

ARA-DAC Weekly Analysis Result: 2301 (GFA)

Technical Report

GPS Week: 2301 (GFA)

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

ARA-DAC details:

Contact person: J. Zurutuza

Contact mail: geodesia@aranzadi.eus

Report generated on 2024/03/04 at 04:39:29

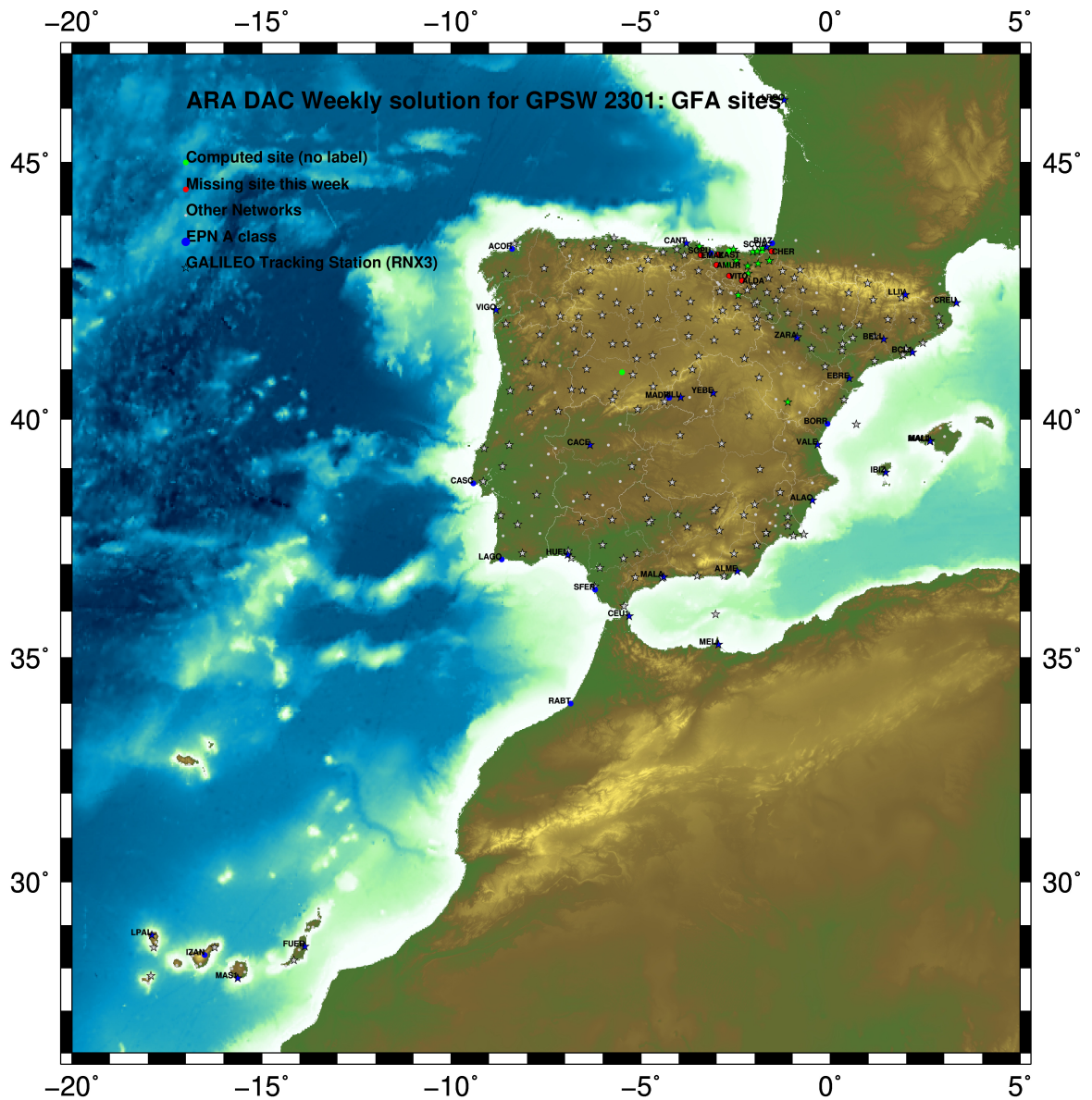


ARANZADI zientzia elkartea
sociedad de ciencias . society of sciences . société de sciences

1 Introduction

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

2 Map of Computed Sites



GM 2024 Mar 04 04:39:24

Fig.1: Computed Sites for GPS Week2301 (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 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                                04-MAR-24 03:36
-----
LOCAL GEODETIC DATUM: IGS20                EPOCH: 2024-02-14 11:59:45
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)    FLAG  SYSTEM
-----
111 ACRD 13434M001        4594489.51845   -678367.33398  4357066.33303  W      G
 50 ALSA 19419M001        4677250.78614   -176770.30404  4319079.92827  A      GRE
384 BIAZ 10074M002        4634455.99853   -124344.88577  4365785.51047  W      GR
101 BIDA 00000M000        4644177.77050   -145778.23337  4354832.53409  A      GR
113 BRZR 19387M001        4662220.94184   -220769.80971  4333309.49142  A      GR
573 CACE 13447M001        4899866.45892   -544566.94530  4033770.26053  W      GRE
592 CANT 13438M001        4625924.26898   -307096.14603  4365771.61514  W      GRE
908 CREU 13432M001        4715420.07574   273178.15067   4271946.89821  W      GRE
135 EBRE 13410M001        4833519.93915    41537.48055   4147461.77182  W      GRE
180 ELGE 19353S001        4657557.34522   -202241.38097  4338991.94139  A      GRE
209 GERN 19389M001        4642811.27140   -217222.83441  4353278.93202  A      GR
257 HOND 15012M002        4640529.26697   -145675.89556  4358781.81041  A      GRE
235 IGEL 19352S001        4645951.37846   -165574.41333  4352550.47765  A      GRE
240 ISPS 19484M001        4640596.42886   -206963.68688  4356391.96873  A      GRE
252 LARE 19440M001        4632831.90760   -279026.05330  4360314.48410  A      GRE
256 LAZK 19354S001        4666098.29405   -178186.10076  4330463.72665  A      GRE
261 LEIT 19428M001        4663521.88612   -155858.62787  4334519.94161  A      GRE
334 ORDN 19427M001        4659695.72740   -130864.64597  4338948.93940  A      GRE
345 PASZ 19351S001        4644909.01203   -156644.97974  4353623.13209  A      GRE
493 PASA 19351S001        4644909.01188   -156644.97938  4353623.13226  A      GRE
553 RIO1 13448M002        4708447.77823   -199490.19210  4284089.79016  A      GRE
558 SALA 13469M001        4803054.43705   -462130.97980  4158379.13137  A      GR
526 SCDA 10088M002        4639940.45541   -136224.85368  4359552.47445  W      GRE
715 SOPU 19386M001        4643997.85615   -255913.81721  4350063.19231  W      GR
443 TERU 13487M001        4867391.27239   -95523.26432   4108341.74095  A      GRE
616 YEBE 13420M001        4848724.51947   -261631.83681  4123094.38482  W      GRE
655 ZARA 13462M001        4773803.11847   -73505.89520   4215454.15106  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-MAR-24 03:36
-----
LOCAL GEODETIC DATUM: ETRF2000                EPOCH: 2024-02-14 11:59:45
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)    FLAG  SYSTEM
-----
111 ACRD 13434M001        4594489.86016   -678367.96410  4357065.85679  W
 50 ALSA 19419M001        4677251.19260   -176770.94316  4319079.45192  A
384 BIAZ 10074M002        4634456.41582   -124345.51960  4365785.03857  W
101 BIDA 00000M000        4644178.18402   -145778.86843  4354832.06104  A
113 BRZR 19387M001        4662221.34350   -220770.44715  4333309.01576  A
573 CACE 13447M001        4899866.79270   -544567.61171  4033769.75960  W
592 CANT 13438M001        4625924.66159   -307096.77930  4365771.14143  W
908 CREU 13432M001        4715420.53907   273177.50851   4271946.42473  W
135 EBRE 13410M001        4833520.36124    41536.82343   4147461.28488  W
180 ELGE 19353S001        4657557.74984   -202242.01780  4338991.46640  A
209 GERN 19389M001        4642811.67515   -217223.46949  4353278.45810  A
257 HOND 15012M002        4640529.68082   -145676.53018  4358781.33768  A
235 IGEL 19352S001        4645951.78912   -165575.04866  4352550.00417  A
240 ISPS 19484M001        4640596.83424   -206964.32167  4356391.49514  A
252 LARE 19440M001        4632832.30357   -279026.68734  4360314.01018  A
256 LAZK 19354S001        4666098.70123   -178186.73854  4330463.25125  A
261 LEIT 19428M001        4663521.29664   -155859.26529  4334519.46674  A
334 ORDN 19427M001        4659696.14165   -130865.28285  4338948.46521  A
345 PASZ 19351S001        4644909.42398   -156645.61491  4353622.65883  A
493 PASA 19351S001        4644909.42383   -156645.61455  4353622.65900  A
553 RIO1 13448M002        4708447.17881   -199490.83502  4284089.31078  A
558 SALA 13469M001        4803054.79203   -462131.63460  4158378.64006  A
526 SCDA 10088M002        4639940.87059   -136225.48820  4359552.00190  W
715 SOPU 19386M001        4643998.25441   -255914.45253  4350062.71774  W
443 TERU 13487M001        4867391.67284   -95523.91592   4108341.24917  A
616 YEBE 13420M001        4848724.89869   -261632.49663  4123093.89235  W
655 ZARA 13462M001        4773803.53052   -73506.54558   4215453.66774  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-MAR-24 03:36				
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2024-02-14 11:59:45				
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACDR 13434M001	4594489.82013	-678368.00098	4357065.90918	W	
50	ALSA 19419M001	4677251.15012	-176770.98155	4319079.50421	A	
384	BLAZ 10074M002	4634456.37363	-124345.55836	4365785.09102	W	
101	BIDA 00000M000	4644178.14179	-145778.90707	4354832.11346	A	
113	BRZR 19387M001	4662221.30135	-220770.48543	4333309.06808	A	
573	CACE 13447M001	4899866.74879	-544567.64771	4033769.81114	W	
592	CANT 13438M001	4625924.62012	-307096.81743	4365771.19382	W	
908	CREU 13432M001	4715420.49444	273177.46865	4271946.47724	W	
135	EBRE 13410M001	4833520.31617	41536.78495	4147461.33687	W	
180	ELGE 19353S001	4657557.70767	-202242.05617	4338991.51874	A	
209	GERN 19389M001	4642811.63318	-217223.50788	4353278.51048	A	
257	HOND 15012M002	4640529.63863	-145676.56884	4358781.39011	A	
235	IHEL 19352S001	4645951.74695	-165575.08722	4352550.05657	A	
240	ISPS 19484M001	4640596.79227	-206964.36011	4356391.54754	A	
252	LARE 19440M001	4632832.26192	-279026.72554	4360314.06256	A	
256	LAZK 19354S001	4666098.65888	-178186.77697	4330463.30358	A	
261	LEIT 19428M001	4663521.25424	-155859.30381	4334519.51909	A	
334	ORON 19427M001	4659696.09920	-130865.32148	4338948.51759	A	
345	PAS2 19351S001	4644909.38179	-156645.65352	4353622.71124	A	
493	PASA 19351S001	4644909.38164	-156645.65316	4353622.71141	A	
553	RI01 13448M002	4708447.13606	-199490.87318	4284089.36297	A	
558	SALA 13469M001	4803054.74903	-462131.67136	4158378.69188	A	
526	SC0A 10088M002	4639940.82838	-136225.52690	4359552.05434	W	
715	SOPU 19386M001	4643998.21257	-255914.49077	4350062.77010	W	
443	TERU 13487M001	4867391.62789	-95523.95374	4108341.30097	A	
616	YEBE 13420M001	4848724.85453	-261632.53393	4123093.94411	W	
655	ZARA 13462M001	4773803.48658	-73506.58391	4215453.71981	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-MAR-24 03:36

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	1.74	1.14	3.10
ALSA 19419M001	7	XXXXXX	3.61	1.41	1.74
BLAZ 10074M002	7	XXXXXX	1.13	0.97	5.78
BIDA 00000M000	7	XXXXXX	1.94	1.03	3.45
BRZR 19387M001	7	XXXXXX	1.45	1.56	3.59
CACE 13447M001	7	XXXXXX	0.98	0.71	2.41
CANT 13438M001	7	XXXXXX	1.07	1.00	4.17
CREU 13432M001	7	XXXXXX	1.33	1.05	2.99
EBRE 13410M001	7	XXXXXX	1.24	2.03	4.35
ELGE 19353S001	7	XXXXXX	0.73	1.39	1.67
GERN 19389M001	7	XXXXXX	2.02	2.28	3.35
HOND 15012M002	7	XXXXXX	1.18	0.69	2.05
IGEL 19352S001	7	XXXXXX	1.77	1.17	2.56
ISPS 19484M001	7	XXXXXX	1.40	1.92	3.13
LARE 19440M001	7	XXXXXX	2.29	1.32	3.26
LAZK 19354S001	7	XXXXXX	1.59	1.16	4.12
LEIT 19428M001	7	XXXXXX	1.98	1.88	4.98
ORON 19427M001	7	XXXXXX	1.05	0.87	4.98
PAS2 19351S001	2	XX	1.10	1.50	1.42
PASA 19351S001	7	XXXXXX	0.93	1.09	3.77
RID1 13448M002	7	XXXXXX	0.78	1.32	3.54
SALA 13469M001	7	XXXXXX	0.82	0.51	3.03
SCDA 10088M002	7	XXXXXX	0.94	1.18	2.87
SOPU 19386M001	7	XXXXXX	1.03	1.25	3.71
TERU 13487M001	7	XXXXXX	1.16	0.78	4.27
YEBE 13420M001	7	XXXXXX	0.40	0.47	2.46
ZARA 13462M001	7	XXXXXX	0.54	0.91	2.97

Comparison of individual solutions:

ACOR 13434M001	N	1.74	1.17	1.16	2.40	0.70	1.45	-2.59	-0.57
ACOR 13434M001	E	1.14	-1.15	1.66	-0.38	1.45	0.95	-0.44	0.62
ACOR 13434M001	U	3.10	-2.93	2.35	1.99	-3.67	4.40	2.41	-0.91
ALSA 19419M001	N	3.61	0.92	2.59	2.25	-5.51	-4.72	2.90	2.09
ALSA 19419M001	E	1.41	-0.43	-1.64	0.58	2.19	1.38	-0.99	-1.04
ALSA 19419M001	U	1.74	1.57	0.61	-2.85	-0.92	-1.45	-2.05	0.35
BLAZ 10074M002	N	1.13	1.64	-0.25	1.35	-0.20	-0.08	0.92	-1.49
BLAZ 10074M002	E	0.97	1.04	0.67	1.41	-0.14	-0.80	0.99	-0.71
BLAZ 10074M002	U	5.78	4.97	5.57	0.47	-7.64	6.28	0.87	-6.75
BIDA 00000M000	N	1.94	0.72	-0.46	2.80	-0.03	-2.64	2.43	-1.09
BIDA 00000M000	E	1.03	-0.25	1.15	1.59	0.72	0.53	-1.31	-0.10
BIDA 00000M000	U	3.45	4.94	5.15	-0.29	0.66	-1.56	-0.04	-4.19
BRZR 19387M001	N	1.45	0.49	-0.65	1.14	-0.73	-3.09	-0.15	0.78
BRZR 19387M001	E	1.56	-1.27	0.44	1.58	0.76	-2.54	1.72	0.59
BRZR 19387M001	U	3.59	2.39	-4.05	-1.00	-6.95	0.88	1.92	-1.13
CACE 13447M001	N	0.98	-1.05	-1.65	-1.01	0.53	0.25	-0.54	-0.53
CACE 13447M001	E	0.71	0.22	-0.38	-1.40	0.75	-0.43	-0.40	-0.06
CACE 13447M001	U	2.41	1.73	-1.83	1.10	4.26	-2.11	1.43	-1.58
CANT 13438M001	N	1.07	1.18	0.38	0.85	0.92	-0.66	-0.91	-1.58
CANT 13438M001	E	1.00	-1.38	1.57	0.61	-0.05	-1.01	-0.46	0.18
CANT 13438M001	U	4.17	-2.13	3.19	-3.42	-4.90	6.92	-0.83	-2.31
CREU 13432M001	N	1.33	-0.43	1.91	1.09	2.03	-0.60	0.23	-1.02
CREU 13432M001	E	1.05	0.53	2.07	0.31	-0.60	0.13	-1.15	-0.54
CREU 13432M001	U	2.99	1.93	-0.19	-3.56	-2.36	-3.59	-4.29	0.41
EBRE 13410M001	N	1.24	-0.34	2.32	1.88	-0.22	-0.04	-0.15	-0.32
EBRE 13410M001	E	2.03	1.45	-4.39	-0.63	1.06	0.81	0.53	0.98
EBRE 13410M001	U	4.35	-0.98	-5.90	-2.92	-2.53	-6.55	3.59	2.67
ELGE 19353S001	N	0.73	0.79	-0.61	0.04	0.17	-0.40	-0.68	-1.24
ELGE 19353S001	E	1.39	-2.28	2.06	0.26	-0.62	0.55	1.15	0.28
ELGE 19353S001	U	1.67	-1.47	-1.74	-0.90	-3.16	0.59	-0.57	-0.30
GERN 19389M001	N	2.02	1.41	1.86	0.65	3.26	-0.87	-0.91	-2.53
GERN 19389M001	E	2.28	-3.69	1.44	3.03	0.57	0.05	-2.38	0.52
GERN 19389M001	U	3.35	-4.48	0.94	-4.65	-1.70	2.47	0.46	-3.96
HOND 15012M002	N	1.18	0.36	1.08	0.89	1.22	0.24	0.31	-2.13
HOND 15012M002	E	0.69	-0.52	1.22	0.75	0.46	0.46	-0.25	0.28
HOND 15012M002	U	2.05	0.72	4.22	1.01	-0.92	0.40	0.58	-2.11
IGEL 19352S001	N	1.77	0.82	-0.78	0.72	0.76	3.36	-1.04	-2.00
IGEL 19352S001	E	1.17	-0.25	0.05	0.87	-0.95	2.51	-0.34	0.34
IGEL 19352S001	U	2.56	0.88	2.88	-1.59	1.94	3.51	-0.63	-3.35
ISPS 19484M001	N	1.40	2.01	2.06	-0.72	0.34	-0.01	0.54	-1.62
ISPS 19484M001	E	1.92	-1.46	2.45	1.82	-2.51	-1.07	-1.01	1.45
ISPS 19484M001	U	3.13	-2.38	1.35	-4.70	-5.27	0.53	-0.93	0.53
LARE 19440M001	N	2.29	2.07	-0.01	2.47	-0.70	-4.44	-0.16	0.91
LARE 19440M001	E	1.32	-1.26	1.84	0.98	0.89	-1.56	-0.95	-0.57
LARE 19440M001	U	3.26	-3.42	2.97	1.55	-5.90	1.71	0.90	-1.50
LAZK 19354S001	N	1.59	2.04	1.81	0.55	-1.57	-1.86	0.66	-1.06
LAZK 19354S001	E	1.16	-1.33	2.14	0.00	-0.33	0.68	-0.09	-1.10
LAZK 19354S001	U	4.12	-2.88	3.28	-4.98	-1.13	6.31	-2.65	-3.11
LEIT 19428M001	N	1.98	1.15	-0.10	-0.67	-2.52	3.93	-0.08	-0.27
LEIT 19428M001	E	1.88	-1.90	0.19	-0.73	0.91	3.90	-0.71	-0.72
LEIT 19428M001	U	4.98	6.18	7.15	-0.40	-2.66	-5.85	-3.52	-2.33
ORON 19427M001	N	1.05	-1.08	-0.81	-0.55	0.17	1.61	-0.70	-1.15
ORON 19427M001	E	0.87	-0.22	1.40	1.36	-0.71	-0.34	-0.12	-0.10
ORON 19427M001	U	4.98	10.10	1.02	2.95	-4.23	-3.97	-0.48	-1.79
PAS2 19351S001	N	1.10			1.09	-0.17			
PAS2 19351S001	E	1.50			1.37	-0.62			
PAS2 19351S001	U	1.42			-1.12	-0.88			
PASA 19351S001	N	0.93	1.10	0.70	0.99	-0.81	0.79	0.31	-1.09
PASA 19351S001	E	1.09	-0.64	1.60	1.29	-0.62	1.16	-0.81	0.34
PASA 19351S001	U	3.77	1.01	6.22	-1.59	-1.00	3.54	1.18	-5.32
RID1 13448M002	N	0.78	1.01	-0.21	0.59	0.30	0.71	-1.18	-0.46
RID1 13448M002	E	1.32	-2.45	1.50	1.40	-0.25	0.27	0.17	-0.06
RID1 13448M002	U	3.54	-1.46	3.49	-4.55	-5.15	2.90	1.70	-1.57
SALA 13469M001	N	0.82	0.17	-1.34	0.99	-0.47	0.15	-0.81	-0.62

SALA 13469M001	E	0.51	-0.27	-0.38	0.26	0.63	-0.92	-0.03	-0.13
SALA 13469M001	U	3.03	1.34	3.88	-0.19	1.15	3.59	-4.26	-2.40
SCDA 10088M002	N	0.94	0.65	0.34	-0.68	1.18	-1.48	0.33	0.78
SCDA 10088M002	E	1.18	0.03	1.10	0.35	0.71	-1.51	0.11	2.05
SCDA 10088M002	U	2.87	1.99	6.45	-1.06	-1.53	-0.60	-0.17	0.16
SOPU 19386M001	N	1.03	0.40	0.71	1.67	0.18	-1.25	-0.41	-1.05
SOPU 19386M001	E	1.25	-1.36	0.39	1.92	0.25	0.44	-1.32	1.32
SOPU 19386M001	U	3.71	0.11	1.20	-1.31	-7.27	4.82	-1.69	0.56
TERU 13487M001	N	1.16	0.12	2.24	1.39	-0.16	0.13	0.81	0.58
TERU 13487M001	E	0.78	-0.95	0.93	1.20	0.13	0.67	0.12	-0.10
TERU 13487M001	U	4.27	-1.47	-0.62	-7.39	-5.04	-5.17	0.18	-0.34
YEBE 13420M001	N	0.40	-0.50	-0.06	-0.34	-0.06	-0.37	0.12	-0.68
YEBE 13420M001	E	0.47	-0.35	0.05	-0.32	0.70	-0.02	-0.37	-0.69
YEBE 13420M001	U	2.46	2.40	3.07	0.90	-2.06	2.19	0.34	-3.33
ZARA 13462M001	N	0.54	0.76	0.16	0.01	-0.36	-0.04	0.66	-0.75
ZARA 13462M001	E	0.91	-0.89	1.75	0.38	-0.22	-0.71	-0.45	-0.49
ZARA 13462M001	U	2.97	-0.51	0.73	-0.52	-3.06	-4.83	-4.36	-0.31

6.2 Datum verification

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

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

LIST OF REMOVED STATIONS:

OUTLIER CRITERIA: 15.00 15.00 20.00

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	1.88	-8.23	0.46
2	ALAC 13433M001	I W	1.28	-0.54	0.22
3	ALME 13437M001	I W	-1.11	1.02	1.73
4	BCL1 19482M001	I W	-0.21	0.30	-0.41
5	BELL 13431M001	I W	0.76	-1.08	2.92
6	BIAZ 10074M002	I W	1.42	0.65	-3.44
7	BORR 13480M001	I W	-2.86	-2.40	-0.03
8	BRST 10004M004	I W	0.29	-2.47	4.26
9	CACE 13447M001	I W	0.57	1.18	6.30
10	CANT 13438M001	I W	1.39	0.17	-2.65
11	CASC 13909S001	I W	1.30	-0.85	-0.35
12	CEU1 13449M002	I W	-0.82	3.14	1.94
13	CREU 13432M001	A W	-0.49	-5.97	-11.40
14	EBRE 13410M001	I W	0.62	4.05	1.14
16	FLRS 31907M001	I W	-5.49	-2.64	0.45
17	FUER 31330M001	I W	0.13	0.88	-0.16
19	HUEL 13451M001	I W	1.08	3.47	-5.84
20	IBIZ 13454S001	I W	-0.17	1.90	2.50
21	IZAN 31309M002	I W	-1.33	1.17	-2.20
22	LAGO 13903M001	I W	-0.33	0.19	0.34
23	LLIV 13436M001	I W	-2.76	1.62	1.27
24	LPAL 81701M001	I W	0.58	1.13	-4.69
25	LROC 10023M001	I W	1.23	-0.64	0.34
26	MADR 13407S012	I W	-2.26	0.09	1.73
27	MAL1 13444M002	I W	2.96	1.82	-4.07
28	MALA 13443M001	I W	2.86	-0.91	3.71
29	MALL 13444M001	I W	-0.62	2.58	4.51
30	MAS1 31303M002	I W	-1.33	-0.91	0.98
31	MELI 19379M001	I W	-0.60	3.56	3.97
32	PDEL 31906M004	I W	-2.44	-4.01	-7.26
33	RABT 35001M002	I W	0.02	-0.02	-3.05
34	SCOA 10088M002	I W	1.57	0.29	-8.13
35	SFER 13402M004	I W	-1.13	-1.64	2.60
36	SOPU 19386M001	I W	0.73	0.58	3.89
37	VALE 13439M001	I W	0.41	2.41	-3.51
38	VIGO 13450M001	I W	1.20	0.66	3.30
39	VILL 13406M001	I W	-0.84	-1.61	4.59
40	YEBE 13420M001	I W	-0.59	-0.10	5.26
41	ZARA 13462M001	I W	-0.04	1.03	-1.24
42	ZIMM 14001M004	I W	-0.12	-0.85	3.15
RMS / COMPONENT			1.62	2.43	3.91
IQR			1.97	2.09	5.46
MEAN			-0.08	-0.02	0.08
MEDIAN			-0.01	0.24	0.46
MIN			-5.49	-8.23	-11.40
MAX			2.96	4.05	6.30
OVERALL RMS/IQR/MAX(3D)			2.82	2.40	12.87
ALL	CREU 13432M001	#SUM			
RMS / COMPONENT			1.62	2.43	3.91
IQR			1.97	2.09	5.46
MEAN			-0.08	-0.02	0.08
MEDIAN			-0.01	0.24	0.46
MIN			-5.49	-8.23	-11.40
MAX			2.96	4.05	6.30
OVERALL RMS/IQR/MAX(3D)			2.82	2.40	12.87
ALL	CREU 13432M001	#SUM_ALL			

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 40
NUMBER OF COORDINATES : 120
RMS OF TRANSFORMATION : 2.82 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.45 MM
TRANSLATION IN Y : -0.00 +- 0.45 MM
TRANSLATION IN Z : -0.00 +- 0.45 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          18334999
NUMBER OF UNKNOWN               199138
NUMBER OF DEGREES OF FREEDOM    18135861
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.422406777869202
```

7 Equipment

7.1 Receiver List

Serial numbers not shown.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__ FIRMWARE____
ACOR A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
ALSA A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
BIAZ A 1 P 24:042:00000 24:048:86370 SPECTRA SP90M -----
BIDA A 1 P 24:042:00000 24:048:86370 LEICA GR10 -----
BRZR A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
CACE A 1 P 24:042:00000 24:048:86370 TRIMBLE NETR9 -----
CANT A 1 P 24:042:00000 24:048:86370 LEICA GR10 -----
CREU A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
EBRE A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
ELGE A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
GERN A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
HOND A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
IGEL A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
ISPS A 1 P 24:042:00000 24:048:86370 TRIMBLE NETR9 -----
LARE A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
LAZK A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
LEIT A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
ORON A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
PAS2 A 1 P 24:044:00000 24:045:86370 STONEX SC2200 -----
PASA A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
RI01 A 1 P 24:042:00000 24:048:86370 LEICA GR25 -----
SALA A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
SCOA A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
SOPU A 1 P 24:042:00000 24:048:86370 LEICA GR30 -----
TERU A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
YEBE A 1 P 24:042:00000 24:048:86370 LEICA GR50 -----
ZARA A 1 P 24:042:00000 24:048:86370 TRIMBLE NETR9 -----
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are used.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__ DAZI
ACOR A 1 P 24:042:00000 24:048:86370 LEIAT504 LEIS -----
ALSA A 1 P 24:042:00000 24:048:86370 LEIAR10 NONE -----
BIAZ A 1 P 24:042:00000 24:048:86370 LEIAR25 LEIT -----
BIDA A 1 P 24:042:00000 24:048:86370 LEIAS10 NONE -----
BRZR A 1 P 24:042:00000 24:048:86370 LEIAS10 NONE -----
CACE A 1 P 24:042:00000 24:048:86370 TRM29659.00 NONE -----
CANT A 1 P 24:042:00000 24:048:86370 LEIAR25_R4 LEIT -----
CREU A 1 P 24:042:00000 24:048:86370 LEIAR25_R4 NONE -----
EBRE A 1 P 24:042:00000 24:048:86370 LEIAR25_R4 NONE -----
ELGE A 1 P 24:042:00000 24:048:86370 LEIAR25_R4 LEIT -----
GERN A 1 P 24:042:00000 24:048:86370 LEIAS10 NONE -----
HOND A 1 P 24:042:00000 24:048:86370 LEIAR20 LEIM -----
IGEL A 1 P 24:042:00000 24:048:86370 LEIAR20 LEIM -----
ISPS A 1 P 24:042:00000 24:048:86370 TRM59900.00 SCIS -----
LARE A 1 P 24:042:00000 24:048:86370 LEIAR20 LEIM -----
LAZK A 1 P 24:042:00000 24:048:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 24:042:00000 24:048:86370 LEIAR10 NONE -----
ORON A 1 P 24:042:00000 24:048:86370 LEIAR10 NONE -----
PAS2 A 1 P 24:044:00000 24:045:86370 LEIAR20 LEIM -----
PASA A 1 P 24:042:00000 24:048:86370 LEIAR20 LEIM -----
RI01 A 1 P 24:042:00000 24:048:86370 LEIAR25_R4 LEIT -----
SALA A 1 P 24:042:00000 24:048:86370 LEIAR25 NONE -----
SCOA A 1 P 24:042:00000 24:048:86370 TRM55971.00 NONE -----
SOPU A 1 P 24:042:00000 24:048:86370 LEIAS10 NONE -----
TERU A 1 P 24:042:00000 24:048:86370 LEIAR20 LEIM -----
YEBE A 1 P 24:042:00000 24:048:86370 LEIAR20 LEIM -----
ZARA A 1 P 24:042:00000 24:048:86370 TRM29659.00 NONE -----
```

7.3 Eccentricities

```
* SITE PT SOLN T DATA_START__ DATA_END_____ UP_____ NORTH_____ EAST_____
*SITE PT SOLN T DATA_START__ DATA_END_____ AXE ARP->BENCHMARK(M)-----
ACDR A 1 P 24:042:00000 24:048:86370 UNE 3.0460 0.0000 0.0000
```

ALSA	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
BIAZ	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
BIDA	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	24:042:00000	24:048:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	24:042:00000	24:048:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	24:042:00000	24:048:86370	UNE	3.0490	0.0000	0.0000
CREU	A	1	P	24:042:00000	24:048:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	24:042:00000	24:048:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
GERN	A	1	P	24:042:00000	24:048:86370	UNE	0.0771	0.0000	0.0000
HOND	A	1	P	24:042:00000	24:048:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	24:042:00000	24:048:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
LAZK	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
ORDN	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
PAS2	A	1	P	24:044:00000	24:045:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
RID1	A	1	P	24:042:00000	24:048:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	24:042:00000	24:048:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	24:042:00000	24:048:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	24:042:00000	24:048:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	24:042:00000	24:048:86370	UNE	0.0600	0.0000	0.0000
YEBE	A	1	P	24:042:00000	24:048:86370	UNE	0.0600	0.0000	0.0000
ZARA	A	1	P	24:042:00000	24:048:86370	UNE	3.2590	0.0000	0.0000

8 Inconsistencies (logsheet-RINEX metadata)

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

```

2024-03-03 03:37 UTC | LARE0420.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-03-03 06:42 UTC | LARE0430.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-03-03 09:51 UTC | LARE0440.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-03-03 12:55 UTC | LARE0450.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-03-03 16:00 UTC | LARE0460.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-03-03 19:06 UTC | LARE0470.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2024-03-03 23:07 UTC | LARE0480.240 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
    
```

9 References

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

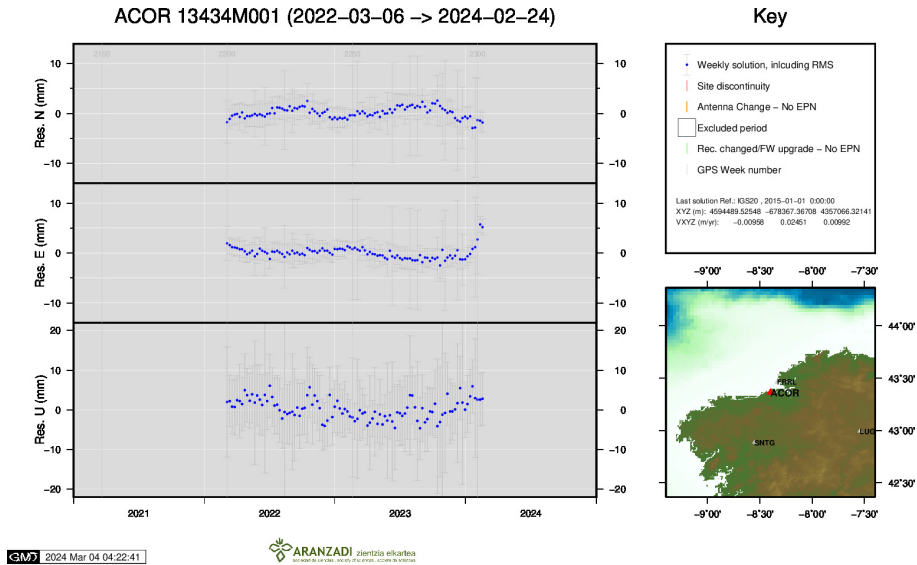
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

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

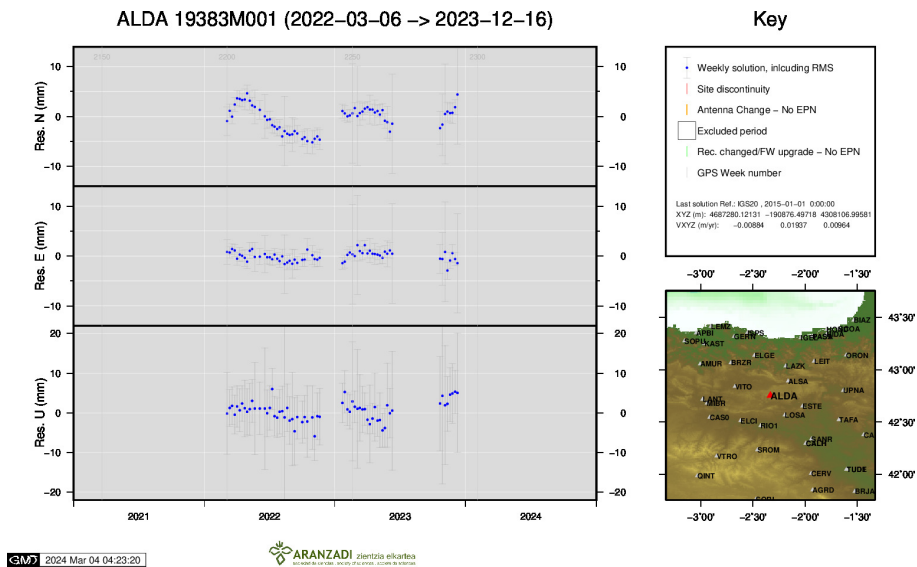
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

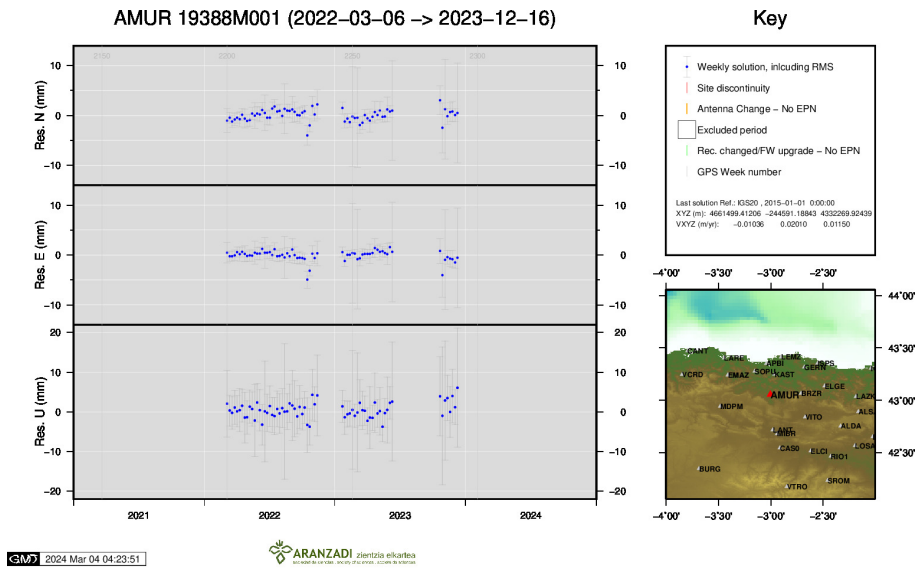
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



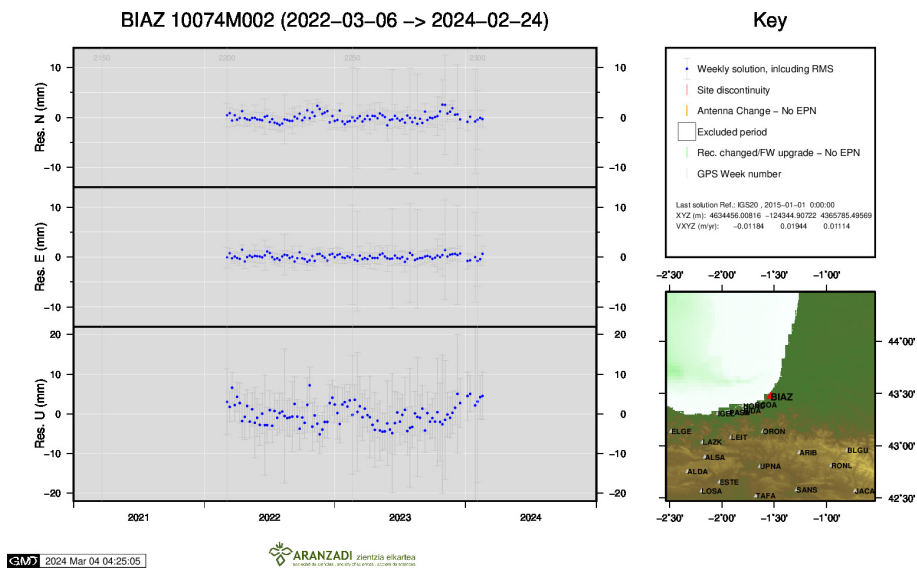
1) ACOR



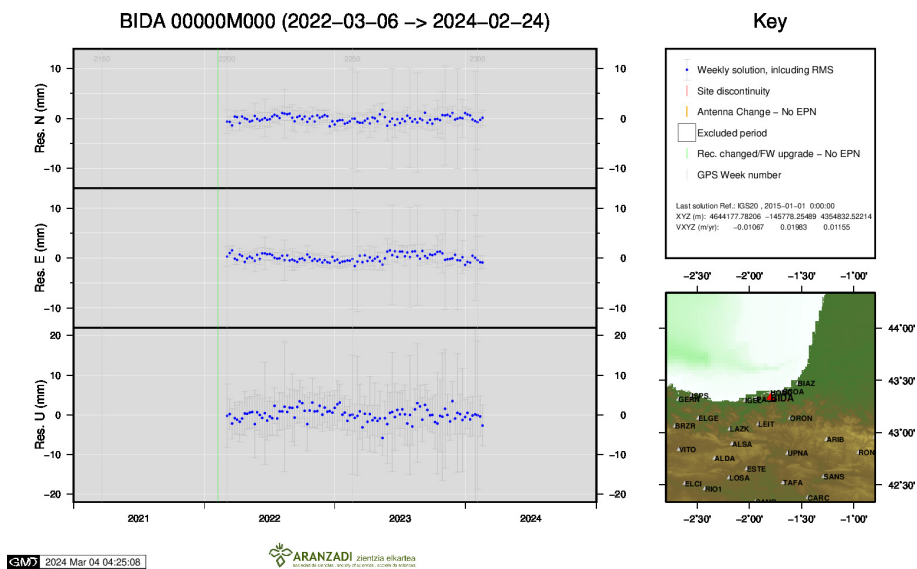
2) ALDA



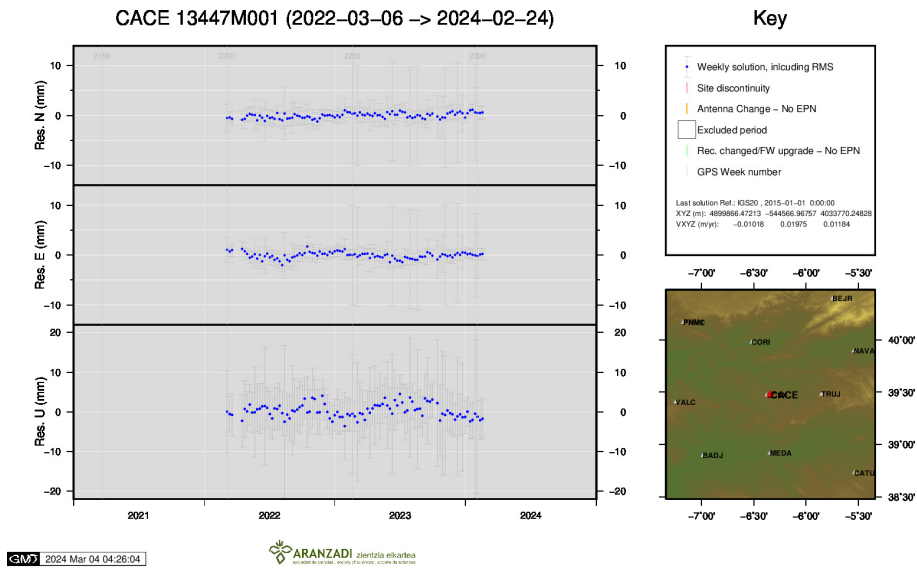
3) AMUR



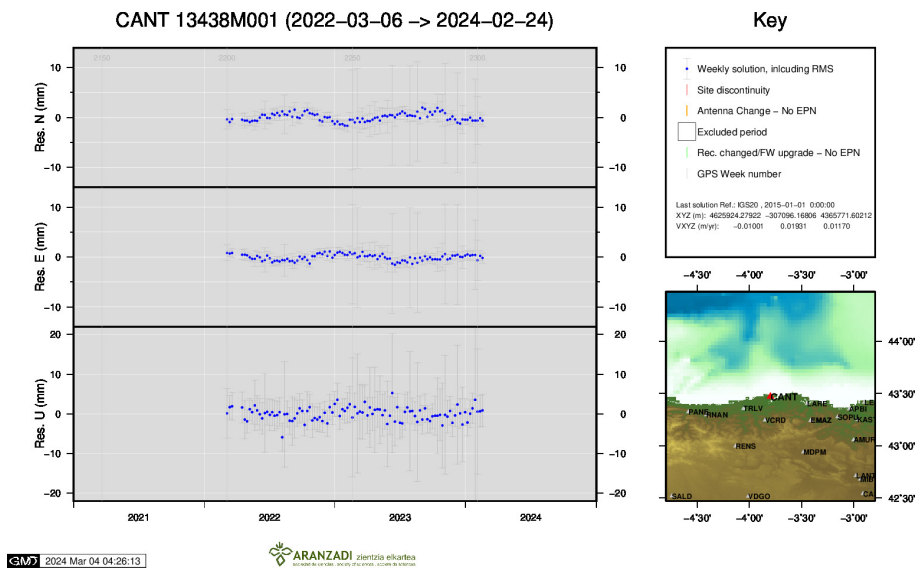
4) BLAZ



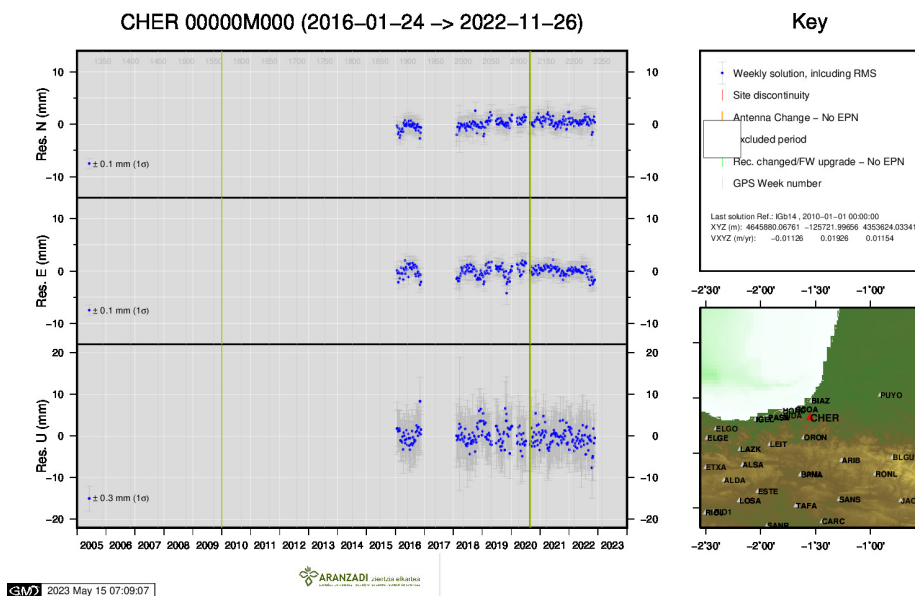
5) BIDA



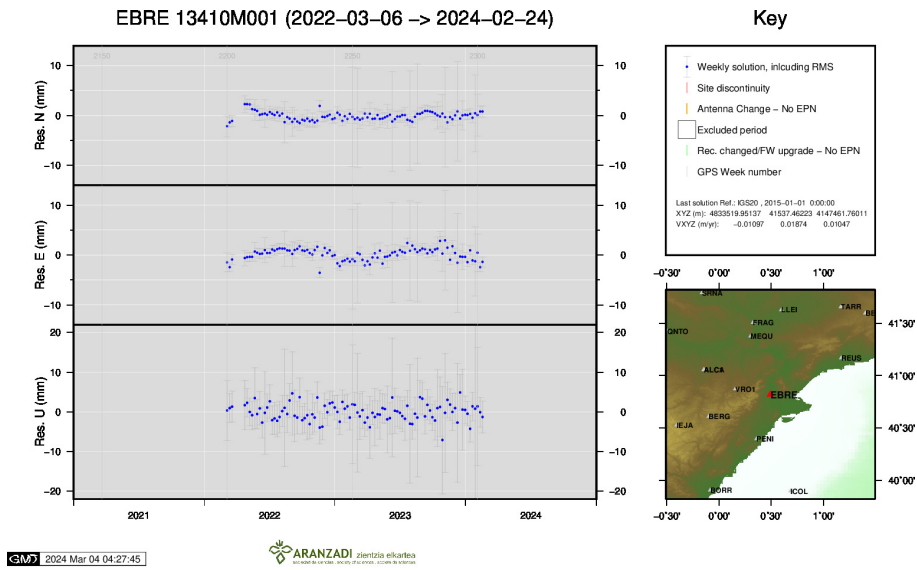
6) CACE



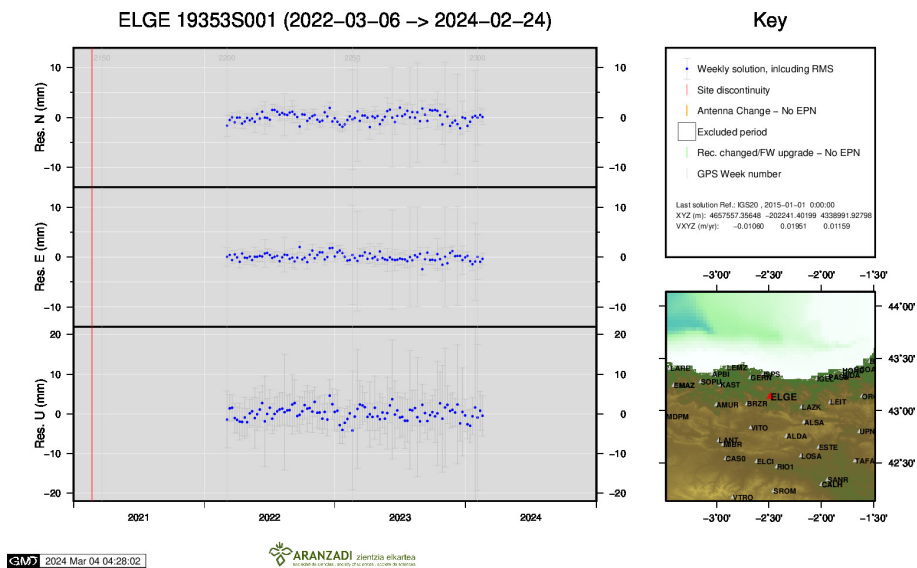
7) CANT



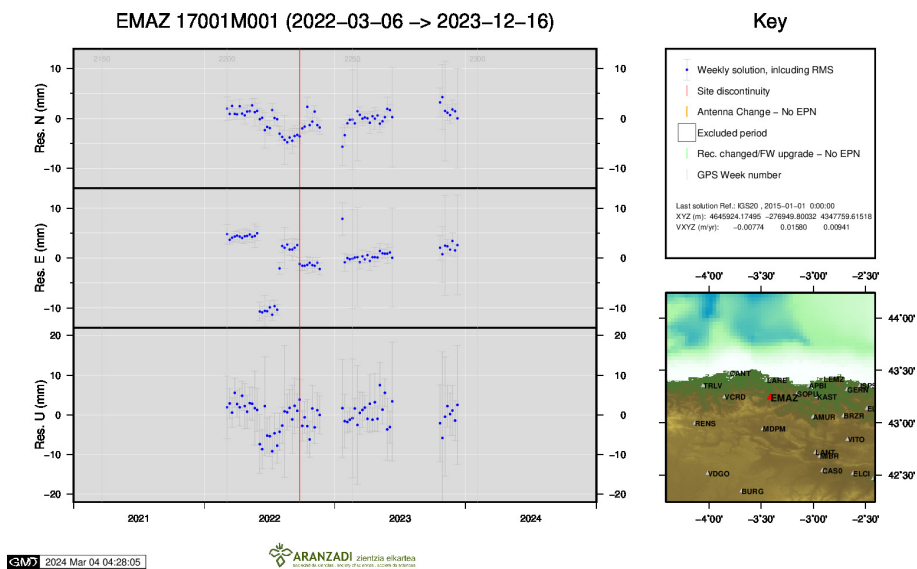
8) CHER



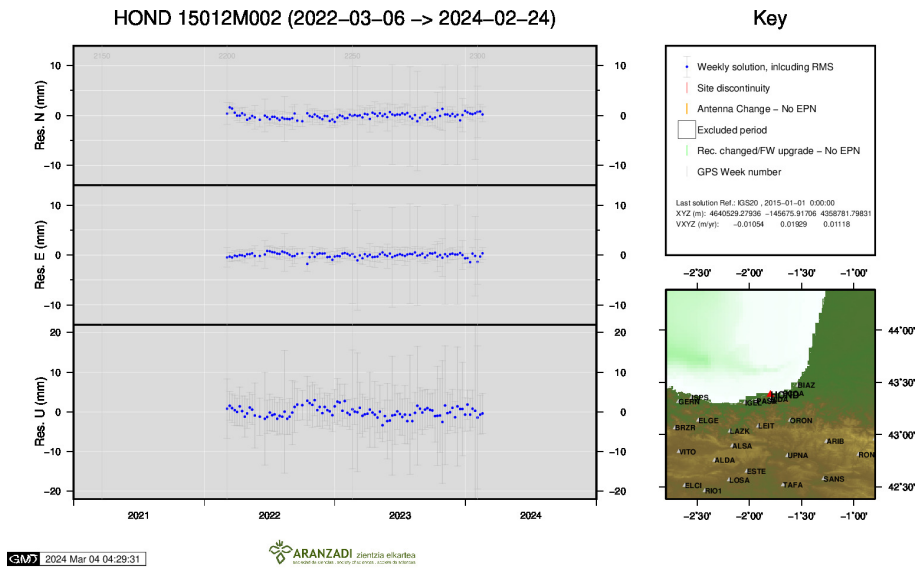
9) EBRE



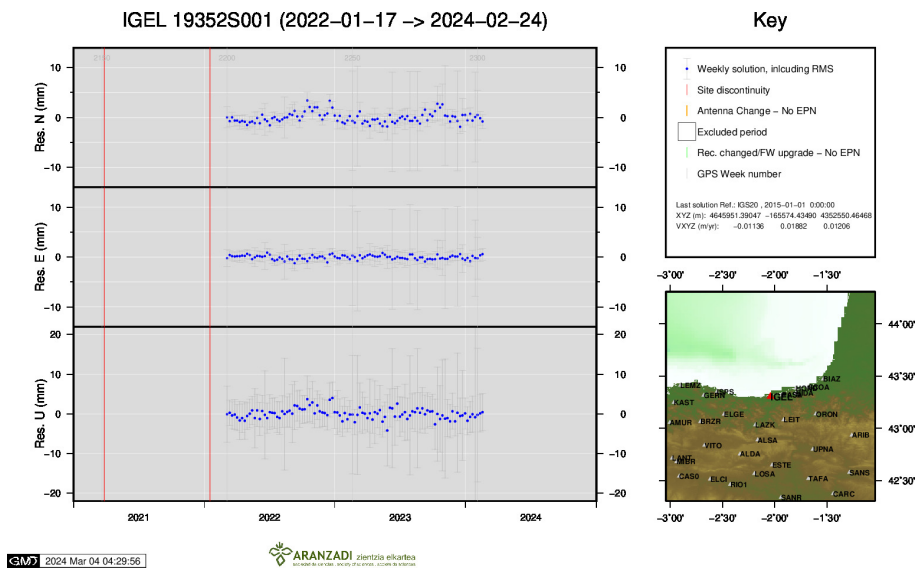
10) ELGE



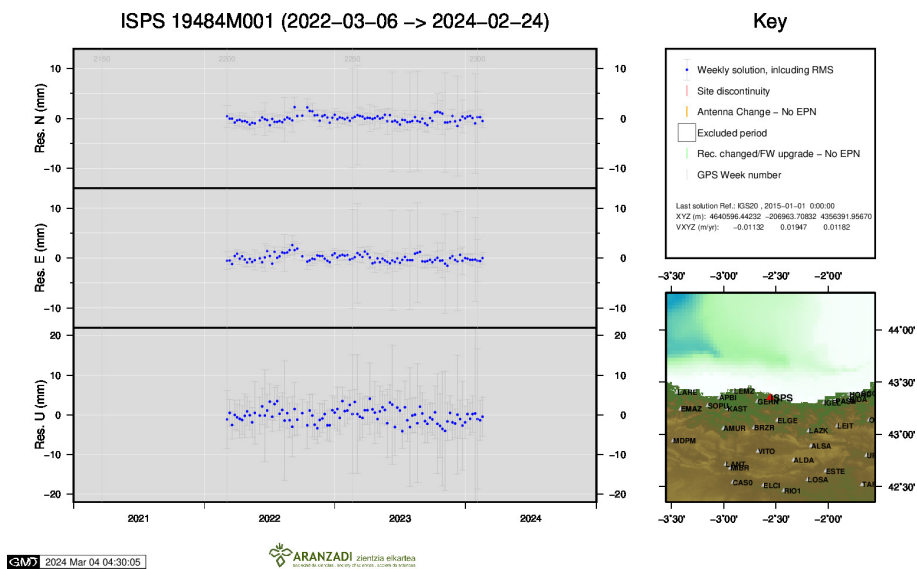
11) EMAZ



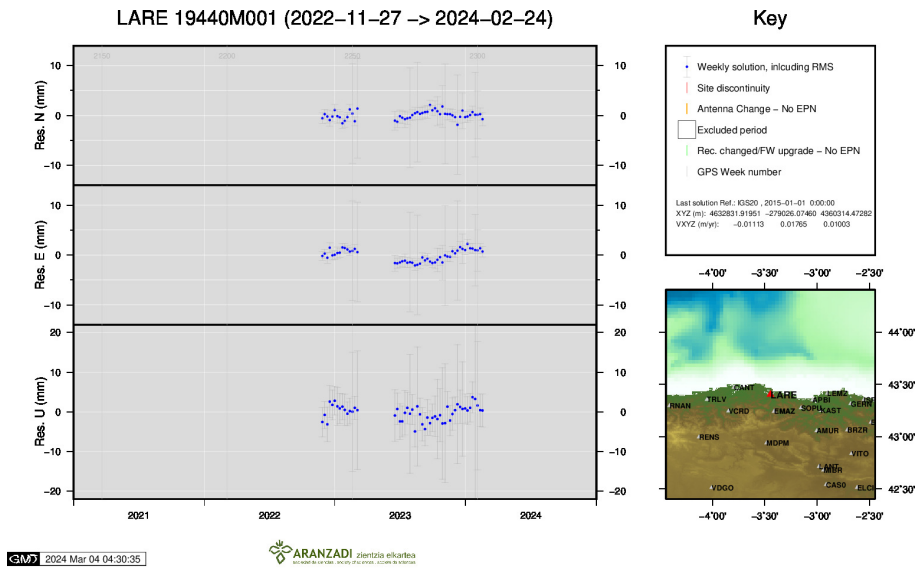
12) HOND



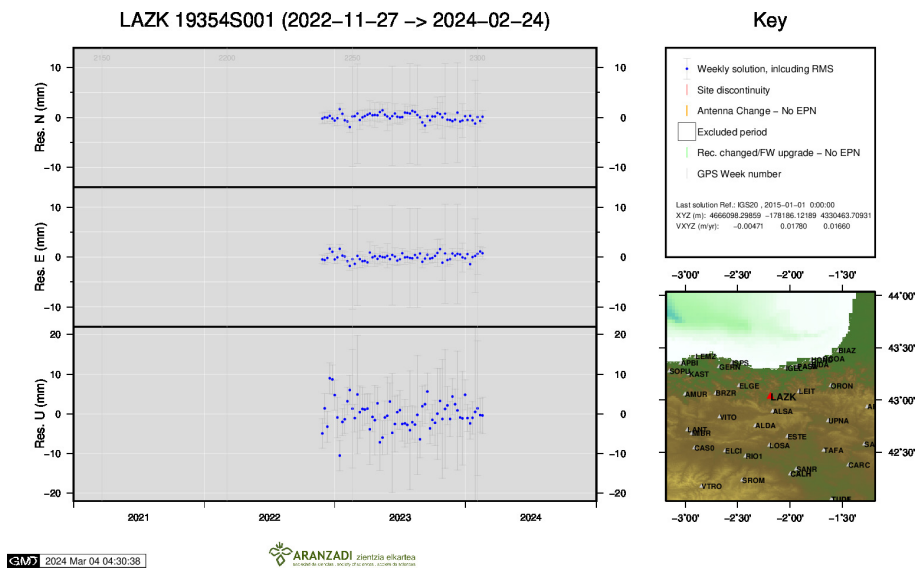
13) IGEL



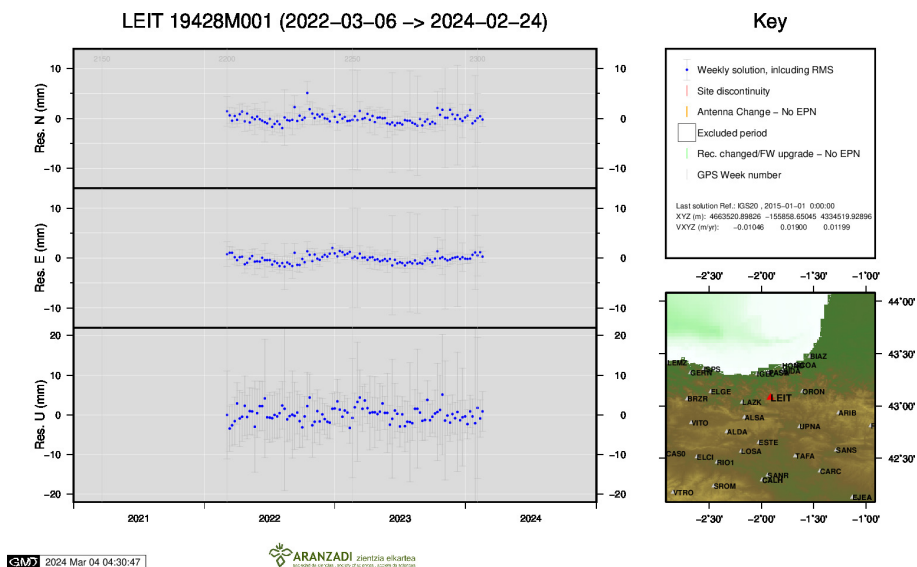
14) ISPS



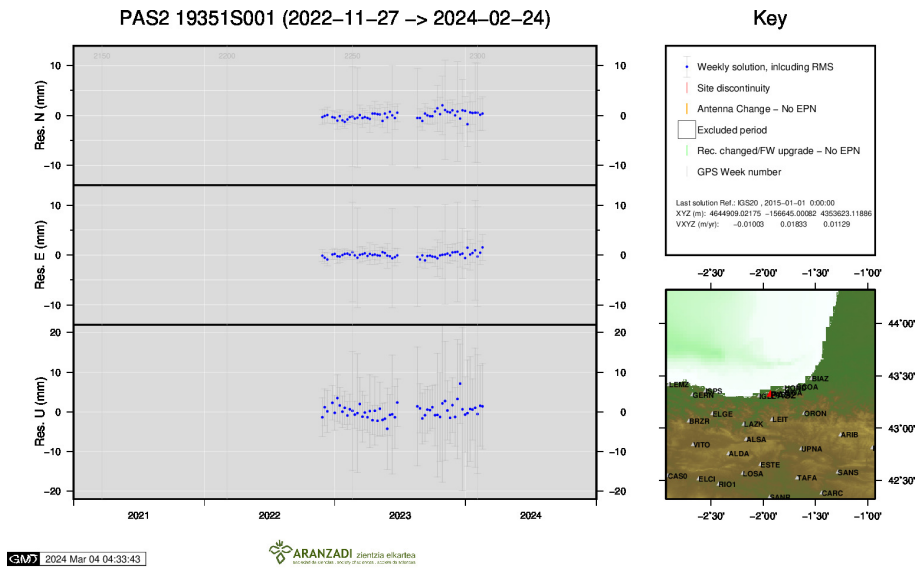
15) LARE



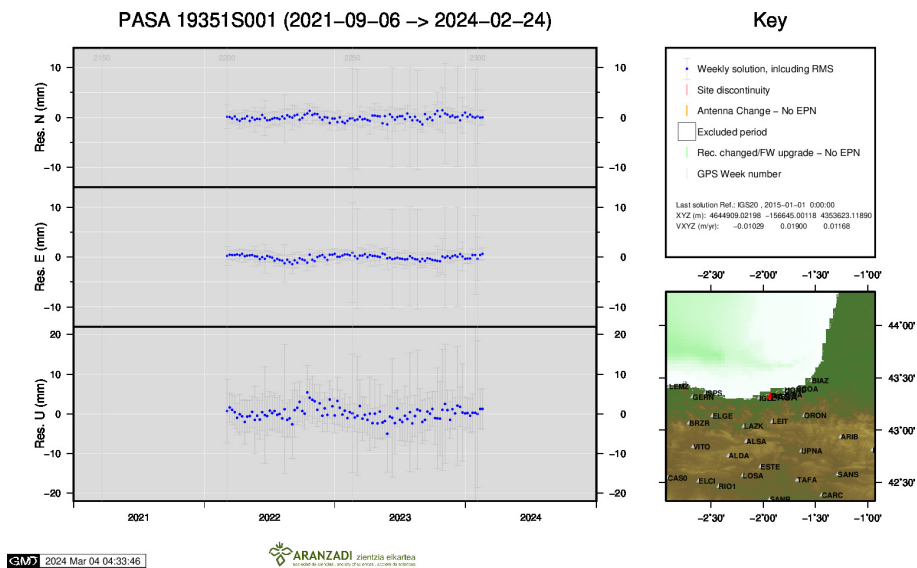
16) LAZK



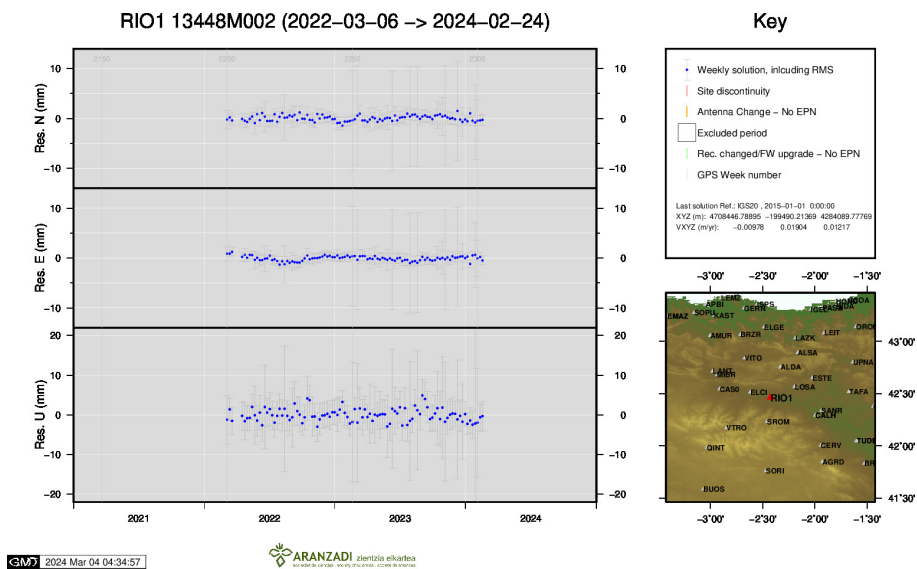
17) LEIT



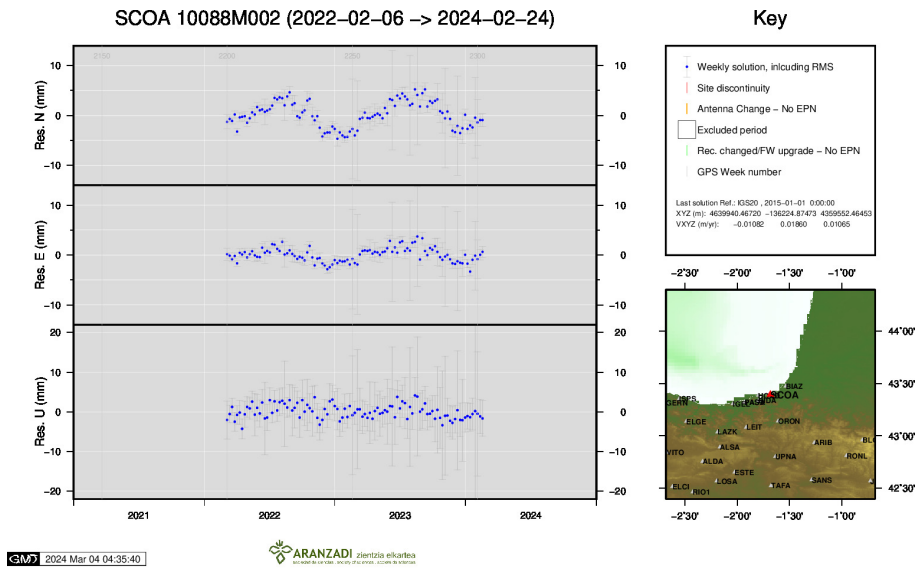
18) PAS2



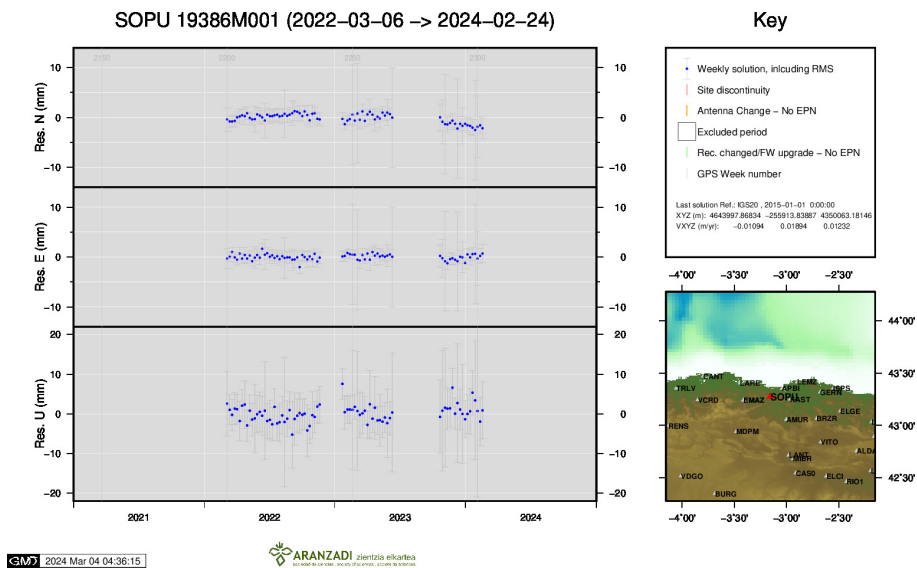
19) PASA



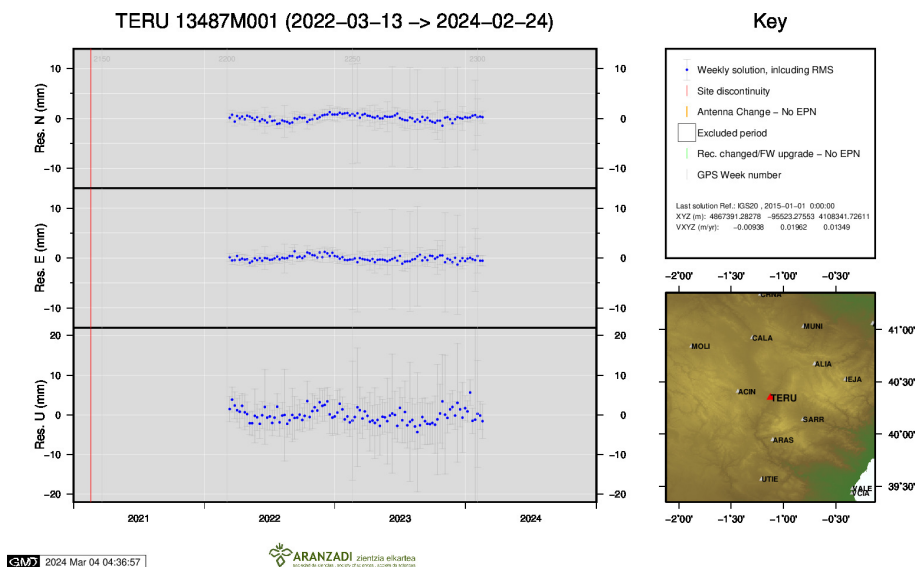
20) RIO1



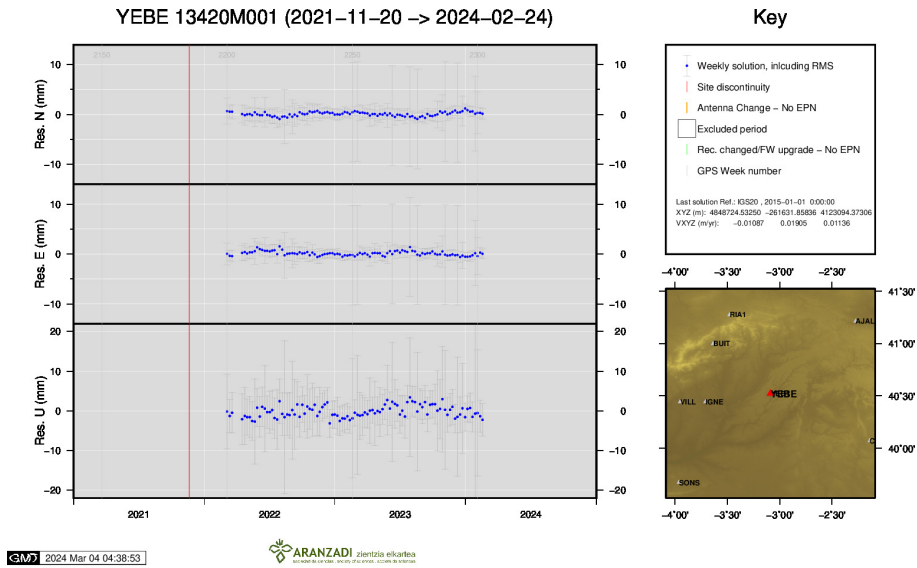
21) SCOA



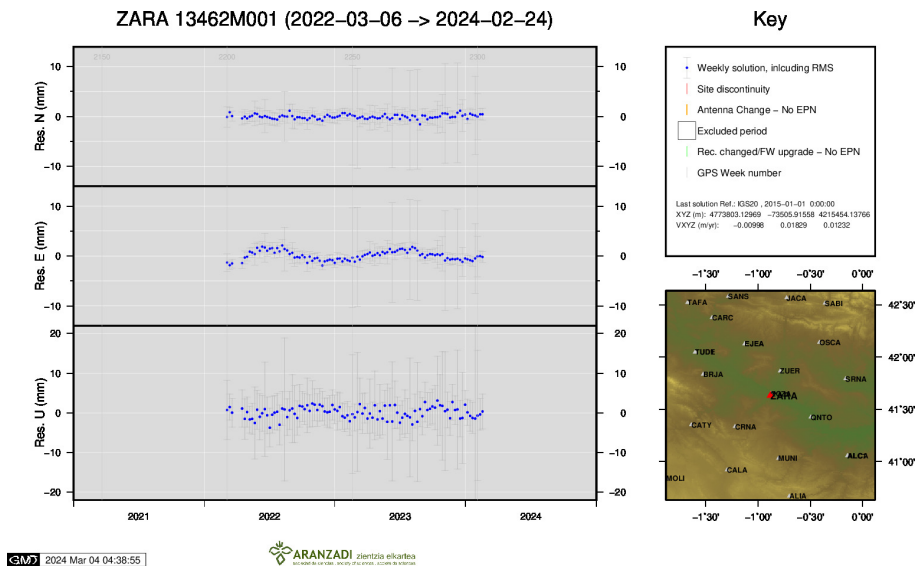
22) SOPU



23) TERU



24) YEBE



25) ZARA