ARA-DAC Weekly Analysis Result: 2244 (GFA)

Technical Report

GPS Week: 2244 (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

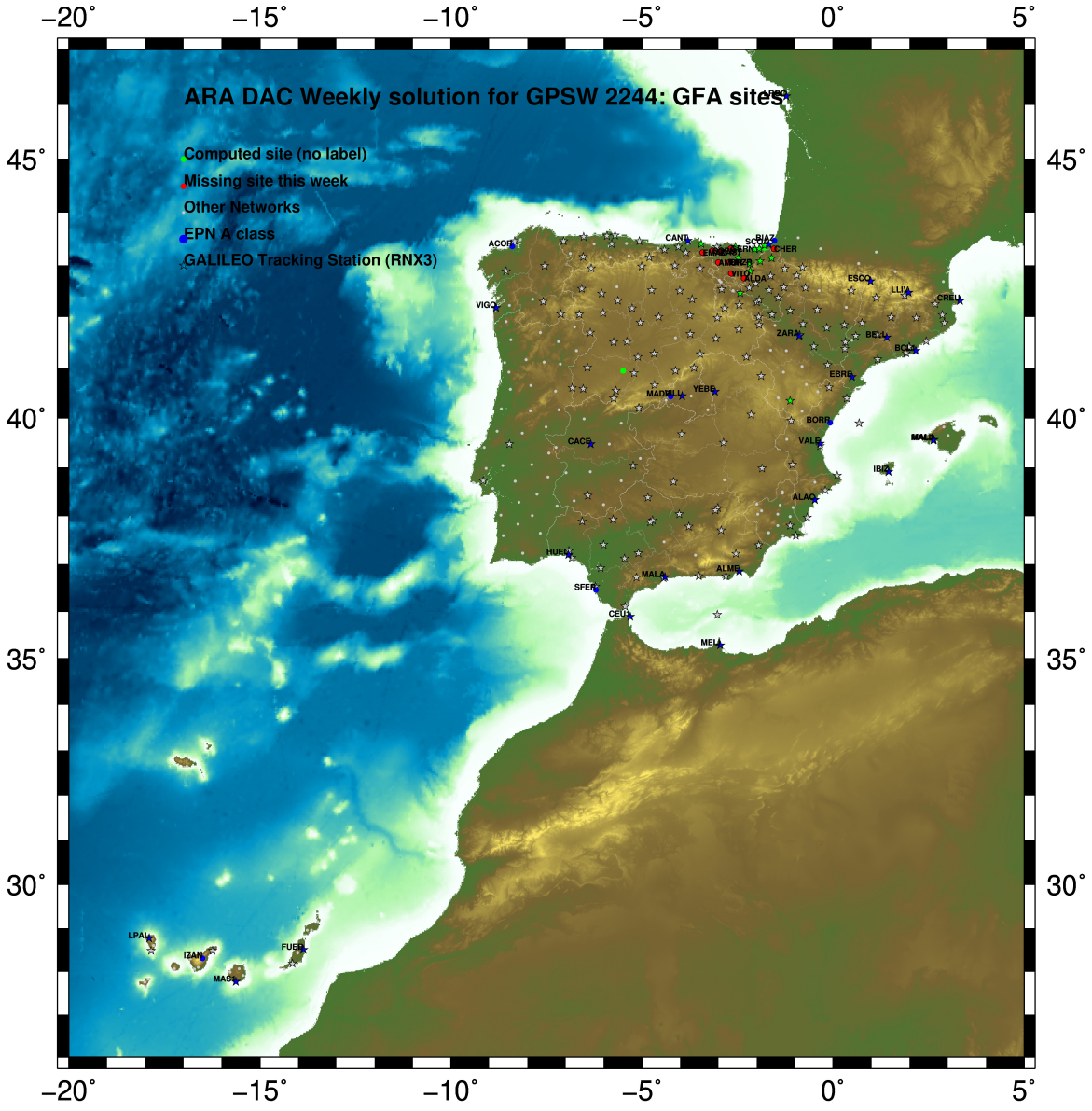


Fig.1: Computed Sites for GPS Week2244 (GFA)

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/theese 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 10-DEC-23 23:17

LOCAL GEODETIC DATUM: IGS20 EPOCH: 2023-01-11 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.52795	-678367.36515	4357066.32145	W	G
50	ALSA 19419M001	4677250.79803	-176770.32656	4319079.91768	A	GRE
384	BIAZ 10074M002	4634456.00888	-124344.90648	4365785.49487	W	GR
101	BIDA 00000M000	4644177.78455	-145778.25492	4354832.52296	A	GR
573	CACE 13447M001	4899866.47183	-544566.96571	4033770.24841	W	GRE
592	CANT 13438M001	4625924.28257	-307096.16675	4365771.60333	W	GRE
908	CREU 13432M001	4715420.08896	273178.12940	4271946.88603	W	GRE
135	EBRE 13410M001	4833519.95114	41537.46039	4147461.76040	W	GRE
180	ELGE 19353S001	4657557.35783	-202241.40066	4338991.92733	A	GRE
257	HOND 15012M002	4640529.28177	-145675.91696	4358781.79918	A	GRE
235	IGEL 19352S001	4645951.39139	-165574.43472	4352550.46383	A	GRE
240	ISPS 19484M001	4640596.44365	-206963.70778	4356391.95699	A	GRE
252	LARE 19440M001	4632831.92079	-279026.07371	4360314.47299	A	GRE
256	LAZK 19354S001	4666098.29838	-178186.12158	4330463.70818	A	GRE
261	LEIT 19428M001	4663520.90149	-155858.64986	4334519.93021	A	GRE
334	ORON 19427M001	4659695.74422	-130864.66739	4338948.92715	A	GRE
345	PAS2 19351S001	4644909.02526	-156645.00083	4353623.11988	A	GRE
493	PASA 19351S001	4644909.02525	-156645.00085	4353623.11989	A	GRE
553	RIO1 13448M002	4708446.78973	-199490.21279	4284089.77661	A	GRE
558	SALA 13469M001	4803054.44860	-462131.00131	4158379.11842	A	GR
526	SCOA 10088M002	4639940.47110	-136224.87611	4359552.46098	W	GRE
443	TERU 13487M001	4867391.28274	-95523.27513	4108341.72715	A	GRE
616	YEBE 13420M001	4848724.53145	-261631.85784	4123094.37221	W	GRE
655	ZARA 13462M001	4773803.13020	-73505.91601	4215454.13770	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 10-DEC-23 23:18

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2023-01-11 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.86054	-678367.97405	4357065.85876	W	
50	ALSA 19419M001	4677251.19335	-176770.94419	4319079.45488	A	
384	BIAZ 10074M002	4634456.41469	-124345.51898	4365785.03638	W	
101	BIDA 00000M000	4644178.18671	-145778.86861	4354832.06336	A	
573	CACE 13447M001	4899866.79673	-544567.60977	4033769.76181	W	
592	CANT 13438M001	4625924.66448	-307096.77871	4365771.14309	W	
908	CREU 13432M001	4715420.53938	273177.50882	4271946.42601	W	
135	EBRE 13410M001	4833520.36160	41536.82532	4147461.28735	W	
180	ELGE 19353S001	4657557.75137	-202242.01606	4338991.46585	A	
257	HOND 15012M002	4640529.68425	-145676.53023	4358781.33989	A	
235	IGEL 19352S001	4645951.79078	-165575.04867	4352550.00382	A	
240	ISPS 19484M001	4640596.83793	-206964.32121	4356391.49687	A	
252	LARE 19440M001	4632832.30595	-279026.68641	4360314.01255	A	
256	LAZK 19354S001	4666098.69440	-178186.73791	4330463.24630	A	
261	LEIT 19428M001	4663521.30075	-155859.26584	4334519.46885	A	
334	ORON 19427M001	4659696.14709	-130865.28285	4338948.46645	A	
345	PAS2 19351S001	4644909.42590	-156645.61463	4353622.66007	A	
493	PASA 19351S001	4644909.42589	-156645.61465	4353622.66008	A	
553	RIO1 13448M002	4708447.17935	-199490.83410	4284089.31088	A	
558	SALA 13469M001	4803054.79404	-462131.63413	4158378.64113	A	
526	SCOA 10088M002	4639940.87488	-136225.48928	4359552.00187	W	
443	TERU 13487M001	4867391.67224	-95523.91454	4108341.24941	A	
616	YEBE 13420M001	4848724.90038	-261632.49552	4123093.89380	W	
655	ZARA 13462M001	4773803.53094	-73506.54455	4215453.66815	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 10-DEC-23 23:18

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2023-01-11 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.82015	-678368.01134	4357065.91061	W	
50	ALSA 19419M001	4677251.15059	-176770.98294	4319079.50664	A	
384	BIAZ 10074M002	4634456.37221	-124345.55810	4365785.08829	W	
101	BIDA 00000M000	4644178.14419	-145778.90761	4354832.11524	A	
573	CACE 13447M001	4899866.75257	-544567.64621	4033769.81283	W	
592	CANT 13438M001	4625924.62268	-307096.81721	4365771.19494	W	
908	CREU 13432M001	4715420.49453	273177.46864	4271946.47797	W	
135	EBRE 13410M001	4833520.31633	41536.78647	4147461.33880	W	
180	ELGE 19353S001	4657557.70890	-202242.05481	4338991.51765	A	
257	HOND 15012M002	4640529.64177	-145676.56924	4358781.39178	A	
235	IGEL 19352S001	4645951.74831	-165575.08760	4352550.05567	A	
240	ISPS 19484M001	4640596.79565	-206964.36001	4356391.54872	A	
252	LARE 19440M001	4632832.26399	-279026.72498	4360314.06439	A	
256	LAZK 19354S001	4666098.65176	-178186.77670	4330463.29809	A	
261	LEIT 19428M001	4663521.25806	-155859.30472	4334519.52066	A	
334	ORON 19427M001	4659696.10436	-130865.32184	4338948.51828	A	
345	PAS2 19351S001	4644909.38341	-156645.65359	4353622.71194	A	
493	PASA 19351S001	4644909.38340	-156645.65361	4353622.71195	A	
553	RIO1 13448M002	4708447.13632	-199490.87263	4284089.36253	A	
558	SALA 13469M001	4803054.75077	-462131.67130	4158378.69242	A	
526	SCOA 10088M002	4639940.83237	-136225.52833	4359552.05376	W	
443	TERU 13487M001	4867391.62708	-95523.95274	4108341.30068	A	
616	YEBE 13420M001	4848724.85598	-261632.53322	4123093.94504	W	
655	ZARA 13462M001	4773803.48676	-73506.58325	4215453.71969	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 10-DEC-23 23:18

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	7	XXXXXXX	0.27	1.34	2.94
ALSA 19419M001	7	XXXXXXX	0.65	1.49	1.14
BIAZ 10074M002	6	XXXXXX	1.17	0.88	3.23
BIDA 00000M000	7	XXXXXXX	1.62	1.82	2.72
CACE 13447M001	7	XXXXXXX	0.77	0.40	2.91
CANT 13438M001	7	XXXXXXX	0.73	0.67	1.75
CREU 13432M001	7	XXXXXXX	1.59	0.54	3.43
EBRE 13410M001	6	X XXXXX	1.19	1.94	5.21
ELGE 19353S001	7	XXXXXXX	1.50	1.45	4.58
HOND 15012M002	7	XXXXXXX	0.89	1.05	2.20
IGEL 19352S001	7	XXXXXXX	1.16	0.98	2.67
ISPS 19484M001	7	XXXXXXX	1.15	1.42	4.69
LARE 19440M001	7	XXXXXXX	0.72	0.80	1.24
LAZK 19354S001	7	XXXXXXX	1.16	1.55	4.20
LEIT 19428M001	7	XXXXXXX	0.94	1.54	3.19
ORON 19427M001	7	XXXXXXX	0.63	1.07	3.38
PAS2 19351S001	7	XXXXXXX	1.19	0.71	3.51
PASA 19351S001	7	XXXXXXX	1.20	0.70	3.65
RIO1 13448M002	7	XXXXXXX	0.67	0.77	1.70
SALA 13469M001	7	XXXXXXX	0.56	0.35	1.88
SCOA 10088M002	7	XXXXXXX	1.24	0.71	2.08
TERU 13487M001	7	XXXXXXX	0.69	0.42	5.46
YEBE 13420M001	7	XXXXXXX	0.55	0.72	2.06
ZARA 13462M001	7	XXXXXXX	0.96	0.66	1.81

Comparison of individual solutions:

ACOR 13434M001	N	0.27	-0.01	-0.24	0.06	-0.32	-0.08	0.01	-0.51
ACOR 13434M001	E	1.34	1.05	0.84	-0.21	2.45	0.04	-1.48	-0.89
ACOR 13434M001	U	2.94	-4.49	3.64	-1.64	-1.77	-2.31	-1.18	2.44
ALSA 19419M001	N	0.65	-0.37	1.00	-0.29	0.72	0.41	0.63	-0.51
ALSA 19419M001	E	1.49	-2.64	1.12	0.78	-0.01	1.09	0.32	-1.78
ALSA 19419M001	U	1.14	-1.57	1.32	1.54	-0.75	-0.33	-0.31	-0.62
BIAZ 10074M002	N	1.17		1.73	1.02	1.39	0.24	-0.78	-0.53
BIAZ 10074M002	E	0.88		0.97	-0.79	-1.29	-0.28	-0.58	-0.51
BIAZ 10074M002	U	3.23		-2.20	1.40	5.31	-3.28	-0.73	2.40
BIDA 00000M000	N	1.62	0.75	0.17	0.13	3.66	-0.04	0.38	-1.22
BIDA 00000M000	E	1.82	1.28	1.48	-0.44	-1.42	0.88	-1.46	-3.31
BIDA 00000M000	U	2.72	4.29	3.97	-0.58	-1.31	-0.99	-0.94	2.50
CACE 13447M001	N	0.77	-1.21	-0.14	-0.15	0.25	-0.99	0.62	-0.80
CACE 13447M001	E	0.40	-0.50	0.34	-0.13	0.15	0.69	0.20	-0.20
CACE 13447M001	U	2.91	-3.62	3.50	-1.17	4.55	-0.80	1.31	-0.99
CANT 13438M001	N	0.73	0.79	-0.96	-0.33	-0.34	-0.60	-0.76	0.67
CANT 13438M001	E	0.67	-0.17	0.45	-0.71	0.20	-0.12	-1.19	-0.70
CANT 13438M001	U	1.75	-1.46	0.87	-0.20	-2.46	0.94	-2.23	1.85
CREU 13432M001	N	1.59	0.89	2.03	2.35	-1.77	0.00	-1.17	0.42
CREU 13432M001	E	0.54	-0.10	0.91	-0.35	-0.48	-0.44	-0.44	-0.39
CREU 13432M001	U	3.43	-2.04	5.19	0.84	-5.36	-1.82	2.52	0.71
EBRE 13410M001	N	1.19	2.26		0.21	0.74	-0.97	0.53	-0.34
EBRE 13410M001	E	1.94	-4.01		0.36	0.96	0.69	-0.91	0.68
EBRE 13410M001	U	5.21	-2.34		-1.13	10.00	-0.67	-5.31	-0.68
ELGE 19353S001	N	1.50	2.30	-1.44	-0.35	-1.31	-0.65	0.13	1.96
ELGE 19353S001	E	1.45	2.68	-0.11	-1.54	-0.03	-1.04	-1.41	-0.05
ELGE 19353S001	U	4.58	1.41	-8.88	3.97	-0.39	0.09	-4.22	3.32
HOND 15012M002	N	0.89	0.06	0.43	0.21	1.97	0.63	0.30	0.38
HOND 15012M002	E	1.05	0.27	-0.25	0.29	-0.48	0.01	-0.47	-2.44
HOND 15012M002	U	2.20	-0.27	3.63	3.13	1.06	-1.62	-0.46	1.45
IGEL 19352S001	N	1.16	2.15	-0.88	-0.13	0.65	0.07	0.57	1.40
IGEL 19352S001	E	0.98	0.06	0.51	-0.18	-0.57	-0.39	-0.29	-2.22
IGEL 19352S001	U	2.67	5.44	-0.34	0.27	2.85	0.84	-2.00	-0.30
ISPS 19484M001	N	1.15	1.13	0.61	0.19	-0.76	-0.06	0.35	-2.36
ISPS 19484M001	E	1.42	1.13	1.56	-0.46	-0.43	-0.12	-1.14	-2.58
ISPS 19484M001	U	4.69	2.55	3.81	3.10	-4.24	0.90	1.28	-8.99
LARE 19440M001	N	0.72	-0.68	-0.91	0.89	-0.20	-0.71	-0.65	-0.30
LARE 19440M001	E	0.80	-1.04	-1.34	0.32	0.56	-0.47	-0.51	-0.25
LARE 19440M001	U	1.24	-0.69	0.11	-0.77	0.22	2.01	-1.95	-0.55
LAZK 19354S001	N	1.16	2.46	0.20	-0.86	0.85	-0.43	-0.16	-0.51
LAZK 19354S001	E	1.55	3.27	-1.19	-0.95	-0.62	-0.23	-0.79	-0.54
LAZK 19354S001	U	4.20	0.70	-5.81	0.44	-3.24	-0.90	0.02	7.75
LEIT 19428M001	N	0.94	1.71	-0.32	0.81	0.99	0.11	0.49	-0.61
LEIT 19428M001	E	1.54	0.57	0.78	0.13	-0.42	0.84	-1.67	-3.10
LEIT 19428M001	U	3.19	5.33	2.24	0.22	-4.32	-2.63	-0.65	1.21
ORON 19427M001	N	0.63	0.41	0.44	0.51	0.78	0.79	-0.60	-0.35
ORON 19427M001	E	1.07	-2.37	0.07	-0.02	0.50	-0.19	0.02	-0.99
ORON 19427M001	U	3.38	0.72	-0.93	1.48	-2.40	-3.74	3.15	5.94
PAS2 19351S001	N	1.19	1.84	-0.12	0.02	2.05	0.56	0.31	-0.69
PAS2 19351S001	E	0.71	-0.54	0.09	-0.28	0.06	-0.21	-1.39	-0.79
PAS2 19351S001	U	3.51	1.88	3.24	-1.39	1.86	-1.50	-3.38	6.38
PASA 19351S001	N	1.20	1.95	-0.12	-0.01	2.02	0.57	0.24	-0.65
PASA 19351S001	E	0.70	-0.54	0.10	-0.24	0.09	-0.32	-1.36	-0.81
PASA 19351S001	U	3.65	1.83	3.36	-1.27	1.90	-1.43	-3.86	6.56
RIO1 13448M002	N	0.67	0.85	-1.04	0.17	0.49	0.77	0.08	0.17
RIO1 13448M002	E	0.77	-1.31	-0.12	0.08	-0.72	1.09	0.01	-0.29
RIO1 13448M002	U	1.70	3.14	1.20	-1.70	-0.54	-1.47	-0.67	-0.39
SALA 13469M001	N	0.56	-0.13	-0.41	-0.72	0.34	-0.92	-0.49	0.02
SALA 13469M001	E	0.35	0.26	0.71	0.06	0.29	0.08	-0.25	-0.10
SALA 13469M001	U	1.88	-1.51	2.84	-1.28	2.67	0.60	0.73	-1.09
SCOA 10088M002	N	1.24	0.61	-1.26	0.01	2.19	0.42	0.19	1.51
SCOA 10088M002	E	0.71	-0.58	-0.16	-0.33	-1.01	0.28	-0.89	-0.79
SCOA 10088M002	U	2.08	2.88	0.35	3.06	-0.07	0.03	-1.81	2.19
TERU 13487M001	N	0.69	0.49	0.11	0.31	0.85	1.06	0.38	0.72
TERU 13487M001	E	0.42	-0.46	0.21	0.46	-0.32	0.00	-0.68	-0.19
TERU 13487M001	U	5.46	11.37	-1.92	-2.03	-4.83	-3.53	-2.46	0.44
YEBE 13420M001	N	0.55	-0.32	-0.89	0.25	-0.26	-0.40	0.52	-0.58

YEBE 13420M001	E	0.72	1.07	-0.07	-0.06	1.14	-0.24	-0.79	-0.11
YEBE 13420M001	U	2.06	0.61	2.72	-1.62	2.93	-0.43	-1.41	-2.07
ZARA 13462M001	N	0.96	1.68	0.23	-0.27	1.51	0.43	0.33	-0.11
ZARA 13462M001	E	0.66	-0.17	0.25	0.19	-0.62	-0.40	-0.61	-1.24
ZARA 13462M001	U	1.81	0.21	-1.05	0.21	-2.47	0.06	-3.34	1.08

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	1.50	-1.41	0.54
2	ALAC 13433M001	I W	-0.23	0.63	1.55
3	ALME 13437M001	I W	-1.36	-0.10	2.07
4	BCL1 19482M001	I W	-1.11	0.03	0.21
5	BELL 13431M001	I W	1.12	0.34	2.04
6	BIAZ 10074M002	I W	1.66	0.04	1.51
7	BORR 13480M001	I W	-0.05	-4.93	-2.22
8	BRST 10004M004	I W	0.84	-1.47	5.65
9	CACE 13447M001	I W	0.91	-0.17	2.62
10	CANT 13438M001	I W	2.05	-0.22	-4.77
11	CEU1 13449M002	I W	0.14	-0.13	0.92
12	CREU 13432M001	I W	-0.67	-4.15	-8.95
13	EBRE 13410M001	I W	-0.50	2.58	0.18
14	ESCO 13435M001	I W	-6.49	3.56	6.75
15	FUER 31330M001	I W	-0.72	-1.55	-1.08
16	HUEL 13451M001	I W	1.19	1.94	-4.22
17	IBIZ 13454S001	I W	-0.04	2.17	0.61
18	IZAN 31309M002	I W	-2.94	-0.73	-1.83
19	LLIV 13436M001	I W	-0.75	1.46	3.97
20	LPAL 81701M001	I W	-0.64	-1.36	-4.99
21	LROC 10023M001	I W	0.79	0.96	1.56
22	MADR 13407S012	I W	-2.65	-0.76	-3.91
23	MAL1 13444M002	I W	1.00	2.71	-4.18
24	MALA 13443M001	I W	2.11	-1.83	0.71
25	MALL 13444M001	I W	-1.17	2.48	0.68
26	MAS1 31303M002	I W	-2.26	-3.10	-0.99
27	MELI 19379M001	I W	-0.72	0.98	4.28
28	SCOA 10088M002	I W	4.59	1.78	-8.74
29	SFER 13402M004	I W	-1.11	-2.33	3.61
30	VALE 13439M001	I W	0.55	1.30	-1.22
31	VIGO 13450M001	I W	1.24	-0.74	1.39
32	VILL 13406M001	I W	-0.42	0.34	3.18
33	YEBE 13420M001	I W	-0.25	-0.35	3.60
34	ZARA 13462M001	I W	0.36	0.75	-0.65
35	ZIMM 14001M004	I W	0.28	-0.38	3.68
	RMS / COMPONENT		1.83	1.89	3.66
	IQR		1.75	2.65	4.45
	MEAN		-0.11	-0.05	0.10
	MEDIAN		-0.05	-0.10	0.68
	MIN		-6.49	-4.93	-8.95
	MAX		4.59	3.56	6.75
	OVERALL RMS/IQR/MAX(3D)		2.60	2.56	10.03	SCOA 10088M002	#SUM

ALL	RMS / COMPONENT		1.83	1.89	3.66		
ALL	IQR		1.75	2.65	4.45		
ALL	MEAN		-0.11	-0.05	0.10		
ALL	MEDIAN		-0.05	-0.10	0.68		
ALL	MIN		-6.49	-4.93	-8.95		
ALL	MAX		4.59	3.56	6.75		
ALL	OVERALL RMS/IQR/MAX(3D)		2.60	2.56	10.03	SCOA 10088M002	#SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 35
NUMBER OF COORDINATES : 105
RMS OF TRANSFORMATION : 2.60 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.44 MM
TRANSLATION IN Y : -0.00 +- 0.44 MM
TRANSLATION IN Z : -0.00 +- 0.44 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                      18227235
 NUMBER OF UNKNOWNS                            186306
 NUMBER OF DEGREES OF FREEDOM                18040929
 PHASE MEASUREMENTS SIGMA                     0.00100
 SAMPLING INTERVAL (SECONDS)                      180
 VARIANCE FACTOR                 3.265649466585744
```

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 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 ALSA  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 BIAZ  A    1 P 23:009:00000 23:014:86370 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 23:008:00000 23:014:86370 LEICA GR10           ----- -----------
 CACE  A    1 P 23:008:00000 23:014:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 23:008:00000 23:014:86370 LEICA GR10           ----- -----------
 CREU  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 23:008:00000 23:014:86370 LEICA GR30           ----- -----------
 HOND  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 IGEL  A    1 P 23:008:00000 23:014:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 23:008:00000 23:014:86370 TRIMBLE NETR9        ----- -----------
 LARE  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 LAZK  A    1 P 23:008:00000 23:014:86370 LEICA GR30           ----- -----------
 LEIT  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 PAS2  A    1 P 23:008:00000 23:014:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 23:008:00000 23:014:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 23:008:00000 23:014:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 SCOA  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 TERU  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 YEBE  A    1 P 23:008:00000 23:014:86370 LEICA GR50           ----- -----------
 ZARA  A    1 P 23:008:00000 23:014:86370 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 23:008:00000 23:014:86370 LEIAT504         LEIS -----
 ALSA  A    1 P 23:008:00000 23:014:86370 LEIAR10          NONE -----
 BIAZ  A    1 P 23:009:00000 23:014:86370 LEIAR25          LEIT -----
 BIDA  A    1 P 23:008:00000 23:014:86370 LEIAS10          NONE -----
 CACE  A    1 P 23:008:00000 23:014:86370 TRM29659.00      NONE -----
 CANT  A    1 P 23:008:00000 23:014:86370 LEIAR25.R4       LEIT -----
 CREU  A    1 P 23:008:00000 23:014:86370 LEIAR25.R4       NONE -----
 EBRE  A    1 P 23:008:00000 23:014:86370 LEIAR25.R4       NONE -----
 ELGE  A    1 P 23:008:00000 23:014:86370 LEIAR25.R4       LEIT -----
 HOND  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 IGEL  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 ISPS  A    1 P 23:008:00000 23:014:86370 TRM59900.00      SCIS -----
 LARE  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 LAZK  A    1 P 23:008:00000 23:014:86370 LEIAR25.R4       LEIT -----
 LEIT  A    1 P 23:008:00000 23:014:86370 LEIAR10          NONE -----
 ORON  A    1 P 23:008:00000 23:014:86370 LEIAR10          NONE -----
 PAS2  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 PASA  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 RIO1  A    1 P 23:008:00000 23:014:86370 LEIAR25.R4       LEIT -----
 SALA  A    1 P 23:008:00000 23:014:86370 LEIAR25          NONE -----
 SCOA  A    1 P 23:008:00000 23:014:86370 TRM55971.00      NONE -----
 TERU  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 YEBE  A    1 P 23:008:00000 23:014:86370 LEIAR20          LEIM -----
 ZARA  A    1 P 23:008:00000 23:014:86370 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 23:008:00000 23:014:86370 UNE   3.0460   0.0000   0.0000
 ALSA  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 23:009:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
 CACE  A    1 P 23:008:00000 23:014:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 23:008:00000 23:014:86370 UNE   3.0490   0.0000   0.0000
 CREU  A    1 P 23:008:00000 23:014:86370 UNE   0.0770   0.0000   0.0000
```

```
EBRE  A    1 P 23:008:00000 23:014:86370 UNE   0.0770   0.0000   0.0000
ELGE  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
HOND  A    1 P 23:008:00000 23:014:86370 UNE   0.0771   0.0000   0.0000
IGEL  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
ISPS  A    1 P 23:008:00000 23:014:86370 UNE   0.0350   0.0000   0.0000
LARE  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
LAZK  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
LEIT  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
ORON  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
PAS2  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
PASA  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
RIO1  A    1 P 23:008:00000 23:014:86370 UNE   0.0606   0.0000   0.0000
SALA  A    1 P 23:008:00000 23:014:86370 UNE   0.0600   0.0000   0.0000
SCOA  A    1 P 23:008:00000 23:014:86370 UNE   0.0000   0.0000   0.0000
TERU  A    1 P 23:008:00000 23:014:86370 UNE   0.0600   0.0000   0.0000
YEBE  A    1 P 23:008:00000 23:014:86370 UNE   0.0600   0.0000   0.0000
ZARA  A    1 P 23:008:00000 23:014:86370 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:

```
2023-12-09 12:51 UTC | ISPS0080.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-09 15:45 UTC | ISPS0090.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-09 18:37 UTC | ISPS0100.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-09 21:00 UTC | ISPS0110.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-10 02:08 UTC | ISPS0120.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-10 05:59 UTC | ISPS0130.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-10 11:14 UTC | ISPS0140.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20230913.log
2023-12-09 12:51 UTC | LARE0080.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (source: lare00esp_20230308.log
2023-12-09 15:45 UTC | LARE0090.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (source: lare00esp_20230308.log
2023-12-09 18:37 UTC | LARE0100.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (source: lare00esp_20230308.log
2023-12-09 21:00 UTC | LARE0110.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (source: lare00esp_20230308.log
2023-12-10 02:08 UTC | LARE0120.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (source: lare00esp_20230308.log
2023-12-10 05:59 UTC | LARE0130.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (source: lare00esp_20230308.log
2023-12-10 11:14 UTC | LARE0140.23O | RECEIVER FIRM. VERS. |  4.52/7.711 -> 4.31/7.403 (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

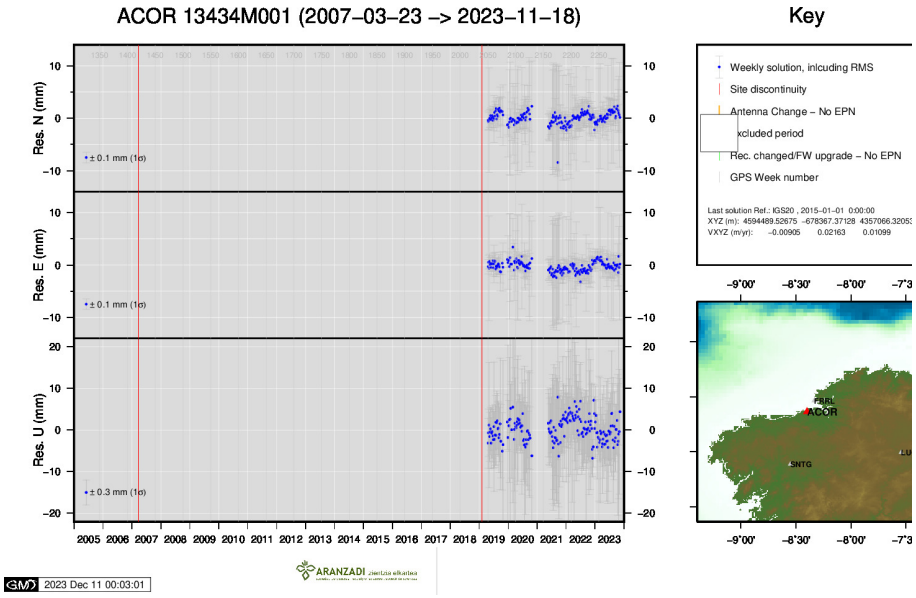
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres.* epncb.oma.be/$_d$*ocumentation/guidelines/guidelines*$_a$*nalysis*$_c$*entres.pdf*

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

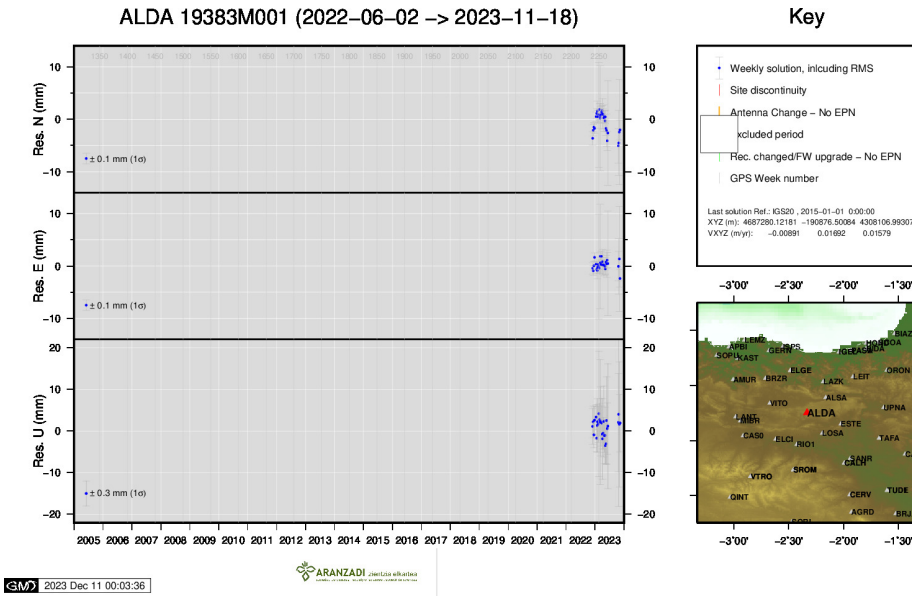
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

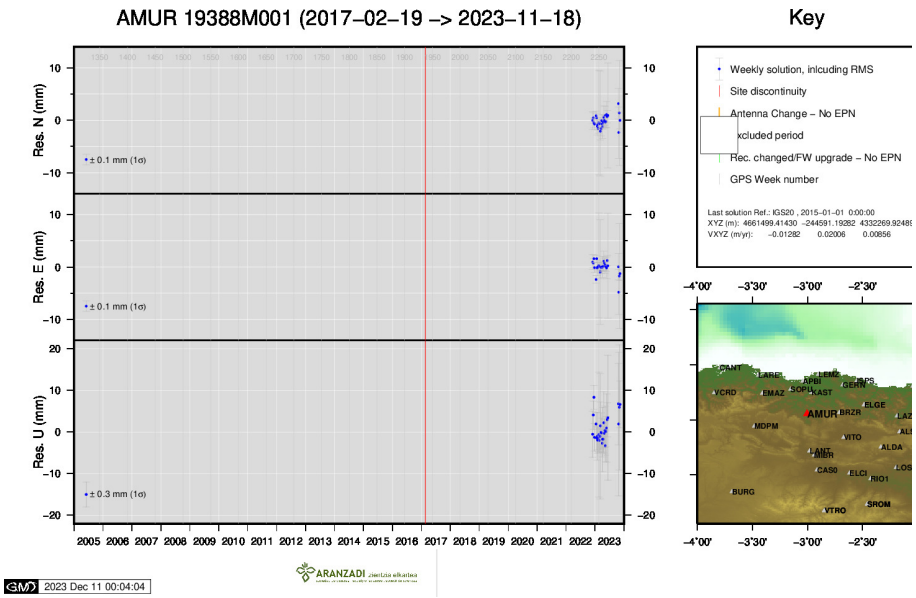
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



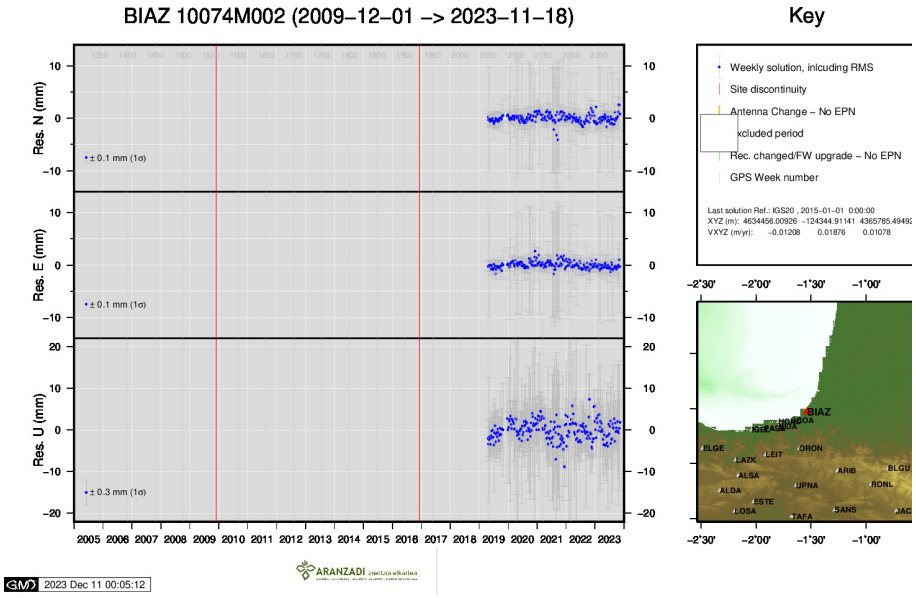
1) ACOR



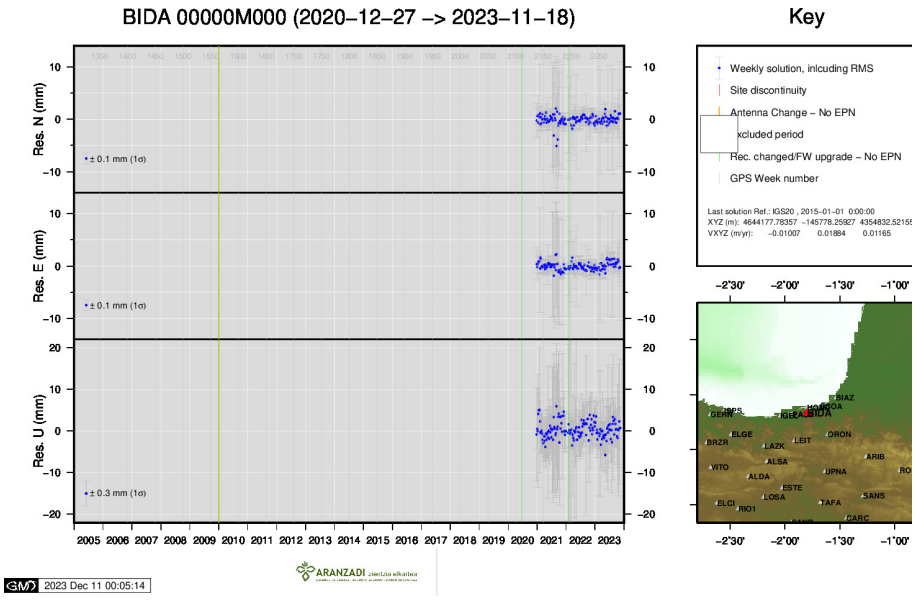
2) ALDA



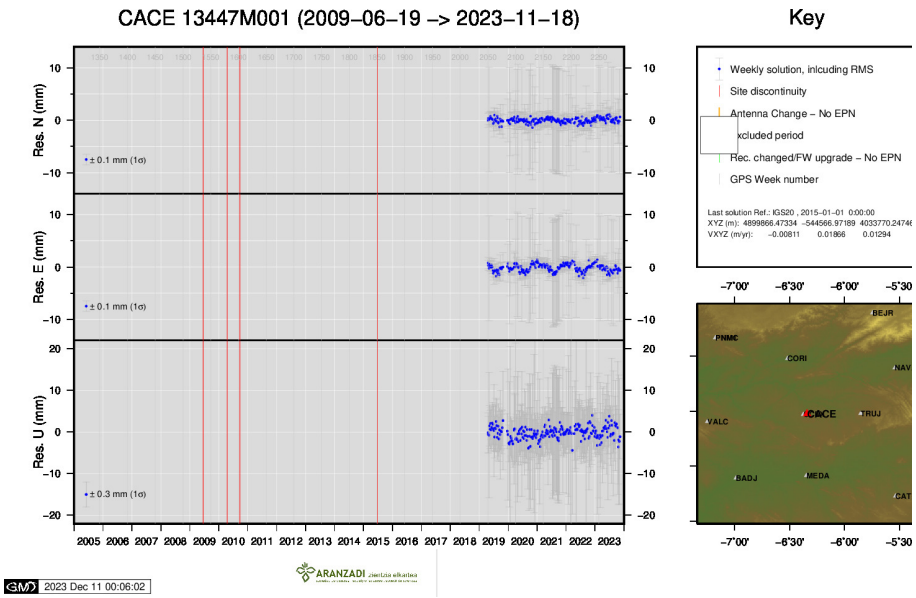
3) AMUR



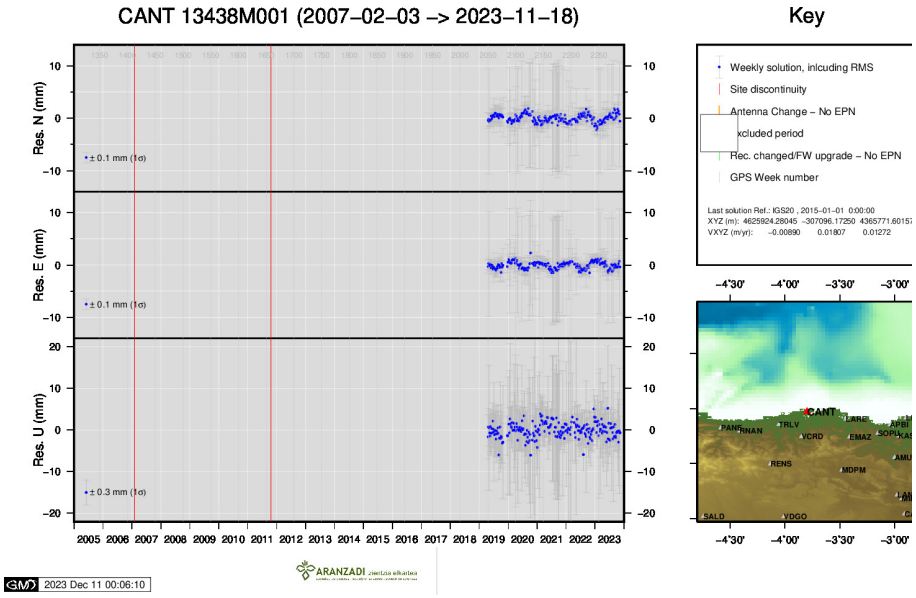
4) BIAZ



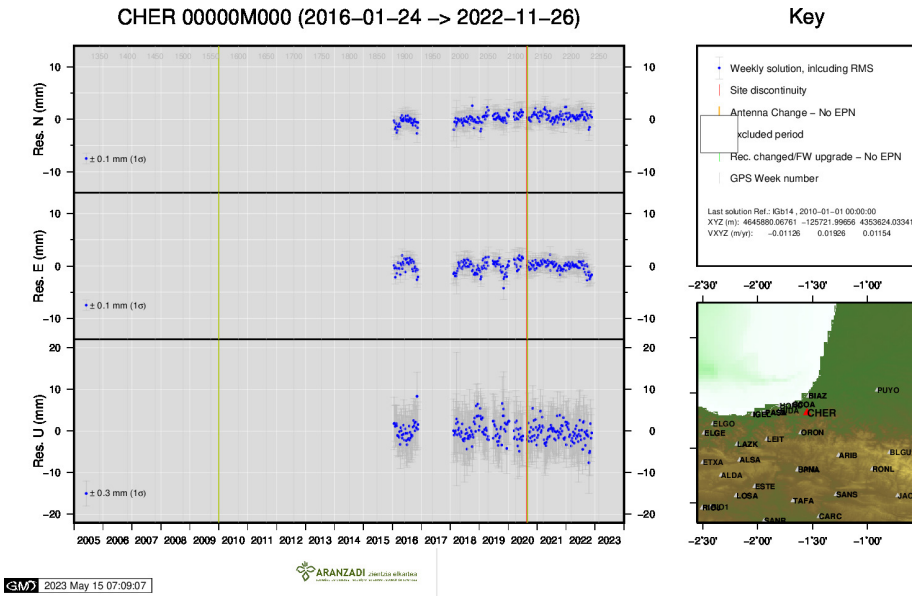
5) BIDA



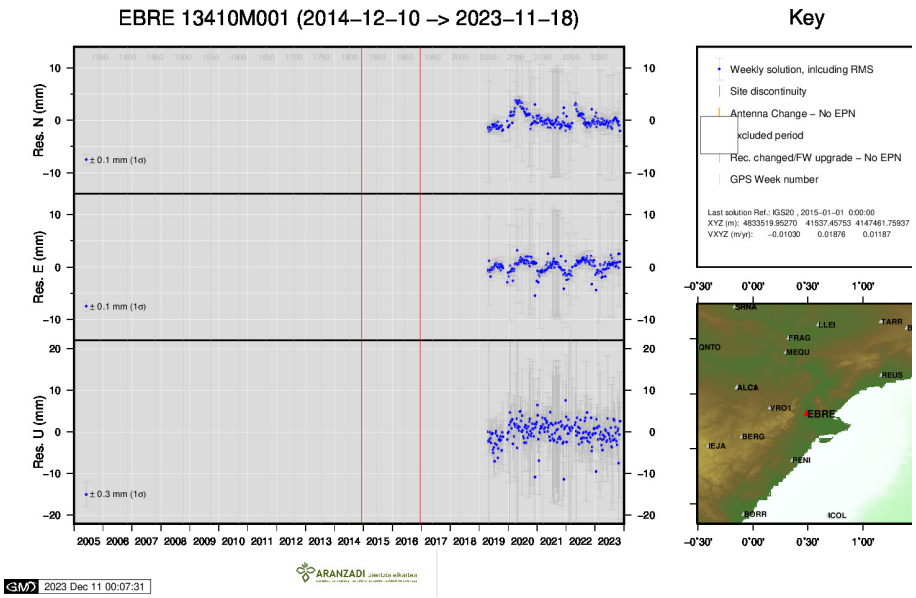
6) CACE



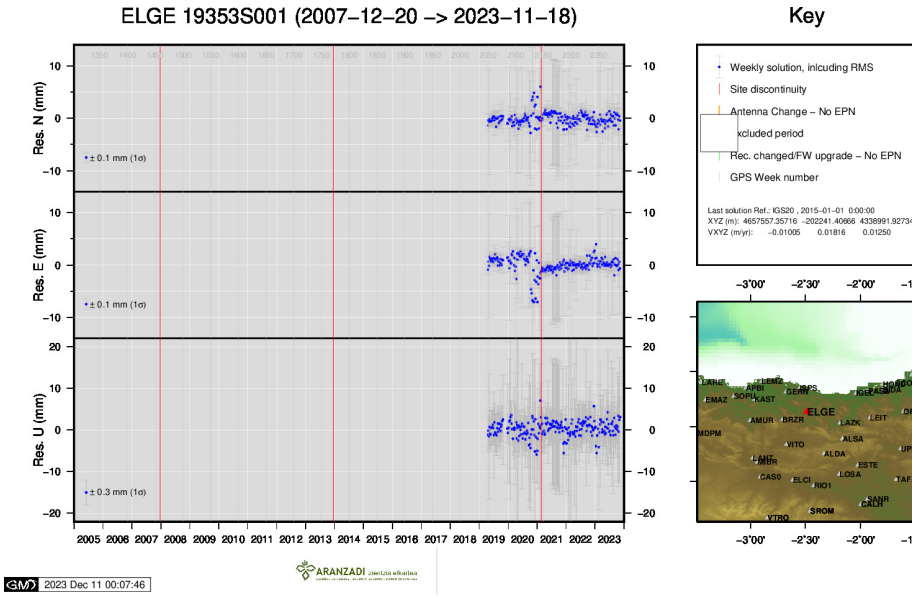
7) CANT



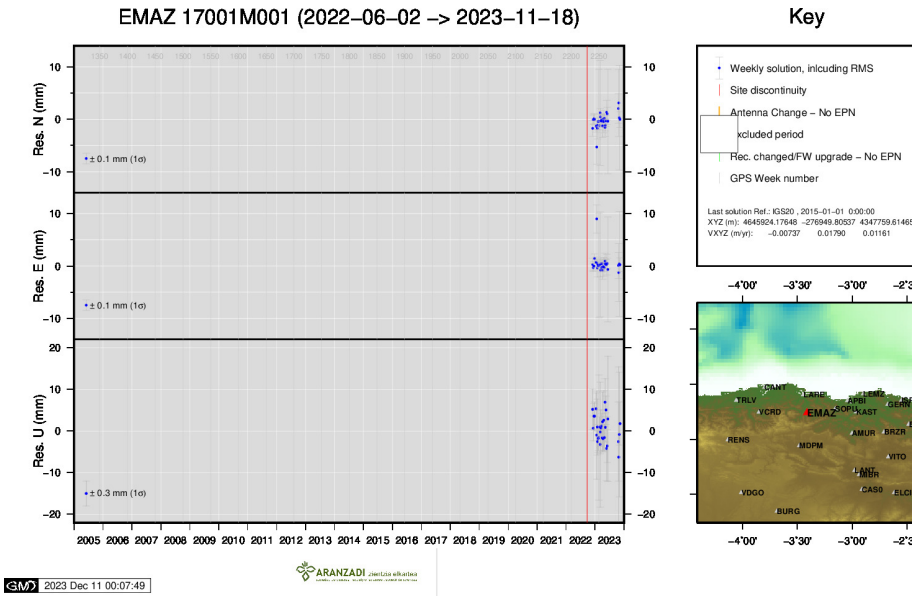
8) CHER



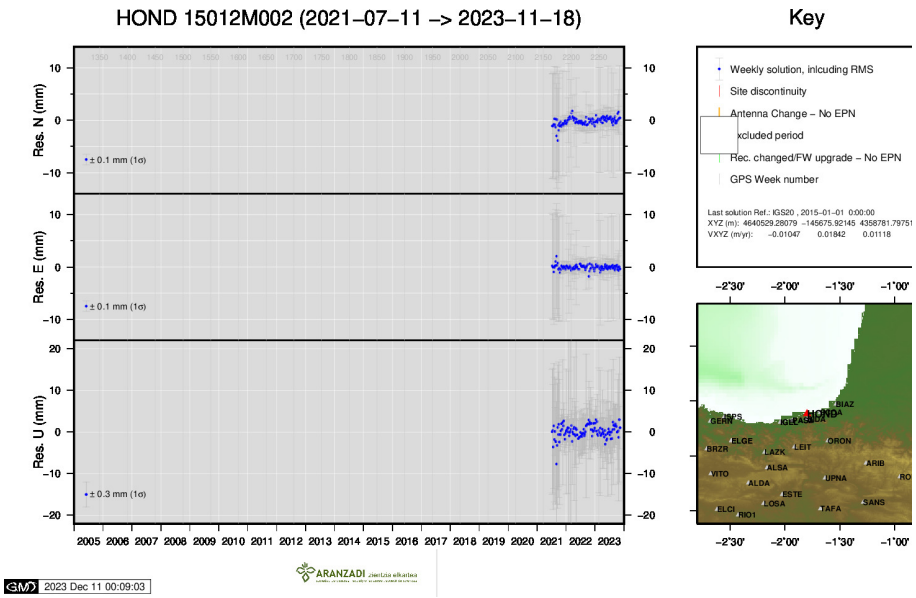
9) EBRE



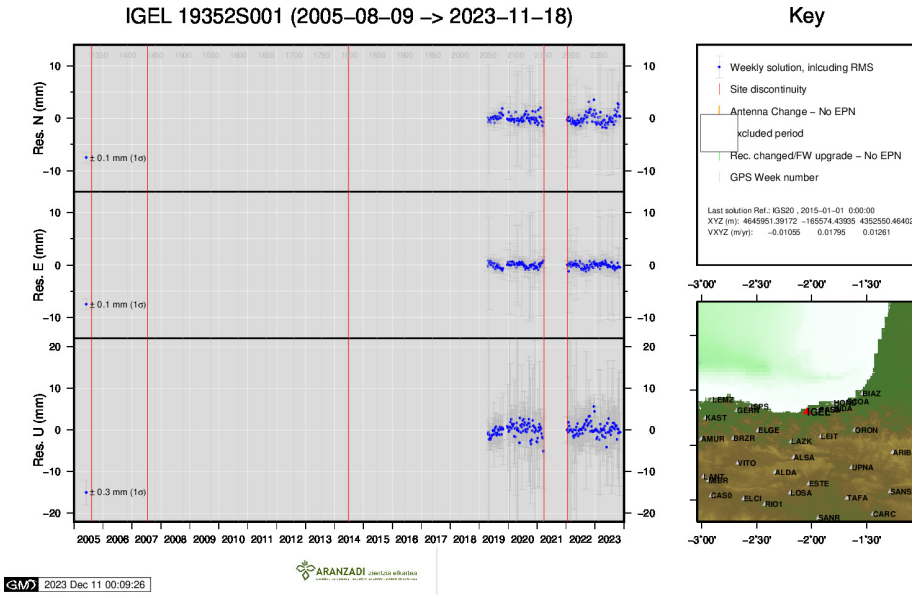
10) ELGE



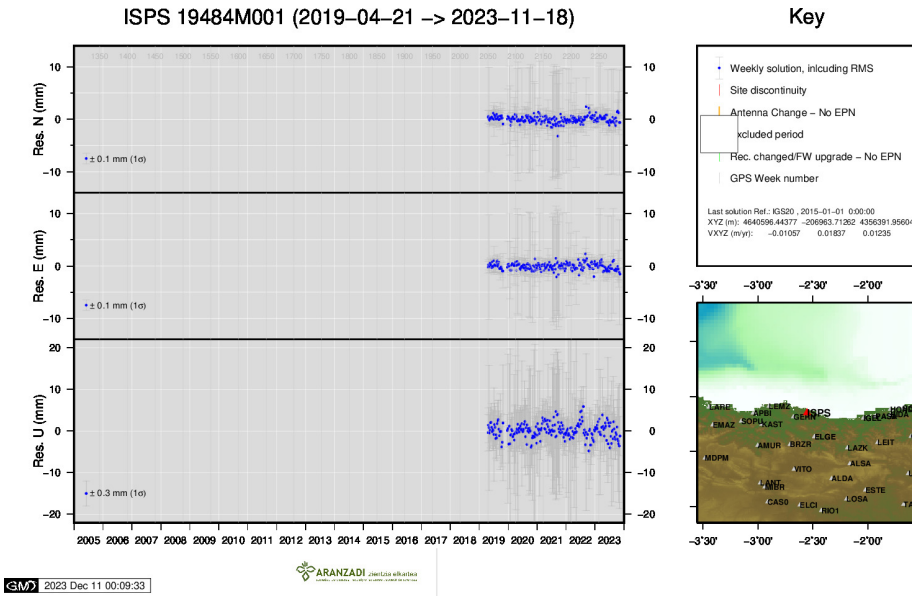
11) EMAZ



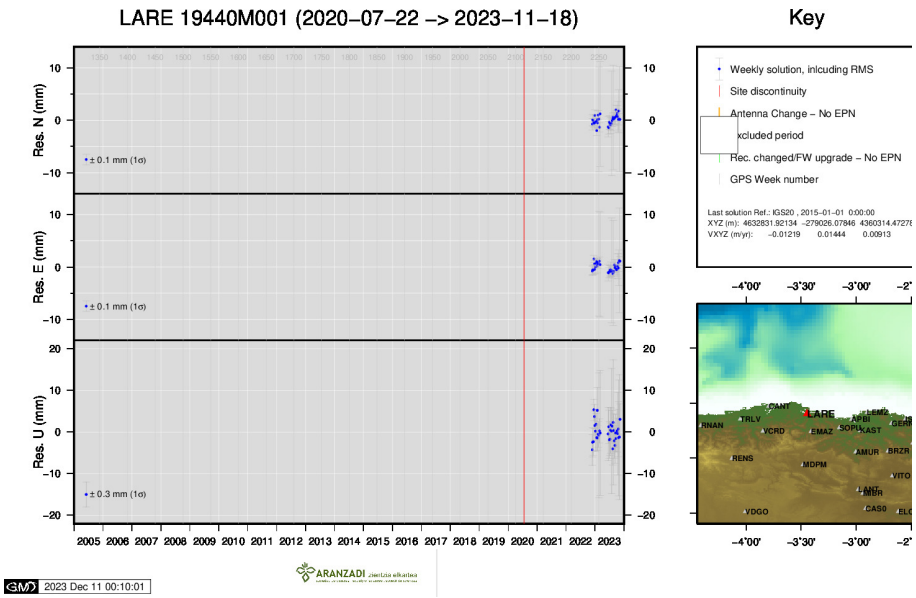
12) HOND



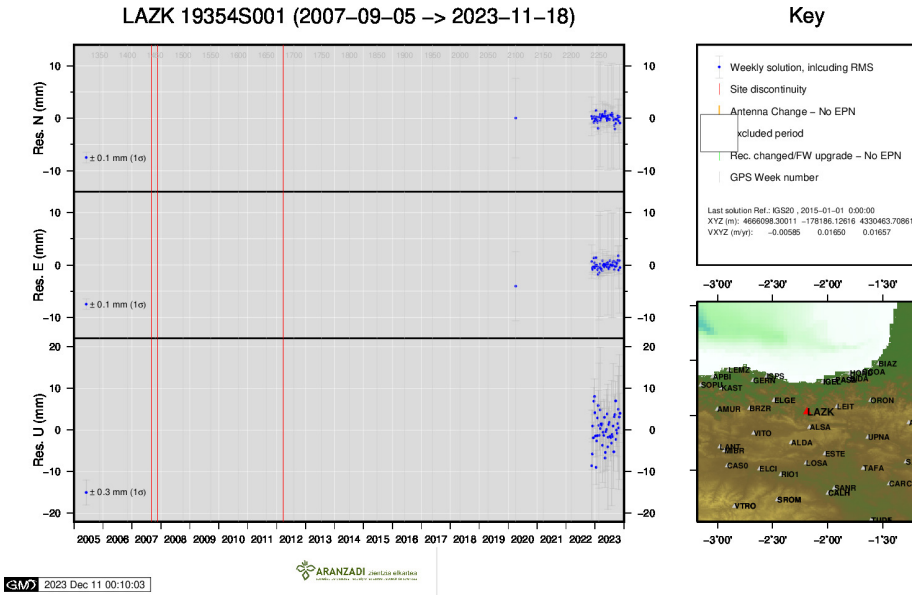
13) IGEL



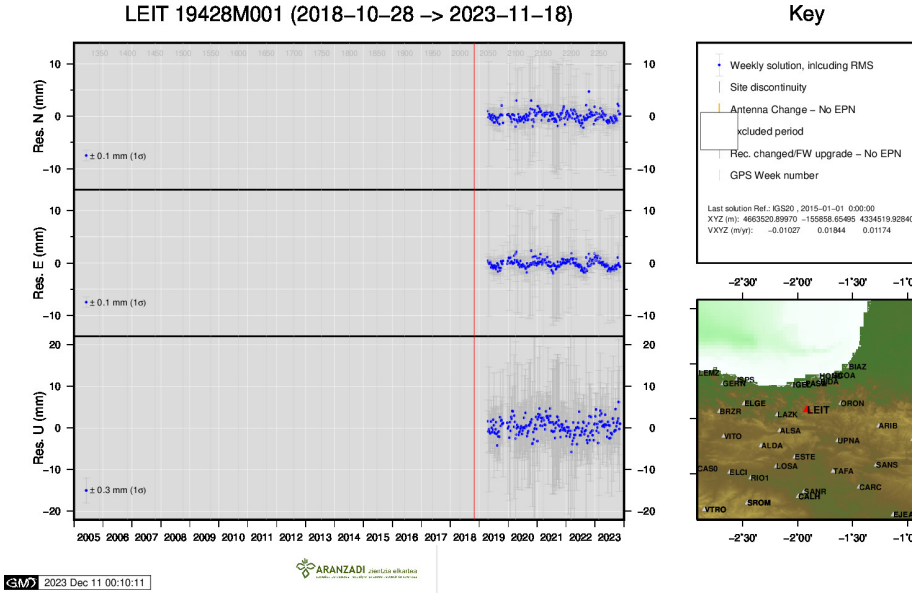
14) ISPS



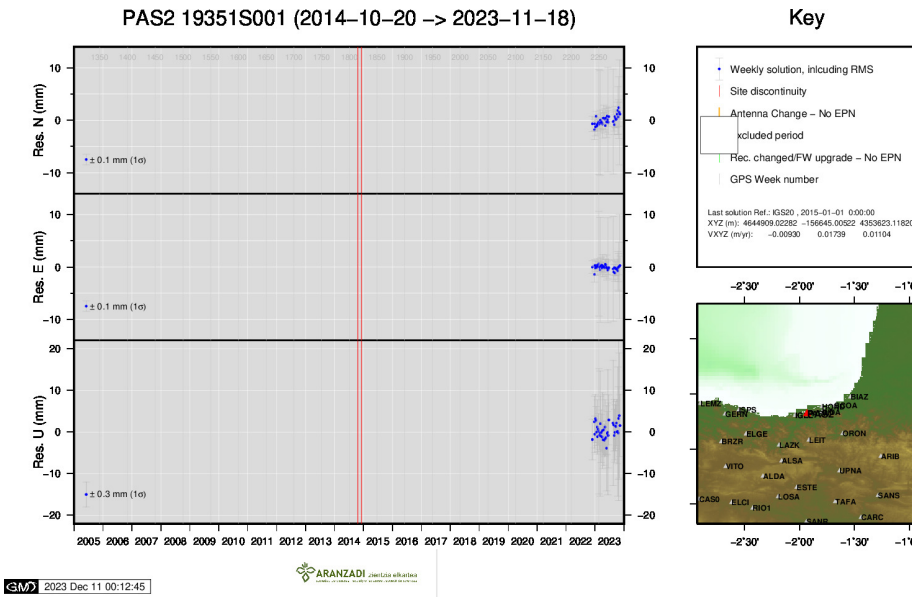
15) LARE



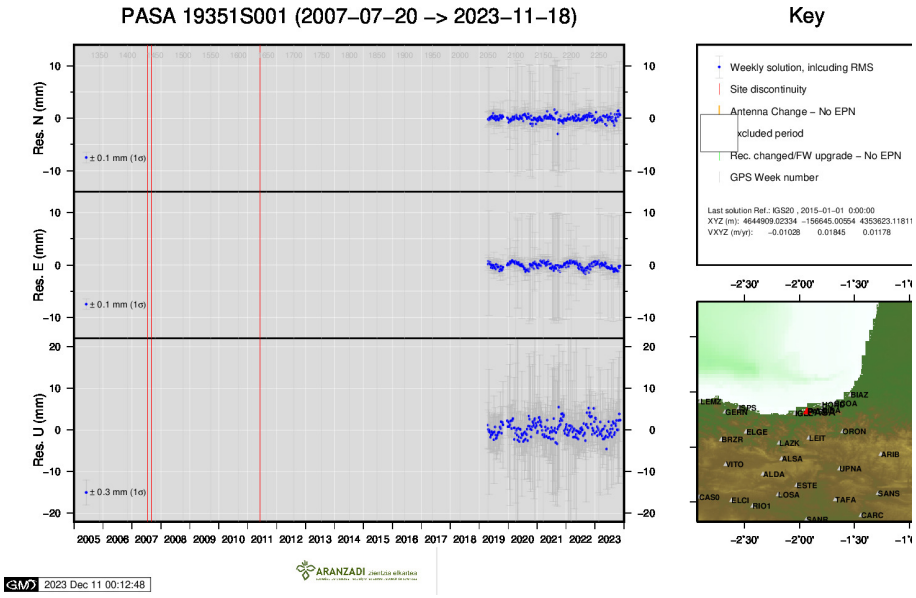
16) LAZK



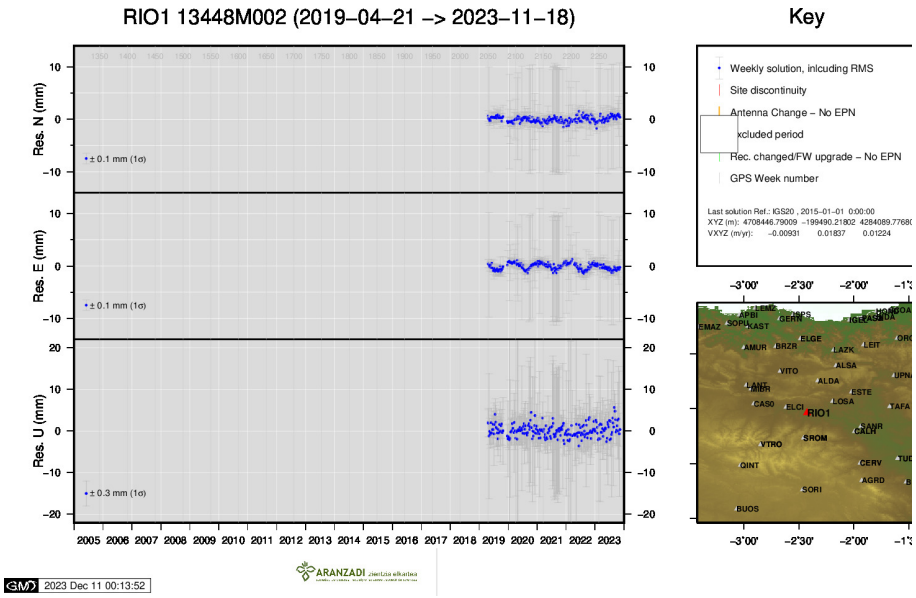
17) LEIT



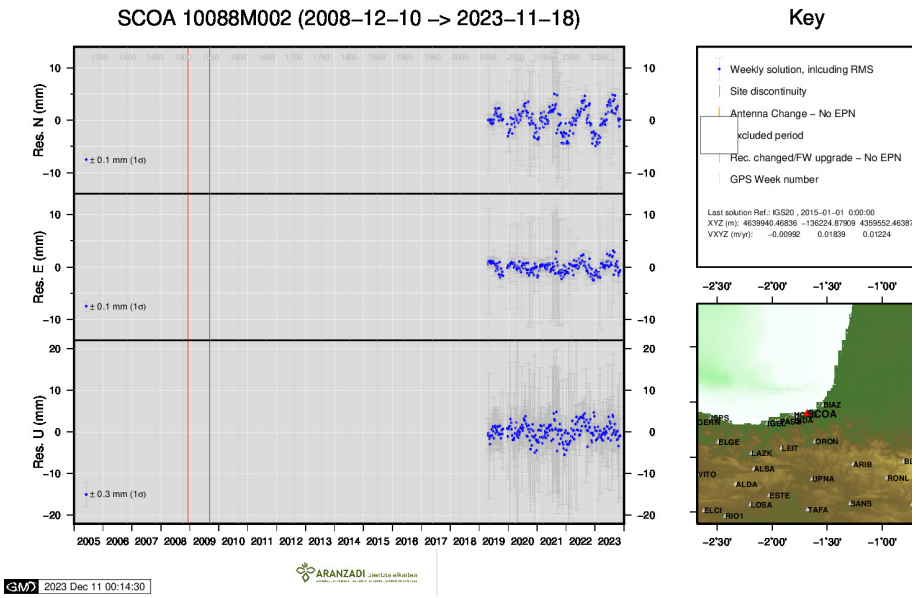
18) PAS2



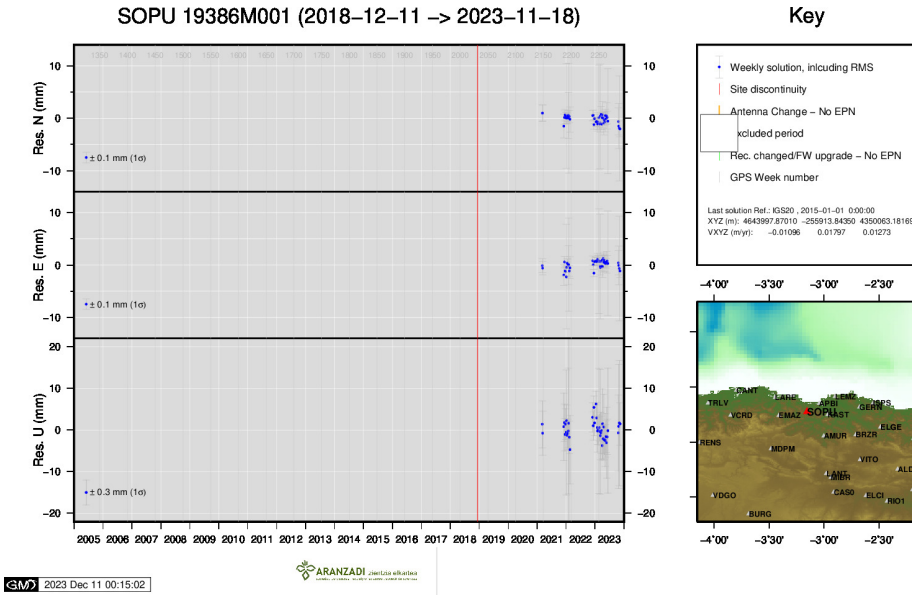
19) PASA



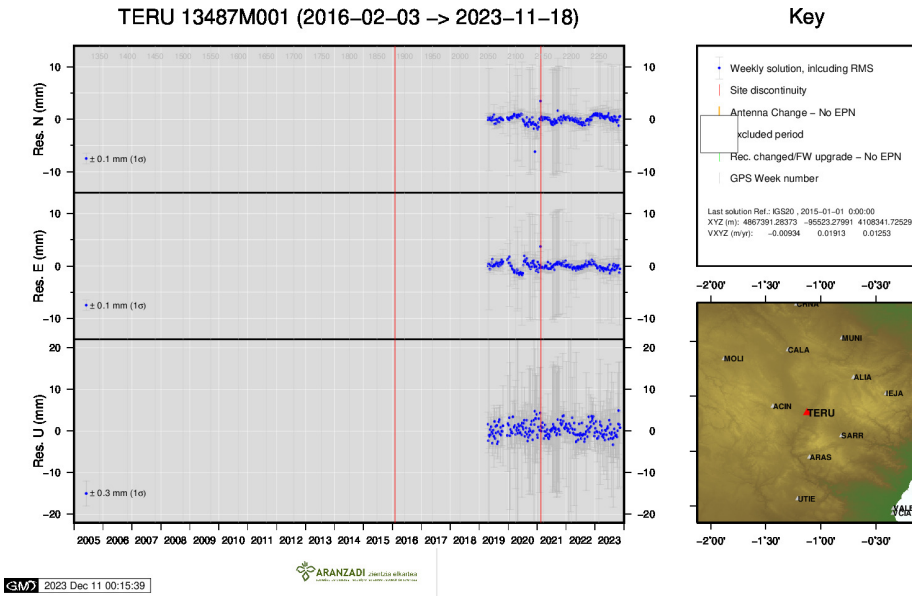
20) RIO1



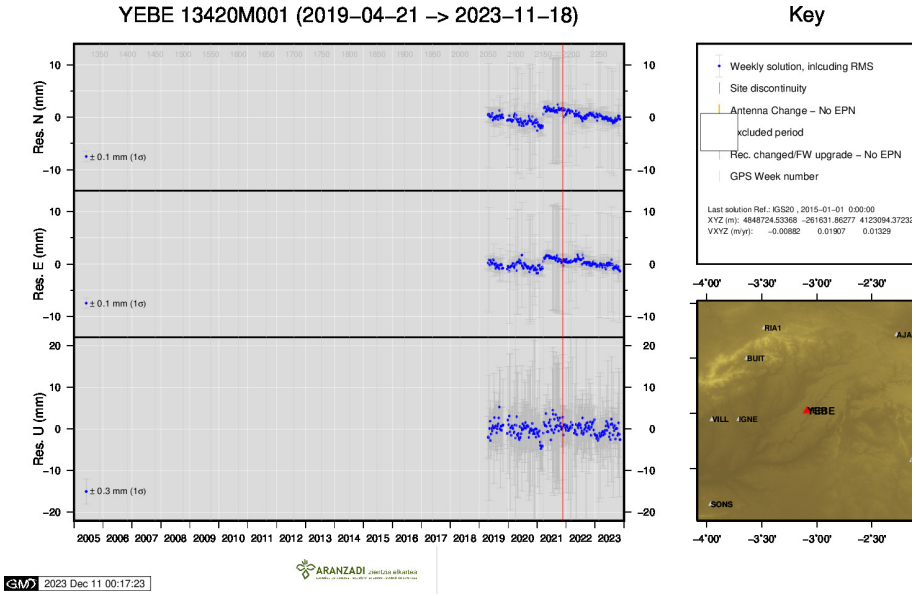
21) SCOA



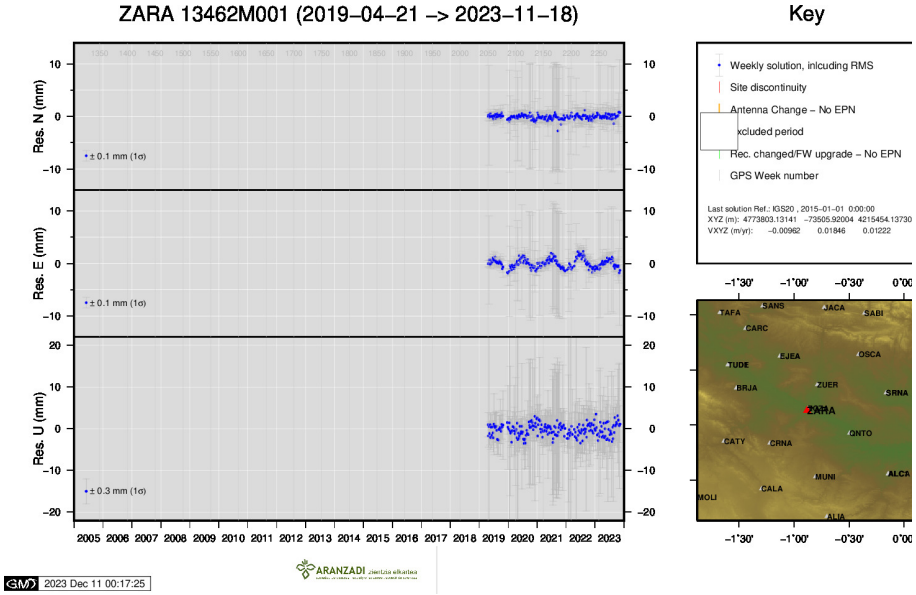
22) SOPU



23) TERU



24) YEBE



25) ZARA