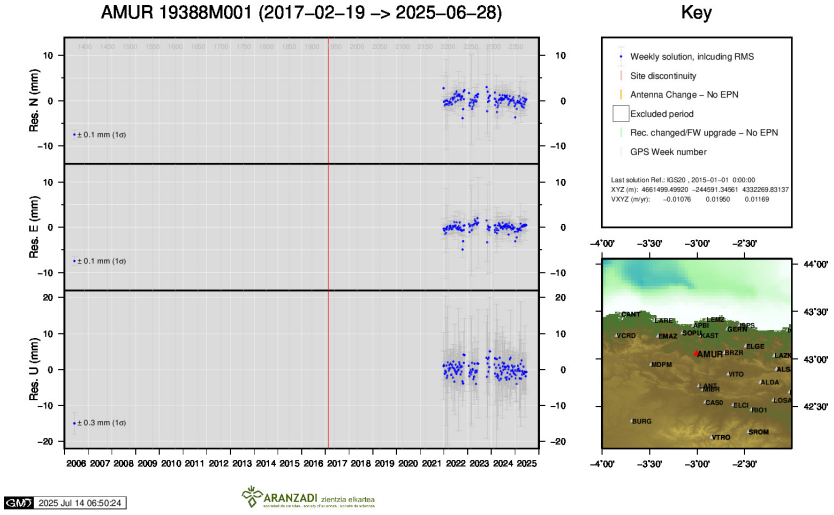

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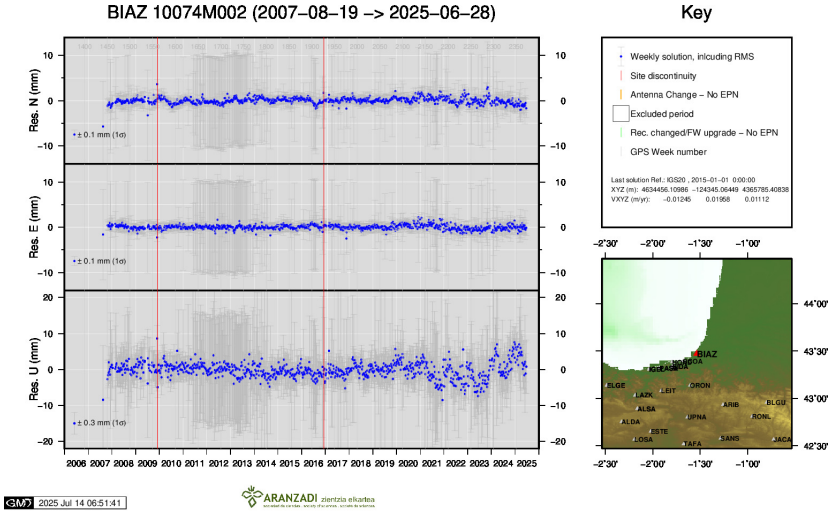

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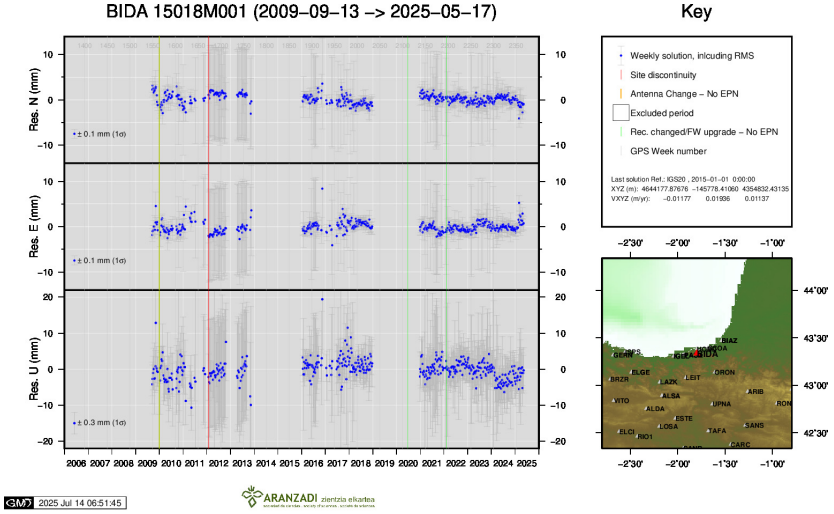

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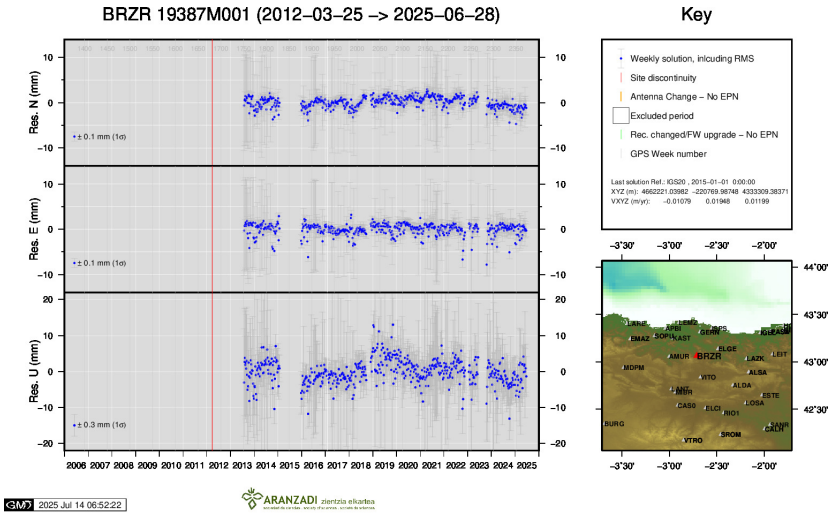

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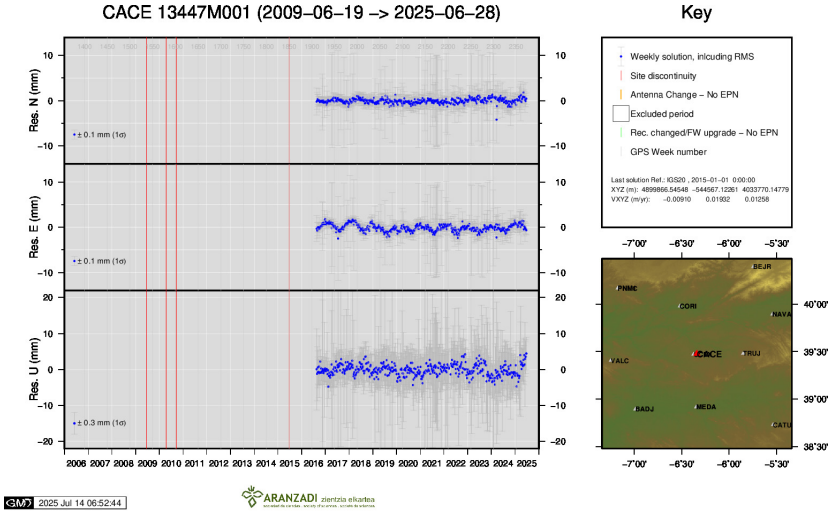

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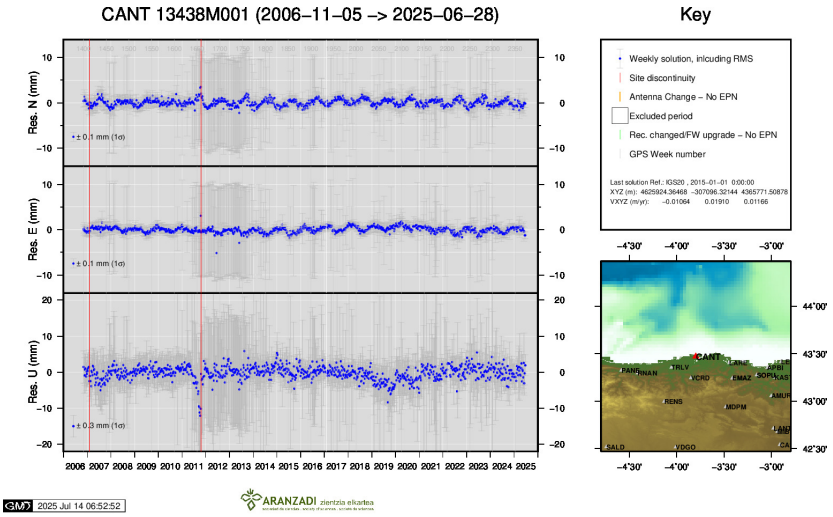

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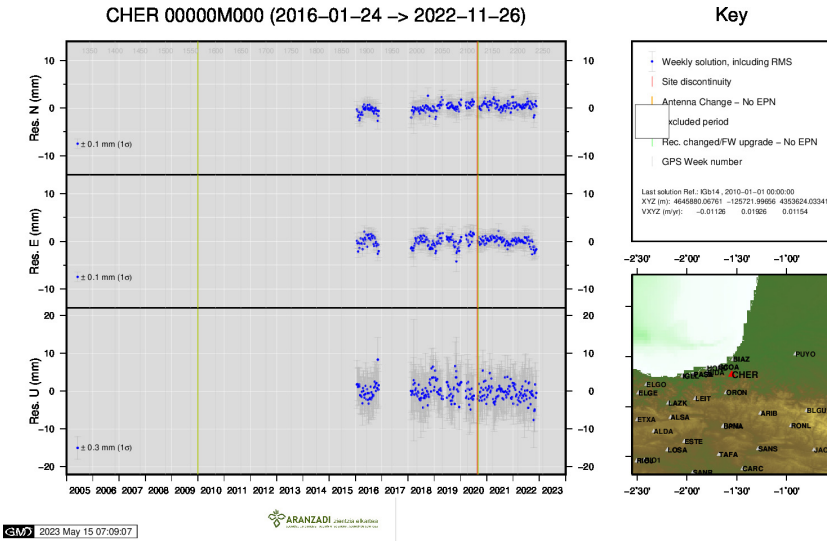

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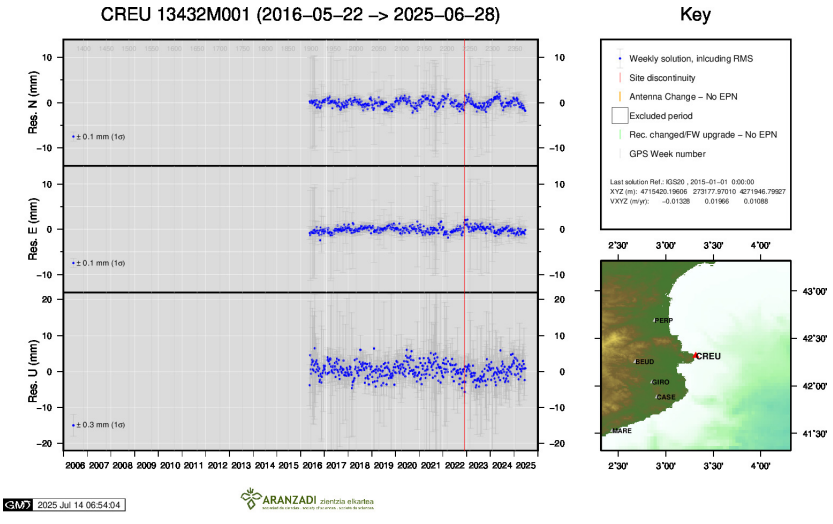

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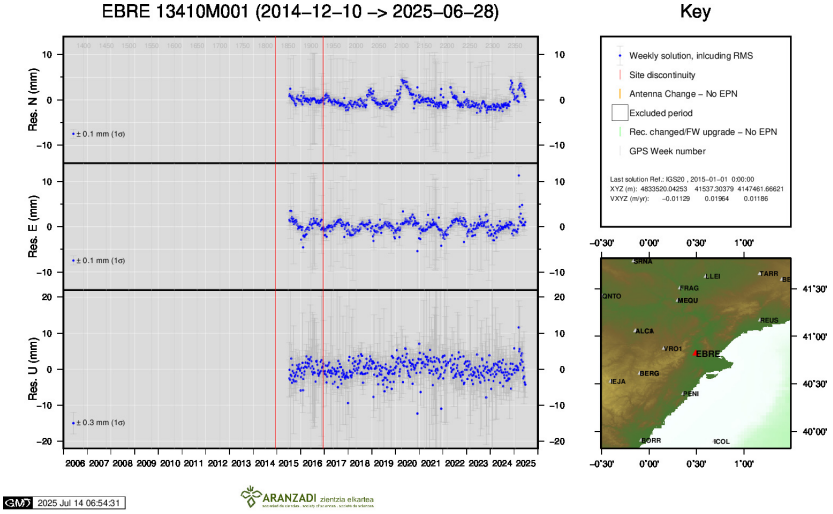

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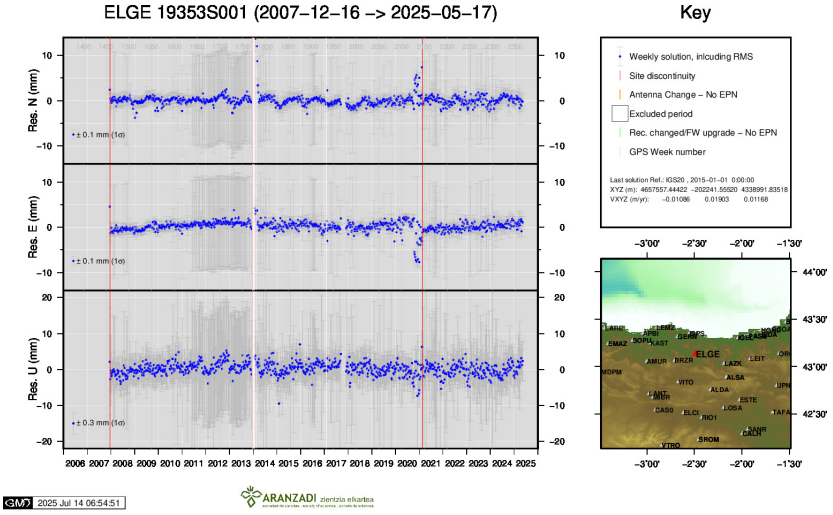

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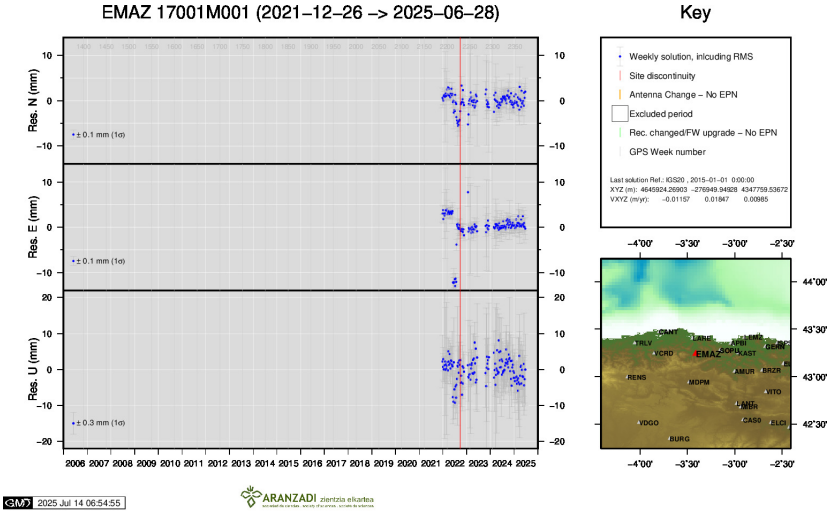

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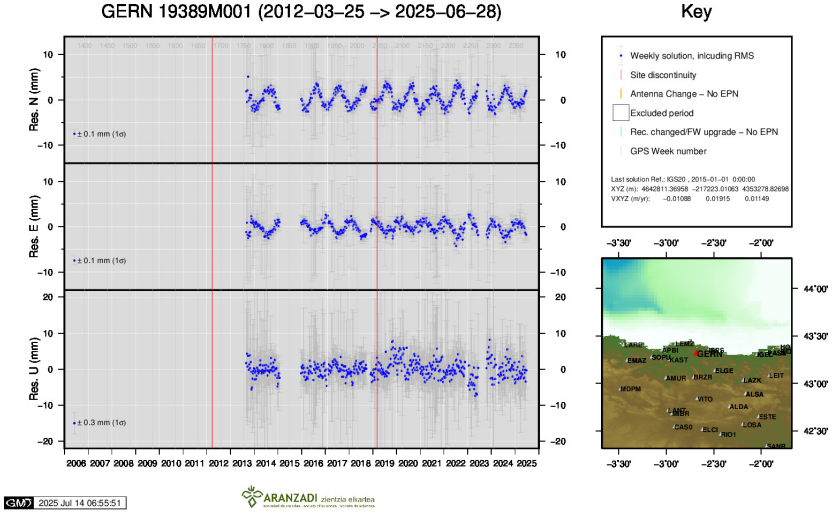

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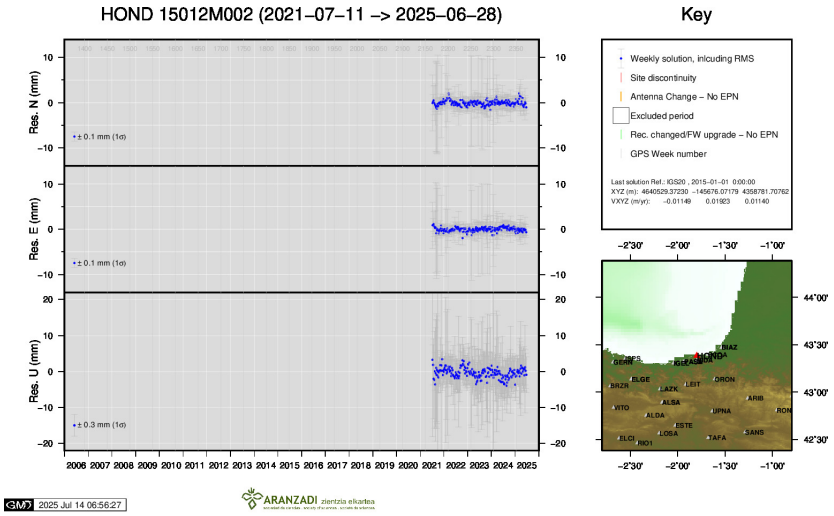

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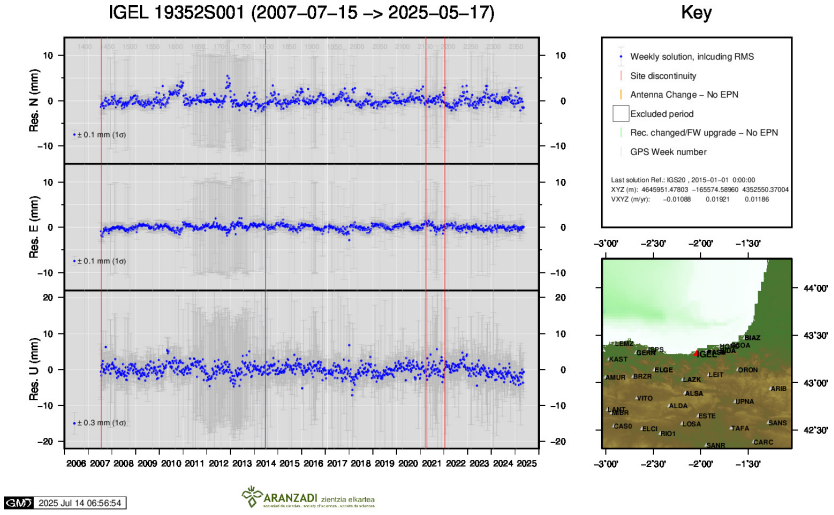

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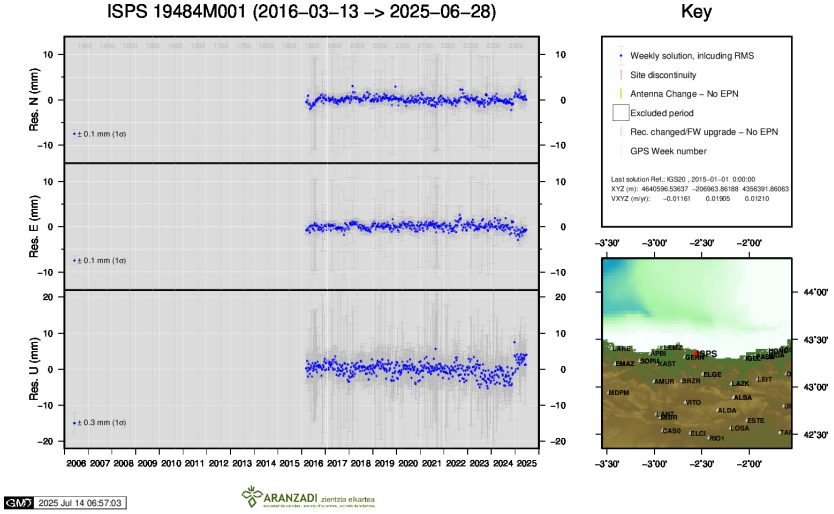

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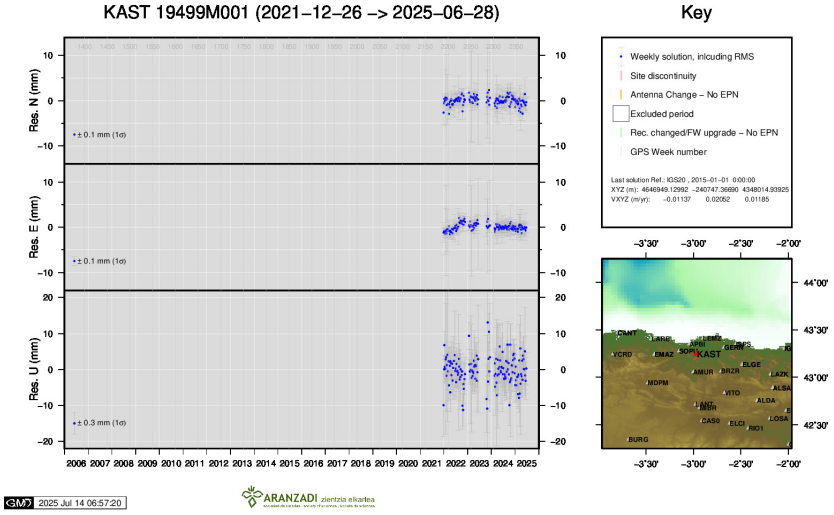

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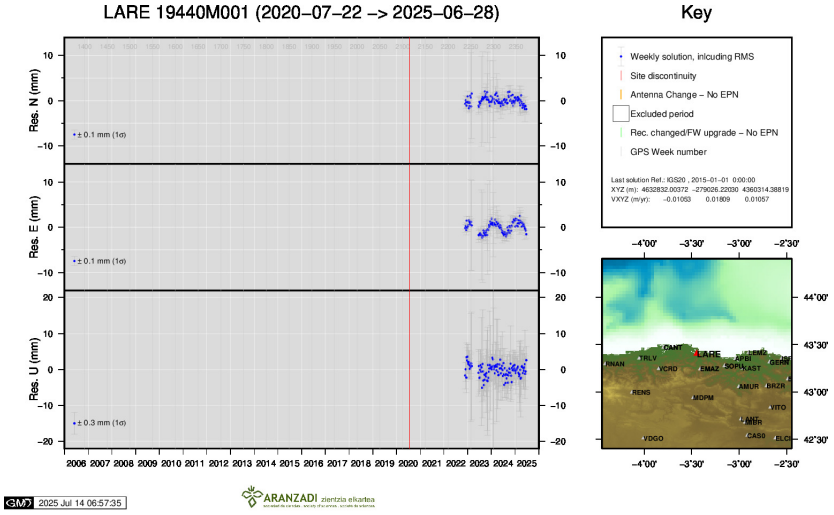

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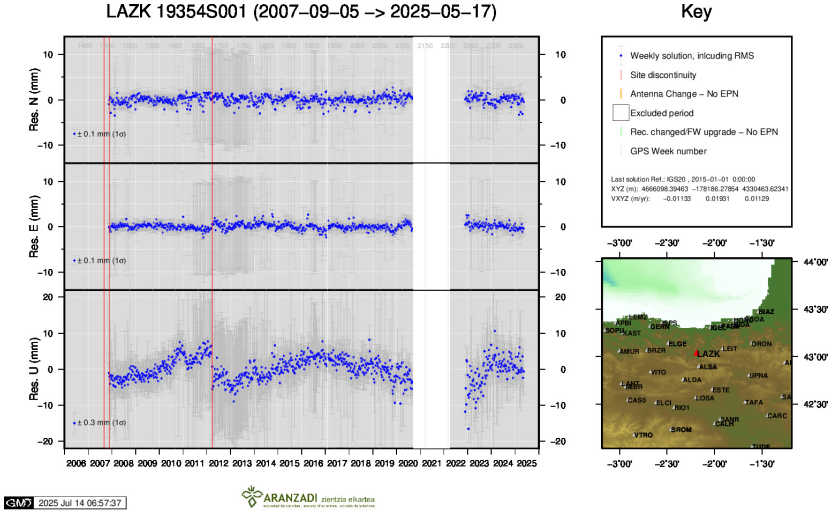

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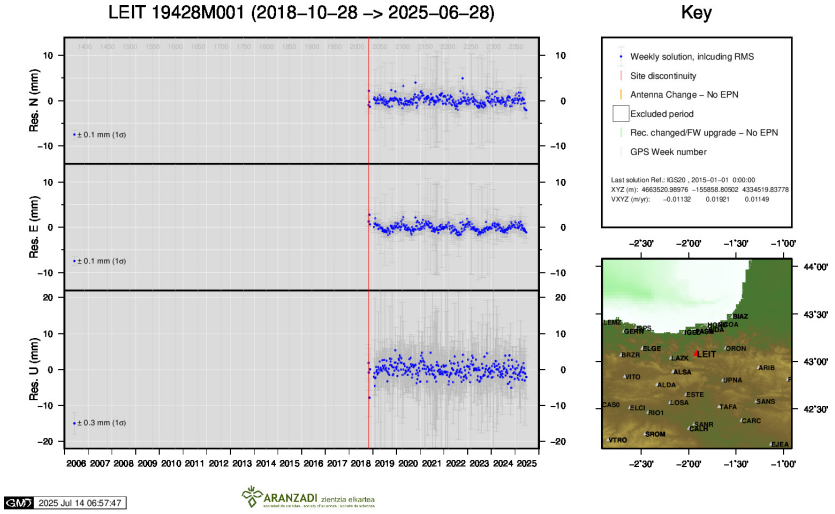

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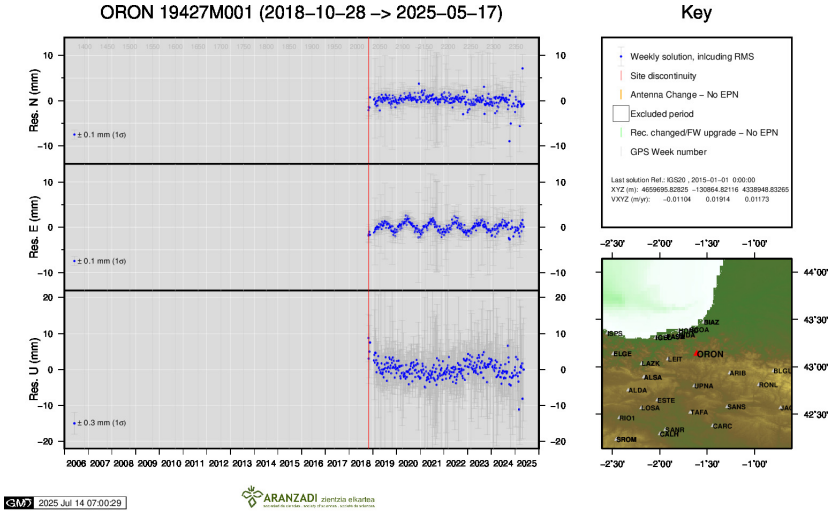

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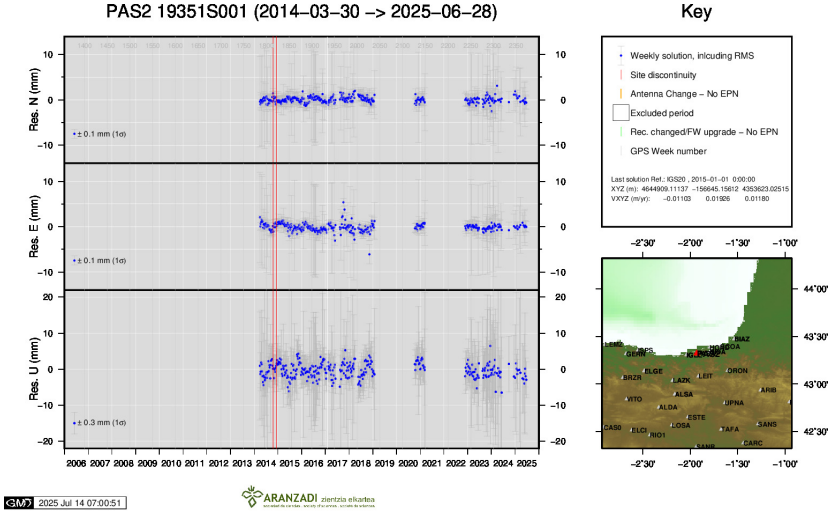

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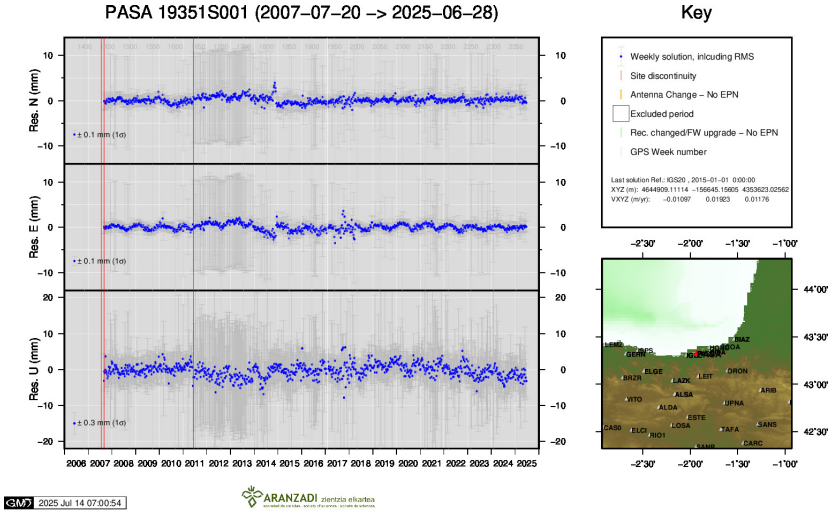

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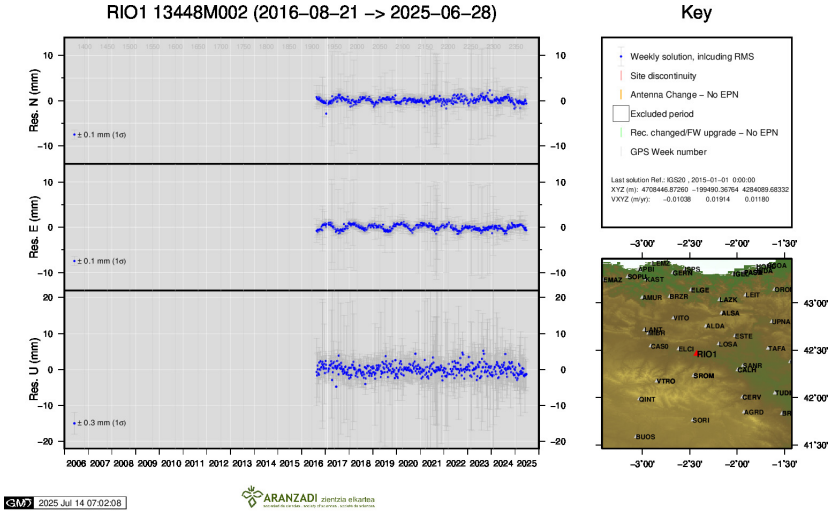

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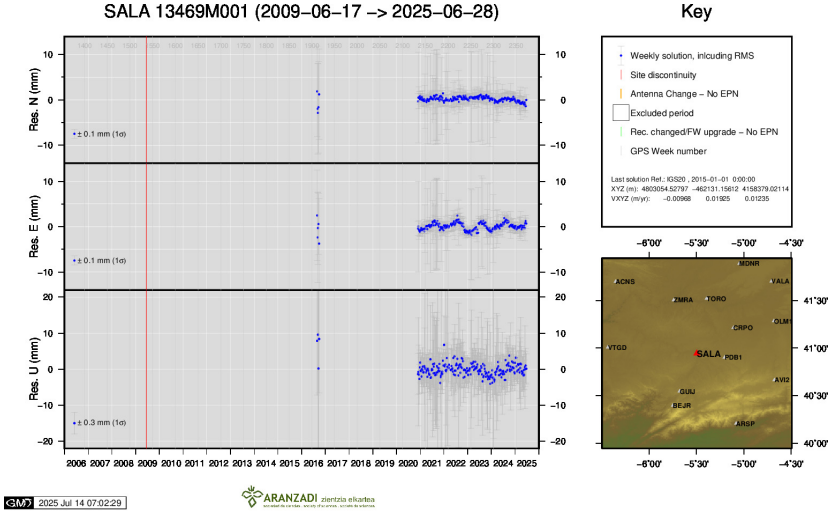

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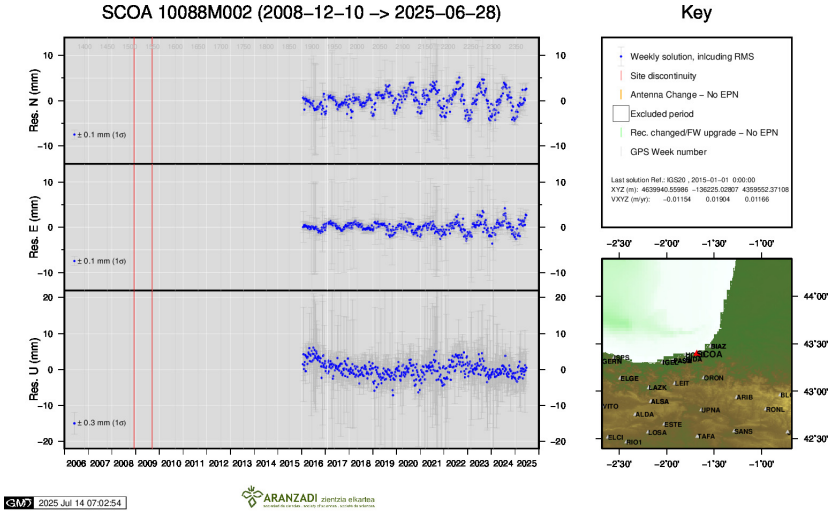

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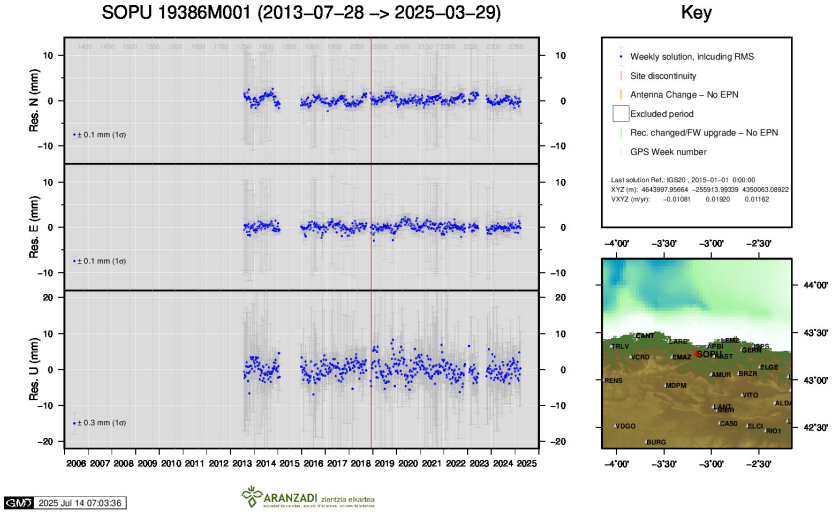

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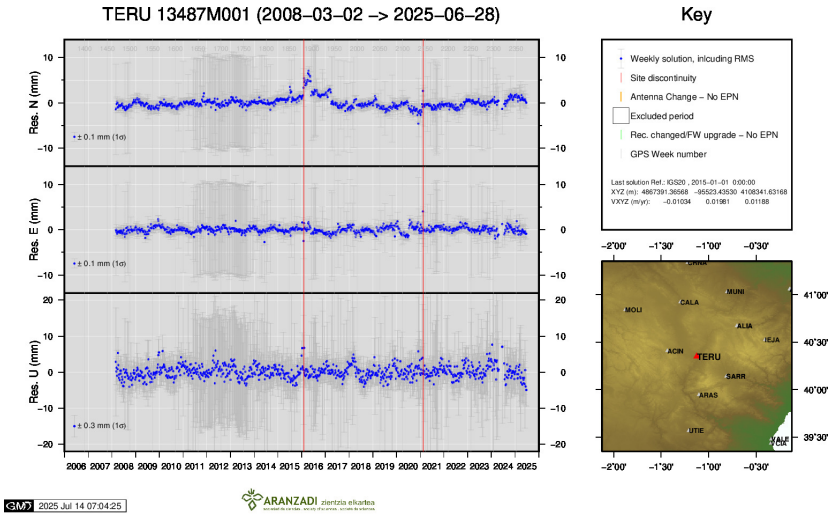

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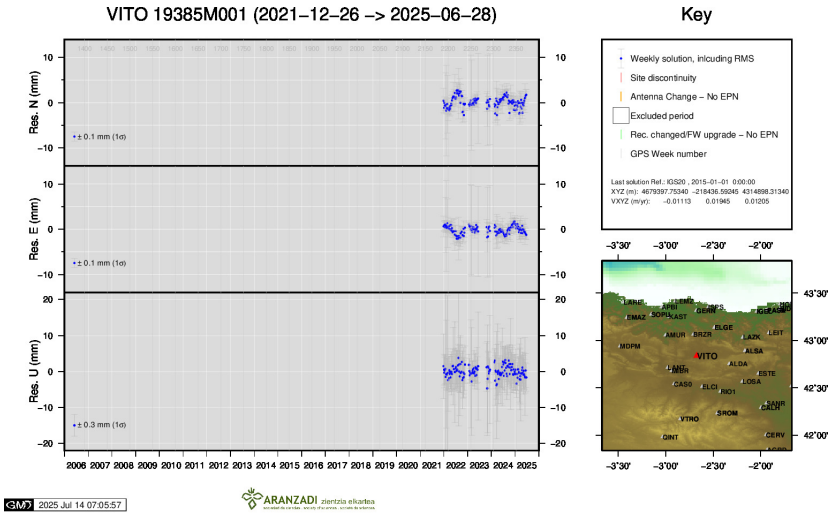

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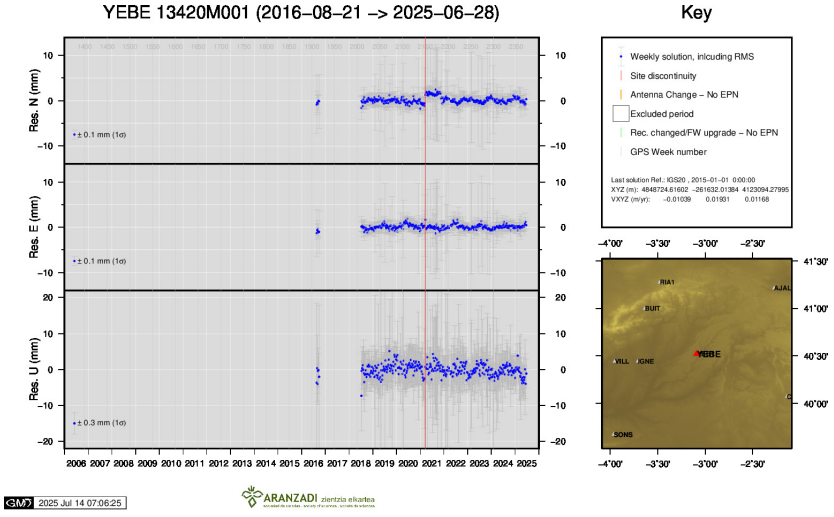

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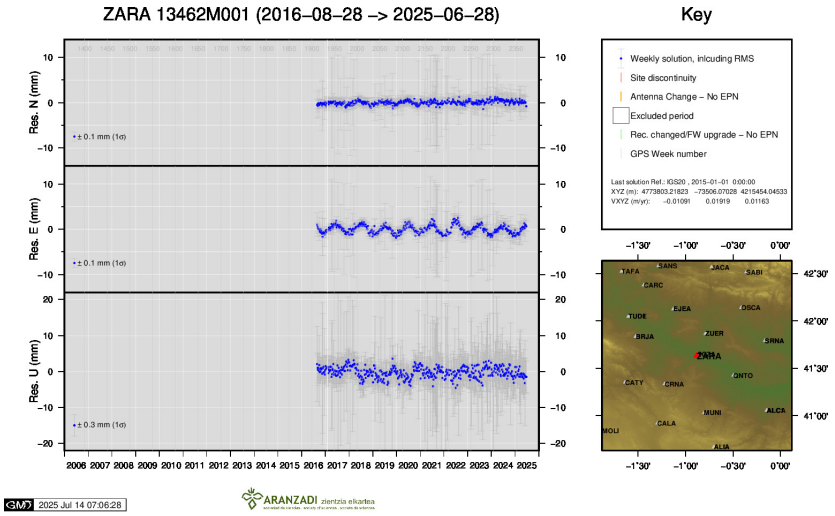
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±0.1 mm (1σ)
±0.3 mm (1σ)
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Site discontinuity
Antenna Change – No EPN
Excluded period
Rec. changed/FW upgrade – No EPN
GPS Week number
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TAFA
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2025 Jul 14 07:06:28
ARANZADI zientzia elkartea

33) ZARA