

ARA-DAC Weekly Analysis Result: 2139 (GFA)

Technical Report

GPS Week: 2139 (GFA)

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

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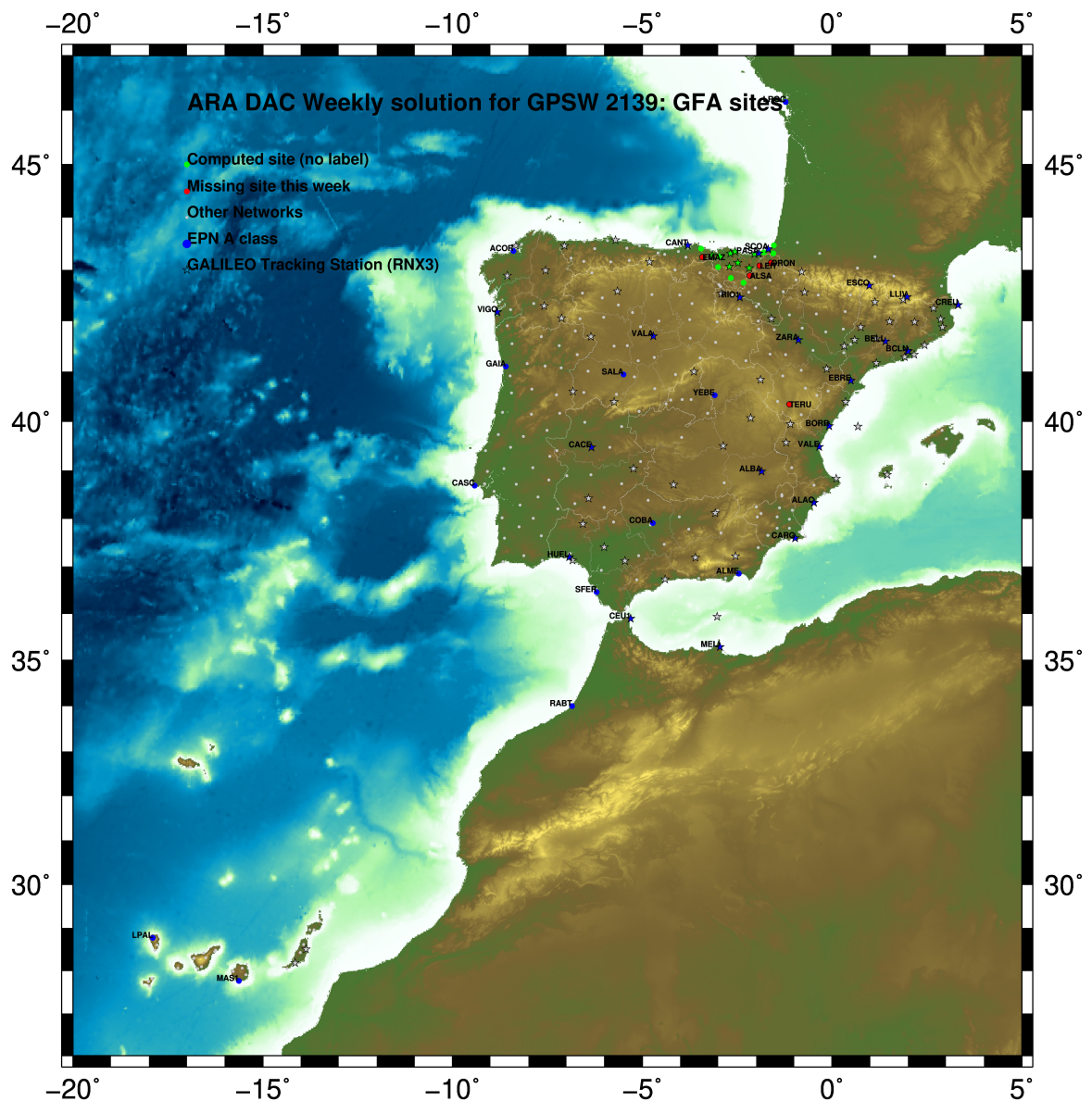
Report generated on 2021/01/25 at 13:34:54



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 2021 Jan 25 13:34:46

Fig.1: Computed Sites for GPS Week2139 (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 also used if available from GPSW 1986 on)
- 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.I14 file and individual calibrations from EPNC_14.ATX. EPN_A class sites (CRD + VEL) IGb14 used to define the reference frame (from GPSW 1934). If individual calibrations, other from these, are available, they are also included in the analysis.
- Troposphere:
 - 3 deg elev. cutoff; elevation dependent weighting
 - VMF1 mapping function. ZPD parameters are estimated using the VMF1 mapping function.
 - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2004 (Scherneck).
- Atmosph. Loading: computed from a global grid using the GRDS1S2 program of Bernese 5.2.

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 EPN A class 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. DE405 planetary ephemeris and JGM3 Earth geopotential model is used.
- Tidal displacements: according to IERS2010 Conventions. Atmospheric loading corrections used.

- Ambiguity: an advanced ambiguity resolution (AR) scheme is included:
 - Code-Based Widelane (WL) 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 are the ones used in the Minimal Constraints condition.

5.1 IGb14

The Reference Frame considered in this section is IGb14, release C2115.

ARA LAC 2139 WEEK FINAL COMBINATION: PRECISE ORBITS 25-JAN-21 10:41

LOCAL GEODETIC DATUM: IGb14 EPOCH: 2021-01-06 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.54052	-678367.41044	4357066.29944	W
39	ALDA 19383M001	4687280.13605	-190876.53636	4308106.97580	A
53	AMUR 19388M001	4661499.42841	-244591.22882	4332269.89851	A
100	BIAZ 10074M002	4634456.02971	-124344.94607	4365785.47640	A
101	BIDA 00000M000	4644177.79988	-145778.29405	4354832.50085	A
113	BRZR 19387M001	4662220.96851	-220769.86645	4333309.45757	A
100	CACE 13447M001	4899866.48635	-544567.00508	4033770.22361	W
111	CANT 13438M001	4625924.29195	-307096.20370	4365771.57215	W
154	CHER 00000M000	4645879.99839	-125721.87976	4353624.10272	A
156	CREU 13432M001	4715420.10635	273178.08939	4271946.85834	W
194	EBRE 13410M001	4833519.97161	41537.42036	4147461.73811	W
180	ELGE 19353S001	4657557.37473	-202241.45084	4338991.88810	A
209	GERN 19389M001	4642811.29960	-217222.89321	4353278.89540	A
235	IGEL 19352S001	4645951.40523	-165574.47328	4352550.43561	A
240	ISPS 19484M001	4640596.45679	-206963.74698	4356391.93221	A
245	KAST 19499M001	4646949.05961	-240747.24379	4348015.01353	A
252	LARE 19440M001	4632831.93431	-279026.11095	4360314.45026	A
256	LAZK 19354S001	4666098.30980	-178186.16116	4330463.68085	A
345	PAS2 19351S001	4644909.03613	-156645.03781	4353623.09443	A
464	PASA 19351S001	4644909.03610	-156645.03774	4353623.09443	W
522	RI01 13448M002	4708446.80560	-199490.25380	4284089.75422	W
527	SALA 13469M001	4803054.46693	-462131.04119	4158379.09951	W
535	SC0A 10088M002	4639940.47790	-136224.91375	4359552.42827	W
418	SOPU 19386M001	4643997.88732	-255913.87675	4350063.16204	A
493	VITO 19385M001	4679397.68078	-218436.47261	4314898.38346	A
708	YEBE 13420M001	4848724.54998	-261631.90066	4123094.34678	W
711	ZARA 13462M001	4773803.14775	-73505.95489	4215454.11502	W

5.2 ETRF2000 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

ETRF2000 FINAL COORD. wk 2139 25-JAN-21 10:41

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2021-01-06 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.85964	-678367.97903	4357065.86093	W
39	ALDA 19383M001	4687280.51168	-190877.11411	4308106.53620	A
53	AMUR 19388M001	4661499.79919	-244591.80389	4332269.46028	A
100	BIAZ 10074M002	4634456.41773	-124345.51783	4365785.04185	A
101	BIDA 00000M000	4644178.18447	-145778.86694	4354832.06525	A
113	BRZR 19387M001	4662221.34230	-220770.44154	4333309.01958	A
100	CACE 13447M001	4899866.79834	-544567.60670	4033769.76248	W
111	CANT 13438M001	4625924.65748	-307096.77502	4365771.13595	W
154	CHER 00000M000	4645880.38536	-125722.45278	4353623.66724	A
156	CREU 13432M001	4715420.53638	273177.51018	4271946.42231	W
194	EBRE 13410M001	4833520.36408	41536.82742	4147461.28977	W
180	ELGE 19353S001	4657557.75122	-202242.02537	4338991.45072	A
209	GERN 19389M001	4642811.67528	-217223.46615	4353278.45900	A
235	IGEL 19352S001	4645951.78722	-165575.04643	4352549.99962	A
240	ISPS 19484M001	4640596.83396	-206964.31965	4356391.49612	A
245	KAST 19499M001	4646949.43101	-240747.81725	4348014.57650	A
252	LARE 19440M001	4632832.30290	-279026.68296	4360314.01387	A
256	LAZK 19354S001	4666098.68762	-178186.73655	4330463.24310	A
345	PAS2 19351S001	4644909.41929	-156645.61081	4353622.65864	A
464	PASA 19351S001	4644909.41926	-156645.61074	4353622.65864	W
522	RI01 13448M002	4708447.17842	-199490.83388	4284089.31282	W
527	SALA 13469M001	4803054.79821	-462131.63220	4158378.64719	W
535	SC0A 10088M002	4639940.86401	-136225.48615	4359551.99313	W
418	SOPU 19386M001	4643998.25800	-255914.44993	4350062.72505	A
493	VITO 19385M001	4679398.05352	-218437.04957	4314897.94414	A
708	YEBE 13420M001	4848724.90338	-261632.49617	4123093.89339	W
711	ZARA 13462M001	4773803.53105	-73506.54172	4215453.67001	W

5.3 ETRF2014 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2014 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

ETRF2014 FINAL COORD. wk 2139 25-JAN-21 10:41

 LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2021-01-06 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.81857	-678368.01708	4357065.91179	W
39	ALDA 19383M001	4687280.46833	-190877.15345	4308106.58693	A
53	AMUR 19388M001	4661499.75626	-244591.84314	4332269.51106	A
100	BIAZ 10074M002	4634456.37470	-124345.55760	4365785.09276	A
101	BIDA 00000M000	4644178.14140	-145778.90660	4354832.11613	A
113	BRZR 19387M001	4662221.29930	-220770.48087	4333309.07037	A
100	CACE 13447M001	4899866.75375	-544567.64396	4033769.81255	W
111	CANT 13438M001	4625924.61509	-307096.81421	4365771.18680	W
154	CHER 00000M000	4645880.34221	-125722.49250	4353623.71812	A
156	CREU 13432M001	4715420.49112	273177.46942	4271946.47327	W
194	EBRE 13410M001	4833520.31843	41536.78791	4147461.34025	W
180	ELGE 19353S001	4657557.70820	-202242.06478	4338991.50153	A
209	GERN 19389M001	4642811.63246	-217223.50558	4353278.50985	A
235	IGEL 19352S001	4645951.74420	-165575.08601	4352550.05048	A
240	ISPS 19484M001	4640596.79113	-206964.35912	4356391.54698	A
245	KAST 19499M001	4646949.38822	-240747.85658	4348014.62733	A
252	LARE 19440M001	4632832.26036	-279026.72222	4360314.06472	A
256	LAZK 19354S001	4666098.64444	-178186.77601	4330463.29389	A
345	PAS2 19351S001	4644909.37623	-156645.65036	4353622.70950	A
464	PASA 19351S001	4644909.37623	-156645.65036	4353622.70950	W
522	RI01 13448M002	4708447.13487	-199490.87310	4284089.36349	W
527	SALA 13469M001	4803054.75445	-462131.67014	4158378.69752	W
535	SC0A 10088M002	4639940.82096	-136225.52586	4359552.04402	W
418	SOPU 19386M001	4643998.21529	-255914.48922	4350062.77588	A
493	VITO 19385M001	4679398.01033	-218437.08884	4314897.99488	A
708	YEBE 13420M001	4848724.85856	-261632.53460	4123093.94367	W
711	ZARA 13462M001	4773803.48642	-73506.58110	4215453.72057	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 IGB14 solution and are given with respect to the Local frame (North-East-Up).

ARA LAC 2139 WEEK FINAL COMBINATION: PRECISE ORBITS 25-JAN-21 10:41

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.61	0.57	2.52
ALDA 19383M001	7	XXXXXX	0.91	0.43	2.05
AMUR 19388M001	7	XXXXXX	5.10	1.95	3.24
BIAZ 10074M002	7	XXXXXX	1.43	0.83	2.78
BIDA 00000M000	7	XXXXXX	0.84	0.90	2.75
BRZR 19387M001	7	XXXXXX	3.20	4.43	4.09
CACE 13447M001	7	XXXXXX	0.43	0.37	1.33
CANT 13438M001	7	XXXXXX	0.72	0.34	2.57
CHEP 00000M000	7	XXXXXX	0.79	0.92	1.96
CREU 13432M001	7	XXXXXX	0.94	0.78	1.72
EBRE 13410M001	7	XXXXXX	1.48	1.11	3.24
ELGE 19353S001	7	XXXXXX	1.92	4.13	7.19
GERN 19389M001	7	XXXXXX	0.69	1.73	7.17
IGEL 19352S001	7	XXXXXX	0.44	0.37	2.22
ISPS 19484M001	7	XXXXXX	0.72	0.48	2.57
KAST 19499M001	7	XXXXXX	0.75	0.73	7.04
LARE 19440M001	7	XXXXXX	1.28	0.36	2.53
LAZK 19354S001	7	XXXXXX	0.79	0.74	12.40
PAS2 19351S001	7	XXXXXX	0.41	0.35	2.07
PASA 19351S001	7	XXXXXX	0.49	0.31	2.24
R101 13448M002	7	XXXXXX	0.49	0.86	2.60
SALA 13469M001	7	XXXXXX	0.84	0.41	2.20
SCOA 10088M002	7	XXXXXX	0.79	0.41	2.73
SOPU 19386M001	7	XXXXXX	0.42	0.99	4.30
VITO 19385M001	7	XXXXXX	1.52	1.94	1.11
YEBE 13420M001	7	XXXXXX	4.11	0.99	3.48
ZARA 13462M001	7	XXXXXX	1.70	3.35	3.20

Comparison of individual solutions:

ACOR 13434M001	N	0.61	-0.91	-0.24	-0.11	0.21	0.39	0.72	0.76
ACOR 13434M001	E	0.57	0.00	0.71	-0.33	0.06	0.48	-1.05	-0.18
ACOR 13434M001	U	2.52	-0.70	-0.61	-1.54	-3.46	-0.16	2.46	4.12
ALDA 19383M001	N	0.91	-0.35	1.40	0.22	0.80	0.27	1.37	0.42
ALDA 19383M001	E	0.43	0.21	-0.00	-0.04	0.08	-0.44	-0.70	-0.63
ALDA 19383M001	U	2.05	1.44	-1.98	-2.25	-0.97	1.91	1.22	2.84
AMUR 19388M001	N	5.10	4.08	3.60	-10.43	2.03	2.34	2.23	-1.73
AMUR 19388M001	E	1.95	0.47	1.40	-3.05	-0.49	-0.82	-1.27	2.98
AMUR 19388M001	U	3.24	0.59	4.49	-4.14	-2.65	-1.47	-3.59	1.86
BIAZ 10074M002	N	1.43	2.07	2.30	0.85	-0.97	-0.13	-1.00	-0.05
BIAZ 10074M002	E	0.83	1.07	0.93	0.27	-0.42	-0.47	-0.67	-1.11
BIAZ 10074M002	U	2.78	-3.71	-1.60	1.49	0.11	-4.13	3.25	0.00
BIDA 00000M000	N	0.84	1.30	1.25	0.69	-0.24	0.58	-0.27	-0.20
BIDA 00000M000	E	0.90	-0.38	-1.09	-0.10	0.27	1.15	0.70	-1.30
BIDA 00000M000	U	2.75	2.61	3.50	0.95	-3.14	-3.46	-1.76	-0.66
BRZR 19387M001	N	3.20	-0.86	-7.26	-0.06	1.67	1.59	1.24	1.07
BRZR 19387M001	E	4.43	5.84	6.39	1.43	-3.20	-2.93	-3.00	-3.61
BRZR 19387M001	U	4.09	2.87	0.70	7.06	-1.31	-2.05	-5.64	1.98
CACE 13447M001	N	0.43	-0.18	-0.45	0.18	0.49	-0.71	-0.31	0.07
CACE 13447M001	E	0.37	0.12	0.35	0.03	0.18	0.20	-0.76	-0.18
CACE 13447M001	U	1.33	-2.67	1.56	0.20	0.03	-0.43	-0.87	0.13
CANT 13438M001	N	0.72	-1.45	-0.54	-0.59	0.22	-0.14	-0.21	0.52
CANT 13438M001	E	0.34	-0.16	0.19	0.44	0.62	-0.12	-0.25	0.02
CANT 13438M001	U	2.57	0.06	-0.05	-3.23	-0.04	-4.47	0.78	2.96
CHEP 00000M000	N	0.79	1.47	0.51	0.63	-0.64	0.46	0.15	0.48
CHEP 00000M000	E	0.92	-0.70	0.72	-1.35	0.57	0.51	0.42	-1.21
CHEP 00000M000	U	1.96	-1.31	1.74	2.46	-0.63	-3.04	1.02	-1.24
CREU 13432M001	N	0.94	1.93	-0.95	-0.32	-0.17	0.00	-0.74	0.10
CREU 13432M001	E	0.78	-1.66	-0.00	0.39	0.49	-0.43	0.60	-0.06
CREU 13432M001	U	1.72	1.77	-0.41	-0.16	-1.31	-2.33	-0.99	2.50
EBRE 13410M001	N	1.48	1.46	1.06	2.81	0.08	-1.04	-0.40	-0.84
EBRE 13410M001	E	1.11	-1.56	-1.88	-0.21	-0.43	0.24	1.04	0.13
EBRE 13410M001	U	3.24	0.11	5.88	-1.89	-2.44	-1.39	-2.89	2.90
ELGE 19353S001	N	1.92	-3.66	-1.61	0.89	1.38	0.83	1.19	1.16
ELGE 19353S001	E	4.13	3.31	6.84	1.22	-3.47	-3.61	-3.41	-2.55
ELGE 19353S001	U	7.19	-8.45	-8.77	-0.98	4.95	6.68	7.11	6.39
GERN 19389M001	N	0.69	-0.96	-0.57	-0.54	0.50	0.39	0.52	-0.80
GERN 19389M001	E	1.73	-1.90	-2.93	-0.37	0.75	1.02	1.09	1.66
GERN 19389M001	U	7.17	13.67	4.30	-1.10	-5.32	-4.56	-7.10	1.63
IGEL 19352S001	N	0.44	-0.43	0.60	-0.37	-0.41	-0.41	-0.03	-0.38
IGEL 19352S001	E	0.37	-0.22	0.63	-0.18	-0.40	0.07	-0.32	-0.25
IGEL 19352S001	U	2.22	2.82	1.55	-2.51	-0.38	-2.09	-0.53	2.84
ISPS 19484M001	N	0.72	-1.00	-0.90	0.03	0.95	-0.35	0.32	-0.44
ISPS 19484M001	E	0.48	-0.52	-0.89	0.23	0.15	-0.25	0.10	0.45
ISPS 19484M001	U	2.57	-2.00	-3.27	2.31	1.46	-2.17	1.71	3.12
KAST 19499M001	N	0.75	1.42	0.04	-0.08	-0.69	-0.84	-0.41	0.12
KAST 19499M001	E	0.73	-0.94	0.31	-0.97	0.10	0.27	-1.08	-0.29
KAST 19499M001	U	7.04	13.90	3.01	5.27	-4.86	-1.41	-6.48	0.06
LARE 19440M001	N	1.28	-0.60	0.23	-1.09	-0.10	1.82	-0.08	-2.21
LARE 19440M001	E	0.36	0.24	-0.15	0.08	0.74	-0.05	-0.03	0.37
LARE 19440M001	U	2.53	2.47	0.44	-1.47	-2.97	-1.66	-2.60	3.41
LAZK 19354S001	N	0.79	-0.08	0.89	0.64	-0.10	-1.32	-0.87	-0.15
LAZK 19354S001	E	0.74	-0.36	1.02	-0.52	-0.80	-0.69	-0.47	0.74
LAZK 19354S001	U	12.40	-9.02	-18.38	-7.77	9.21	11.24	15.15	-1.32
PAS2 19351S001	N	0.41	-0.59	-0.04	-0.03	0.24	-0.11	-0.30	-0.72
PAS2 19351S001	E	0.35	-0.08	0.34	-0.11	-0.09	-0.11	0.12	-0.75
PAS2 19351S001	U	2.07	2.86	2.31	0.46	-2.48	-1.02	-1.98	0.99
PASA 19351S001	N	0.49	-0.53	0.01	-0.14	0.24	0.09	-0.21	-1.03
PASA 19351S001	E	0.31	-0.05	0.22	-0.12	-0.08	0.01	0.08	-0.72
PASA 19351S001	U	2.24	2.85	1.93	0.59	-2.55	-1.40	-2.26	2.06
R101 13448M002	N	0.49	-0.14	0.50	-0.24	0.17	0.84	0.61	0.07
R101 13448M002	E	0.86	-1.21	-1.36	-0.31	0.19	-0.32	-0.51	0.81
R101 13448M002	U	2.60	2.84	2.13	3.20	1.42	0.07	0.78	-3.87
SALA 13469M001	N	0.84	-1.32	-0.72	0.15	1.03	0.58	-0.12	0.73

SALA 13469M001	E	0.41	0.20	0.26	0.49	0.13	0.34	-0.58	-0.41
SALA 13469M001	U	2.20	-1.83	-1.36	-0.29	-2.55	-1.90	0.65	3.65
SCDA 10088M002	N	0.79	1.02	0.04	0.20	-0.22	1.48	0.06	0.62
SCDA 10088M002	E	0.41	-0.59	-0.38	-0.27	0.31	0.51	-0.07	-0.30
SCDA 10088M002	U	2.73	-3.29	-4.49	0.20	1.50	-0.59	3.23	0.90
SOPU 19386M001	N	0.42	-0.64	0.49	-0.03	-0.17	-0.36	0.25	-0.42
SOPU 19386M001	E	0.99	-1.53	-0.68	-0.08	1.01	-0.40	-0.82	1.12
SOPU 19386M001	U	4.30	7.33	2.72	-2.85	2.20	-3.81	-3.39	3.28
VITO 19385M001	N	1.52	0.48	0.38	-2.64	1.14	0.72	1.76	1.26
VITO 19385M001	E	1.94	-0.64	0.81	4.01	-0.67	-0.93	-1.34	-1.53
VITO 19385M001	U	1.11	0.72	-0.77	1.42	-1.16	-1.19	0.16	-1.21
YEBE 13420M001	N	4.11	1.23	2.00	2.50	2.90	3.62	-6.41	-5.19
YEBE 13420M001	E	0.99	0.12	-0.32	-0.16	-0.22	-0.54	1.91	-1.32
YEBE 13420M001	U	3.48	1.15	-0.22	1.72	0.26	0.19	-1.79	-8.07
ZARA 13462M001	N	1.70	-1.05	-0.59	-0.59	-0.63	-0.36	-0.34	3.87
ZARA 13462M001	E	3.35	-1.36	-0.77	-0.86	-0.45	-2.04	-1.25	7.62
ZARA 13462M001	U	3.20	1.95	0.36	-0.44	-2.00	-3.36	-2.00	6.16

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.

LOCAL GEODETIC DATUM: Igb14
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
4	ACOR 13434M001	I W	0.22	-0.52	1.96
11	ALAC 13433M001	I W	0.58	0.29	1.14
14	ALBA 13452M001	I W	1.12	0.88	2.13
20	ALME 13437M001	I W	-1.71	-1.73	2.81
43	BCLN 13412M001	I W	0.42	-1.23	1.02
48	BELL 13431M001	I W	-0.30	-2.14	3.05
67	BORR 13480M001	I W	-1.91	-3.87	-2.47
72	BRST 10004M004	I W	-0.27	-0.76	6.89
100	CACE 13447M001	I W	1.67	-1.19	2.04
111	CANT 13438M001	I W	0.61	-0.72	2.12
112	CARG 19412M001	I W	0.63	-2.98	-1.26
116	CASC 13909S001	I W	-1.48	1.25	0.66
123	CEU1 13449M002	I W	-0.15	-0.27	-2.89
137	COBA 13453M001	I W	0.88	0.18	-5.77
156	CREU 13432M001	I W	-0.18	0.56	2.76
194	EBRE 13410M001	I W	-1.82	0.63	-3.92
212	ESCO 13435M001	I W	-0.10	0.53	1.33
229	GAI1 13902M001	I W	-0.15	-0.47	2.77
291	HUEL 13451M001	I W	-2.45	6.04	-3.18
365	LLIV 13436M001	I W	1.25	-0.62	1.36
370	LPAL 81701M001	I W	-4.15	2.89	-3.92
372	LROC 10023M001	I W	-0.58	0.45	3.50
395	MAS1 31303M002	I W	-0.03	-1.20	0.98
406	MELI 19379M001	I W	0.98	0.08	-2.94
464	PASA 19351S001	I W	-0.66	-0.60	0.70
505	RABT 35001M002	I W	0.68	0.51	-12.79
522	RID1 13448M002	I W	-0.04	-0.82	-0.31
527	SALA 13469M001	I W	0.36	0.83	-5.12
535	SCOA 10088M002	I W	2.06	0.98	0.35
543	SFER 13402M004	I W	1.01	-0.40	2.25
664	VALA 13463M002	I W	-0.09	1.76	-0.12
668	VALE 13439M001	I W	1.14	1.02	-0.26
679	VIGO 13450M001	I W	-0.33	1.17	3.20
708	YEBE 13420M001	I W	2.26	0.44	3.40
711	ZARA 13462M001	I W	0.57	0.43	-0.89
720	ZIMM 14001M004	I W	-0.05	-1.40	-0.57
	RMS / COMPONENT		1.28	1.67	3.52
	MEAN		-0.00	-0.00	-0.00
	MIN		-4.15	-3.87	-12.79
	MAX		2.26	6.04	6.89

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 108
RMS OF TRANSFORMATION : 2.37 MM

BARYCENTER COORDINATES:

LATITUDE : 40 5 50.25
LONGITUDE : - 3 40 50.56
HEIGHT : -31.007 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.39 MM
TRANSLATION IN E : 0.00 +- 0.39 MM
TRANSLATION IN U : 0.00 +- 0.39 MM

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          16078112
NUMBER OF UNKNOWN(S)            182328
NUMBER OF DEGREES OF FREEDOM    15895784
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  1.622890026267044

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00250    0.0045  0.0037 -0.0081  0.0000  0.0003  0.0002  0.00024
 2  0.00218    0.0027  0.0089 -0.0007 -0.0001  0.0001  0.0003 -0.00016
 3  0.00197    0.0072 -0.0072 -0.0100  0.0002  0.0004 -0.0002  0.00010
 4  0.00232    0.0156  0.0076 -0.0194  0.0001  0.0008  0.0004  0.00010
 5  0.00246    0.0000 -0.0042 -0.0003  0.0001  0.0000 -0.0001 -0.00004
 6  0.00213   -0.0224 -0.0263  0.0259  0.0004 -0.0011 -0.0008 -0.00020
 7  0.00313    0.0024 -0.0006  0.0042 -0.0000 -0.0000 -0.0000 -0.00068
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00126    2127375  1.59          2152500      3          819  24309  0
 2  0.00130    2175452  1.68          2202495      3          822  26224  0
 3  0.00127    2161687  1.61          2187427      3          822  24921  0
 4  0.00128    2185162  1.64          2210643      3          819  24665  0
 5  0.00124    2430012  1.55          2458263      3          882  27372  0
 6  0.00128    2454260  1.63          2483022      3          885  27880  0
 7  0.00126    2356856  1.58          2383762      3          855  26054  0
```

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 21:003:00000 21:009:86370 LEICA GR50 -----
ALDA A 1 P 21:003:00000 21:009:86370 LEICA GR10 -----
AMUR A 1 P 21:003:00000 21:009:86370 LEICA GR10 -----
BIAZ A 1 P 21:003:00000 21:009:86370 SPECTRA SP90M -----
BIDA A 1 P 21:003:00000 21:009:86370 LEICA GR10 -----
BRZR A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
CACE A 1 P 21:003:00000 21:009:86370 TRIMBLE NETR9 -----
CANT A 1 P 21:003:00000 21:009:86370 LEICA GR10 -----
CHER A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
CREU A 1 P 21:003:49290 21:009:86370 LEICA GR50 -----
EBRE A 1 P 21:003:55530 21:009:86370 LEICA GR50 -----
ELGE A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
GERN A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
IGEL A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
ISPS A 1 P 21:003:00000 21:009:86370 TRIMBLE NETR9 -----
KAST A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
LARE A 1 P 21:003:00000 21:009:86370 LEICA GR50 -----
LAZK A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
PAS2 A 1 P 21:003:00030 21:009:86370 STONEX SC2200 -----
PASA A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
RIO1 A 1 P 21:003:00000 21:009:86370 LEICA GR25 -----
SALA A 1 P 21:003:00000 21:009:86370 LEICA GRX1200+GNSS -----
SCOA A 1 P 21:003:00000 21:009:86370 LEICA GR25 -----
SOPU A 1 P 21:003:00000 21:009:86370 LEICA GR30 -----
VITO A 1 P 21:003:00000 21:009:86370 LEICA GR10 -----
YEBE A 1 P 21:003:00000 21:009:86370 TRIMBLE NETR9 -----
ZARA A 1 P 21:003:00000 21:009:86370 TRIMBLE NETR9 -----
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are available.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__
ACOR A 1 P 21:003:00000 21:009:86370 LEIAT504 LEIS -----
ALDA A 1 P 21:003:00000 21:009:86370 LEIAS10 NONE -----
AMUR A 1 P 21:003:00000 21:009:86370 LEIAS10 NONE -----
BIAZ A 1 P 21:003:00000 21:009:86370 LEIAR25 LEIT -----
BIDA A 1 P 21:003:00000 21:009:86370 LEIAS10 NONE -----
BRZR A 1 P 21:003:00000 21:009:86370 LEIAS10 NONE -----
CACE A 1 P 21:003:00000 21:009:86370 TRM29659.00 NONE -----
CANT A 1 P 21:003:00000 21:009:86370 LEIAR25.R4 LEIT 25066
CHER A 1 P 21:003:00000 21:009:86370 LEIAR10 NONE -----
```

CREU	A	1	P	21:003:49290	21:009:86370	LEIAR25.R4	NONE	26357
EBRE	A	1	P	21:003:55530	21:009:86370	LEIAR25.R4	NONE	26359
ELGE	A	1	P	21:003:00000	21:009:86370	LEIAR25.R4	LEIT	----
GERN	A	1	P	21:003:00000	21:009:86370	LEIAS10	NONE	----
IGEL	A	1	P	21:003:00000	21:009:86370	LEIAR20	LEIM	----
ISPS	A	1	P	21:003:00000	21:009:86370	TRM59900.00	SCIS	----
KAST	A	1	P	21:003:00000	21:009:86370	LEIAS10	NONE	----
LARE	A	1	P	21:003:00000	21:009:86370	LEIAR20	LEIM	----
LAZK	A	1	P	21:003:00000	21:009:86370	LEIAR25.R4	LEIT	----
PAS2	A	1	P	21:003:00030	21:009:86370	LEIAR20	LEIM	73034
PASA	A	1	P	21:003:00000	21:009:86370	LEIAR20	LEIM	73034
RI01	A	1	P	21:003:00000	21:009:86370	LEIAR25.R4	LEIT	25138
SALA	A	1	P	21:003:00000	21:009:86370	LEIAR25	NONE	----
SCDA	A	1	P	21:003:00000	21:009:86370	TRM55971.00	NONE	----
SOPU	A	1	P	21:003:00000	21:009:86370	LEIAS10	NONE	----
VITO	A	1	P	21:003:00000	21:009:86370	LEIAS10	NONE	----
YEBE	A	1	P	21:003:00000	21:009:86370	TRM29659.00	NONE	----
ZARA	A	1	P	21:003:00000	21:009:86370	TRM29659.00	NONE	----

7.3 Eccentricities

*SITE	PT	SOLN	T	DATA_START_	DATA_END_	AXE	UP_	NORTH_	EAST_	
							ARP->	BENCHMARK(M)		
ACOR	A	1	P	21:003:00000	21:009:86370	UNE	3.0460	0.0000	0.0000	
ALDA	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
AMUR	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
BIAZ	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
BIDA	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
BRZR	A	1	P	21:003:00000	21:009:86370	UNE	0.0771	0.0000	0.0000	
CACE	A	1	P	21:003:00000	21:009:86370	UNE	0.0600	0.0000	0.0000	
CANT	A	1	P	21:003:00000	21:009:86370	UNE	3.0490	0.0000	0.0000	
CHER	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
CREU	A	1	P	21:003:49290	21:009:86370	UNE	0.0770	0.0000	0.0000	
EBRE	A	1	P	21:003:55530	21:009:86370	UNE	0.0770	0.0000	0.0000	
ELGE	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
GERN	A	1	P	21:003:00000	21:009:86370	UNE	0.0771	0.0000	0.0000	
IGEL	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
ISPS	A	1	P	21:003:00000	21:009:86370	UNE	0.0350	0.0000	0.0000	
KAST	A	1	P	21:003:00000	21:009:86370	UNE	0.0350	0.0000	0.0000	
LARE	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
LAZK	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
PAS2	A	1	P	21:003:00030	21:009:86370	UNE	0.0000	0.0000	0.0000	
PASA	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
RI01	A	1	P	21:003:00000	21:009:86370	UNE	0.0606	0.0000	0.0000	
SALA	A	1	P	21:003:00000	21:009:86370	UNE	0.0600	0.0000	0.0000	
SCDA	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
SOPU	A	1	P	21:003:00000	21:009:86370	UNE	0.0771	0.0000	0.0000	
VITO	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
YEBE	A	1	P	21:003:00000	21:009:86370	UNE	0.0000	0.0000	0.0000	
ZARA	A	1	P	21:003:00000	21:009:86370	UNE	3.2590	0.0000	0.0000	

8 References

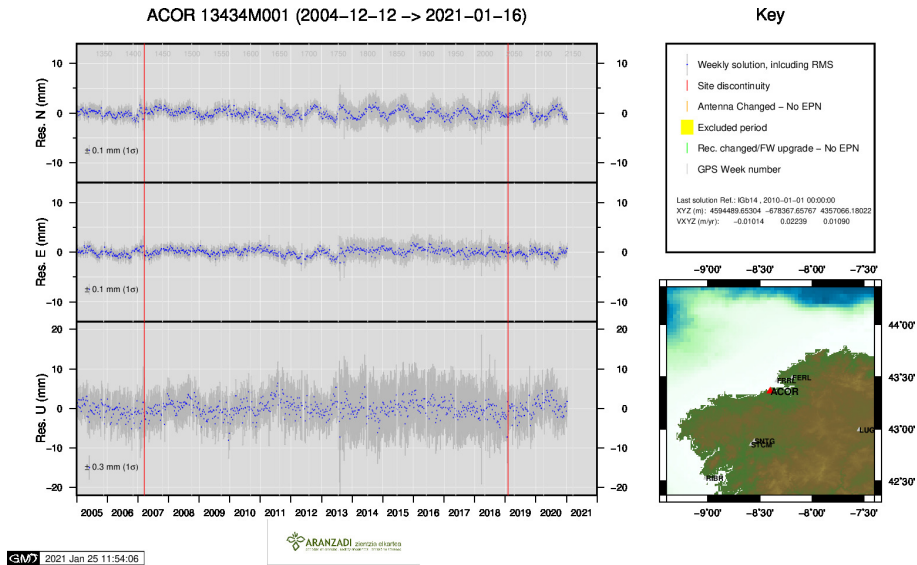
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. etrs89.ensg.ign.fr/memo-V8.pdf

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

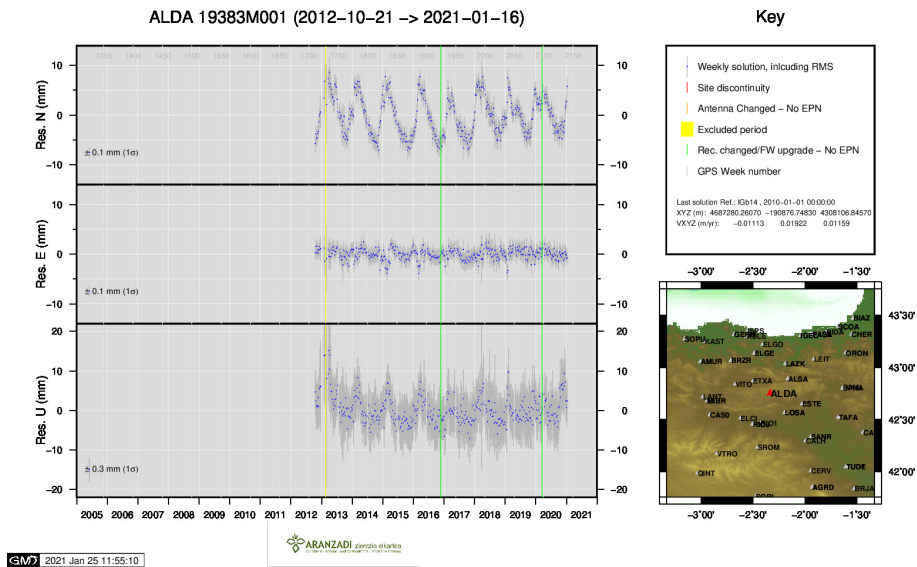
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

9 Cumulative Time Series

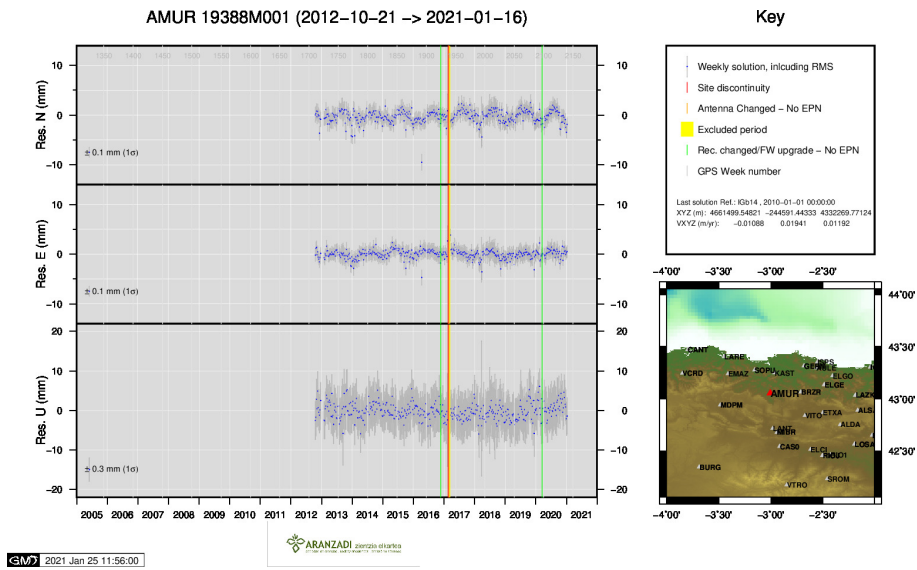
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



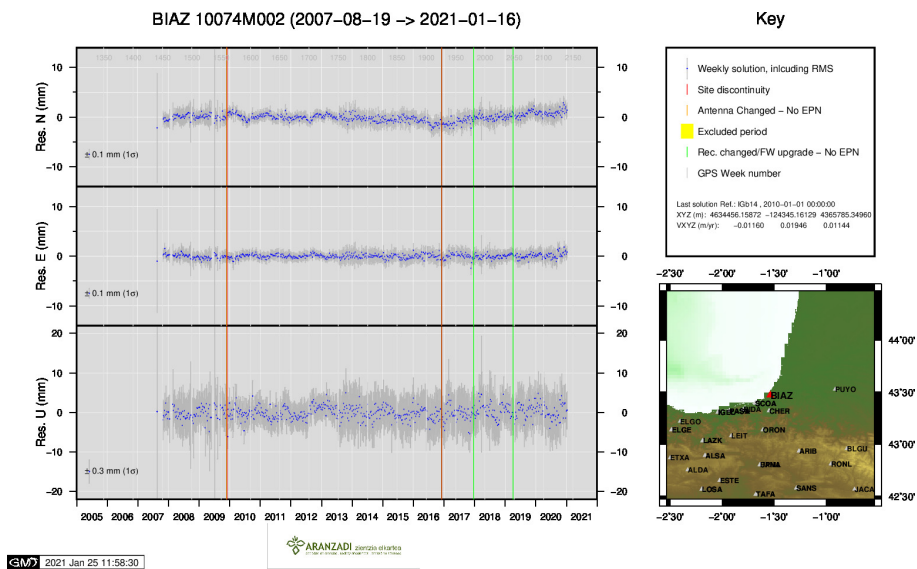
1) ACOR



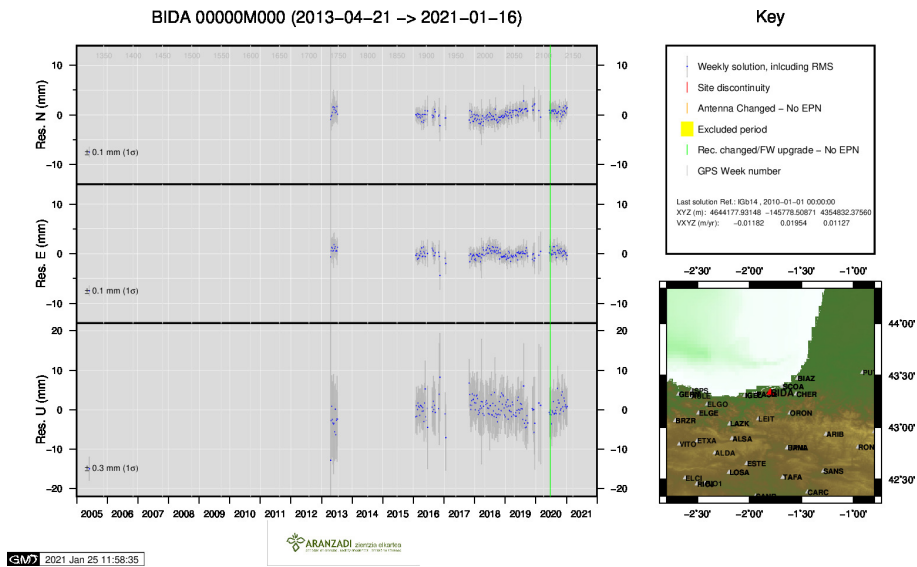
2) ALDA



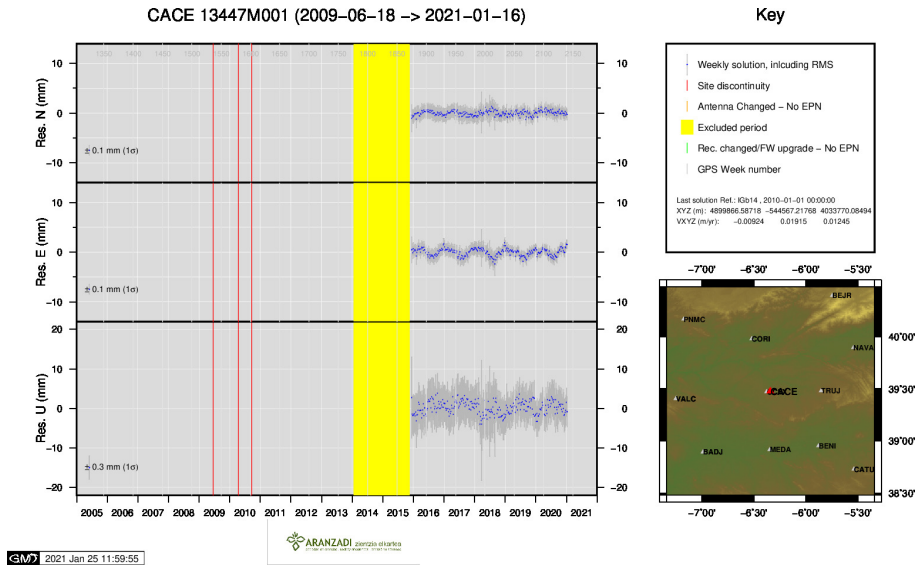
3) AMUR



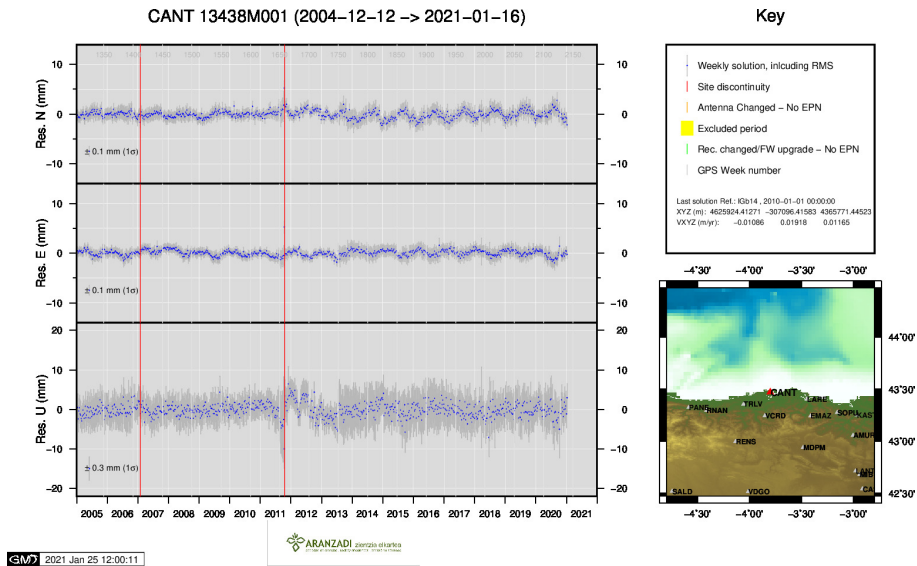
4) BIAZ



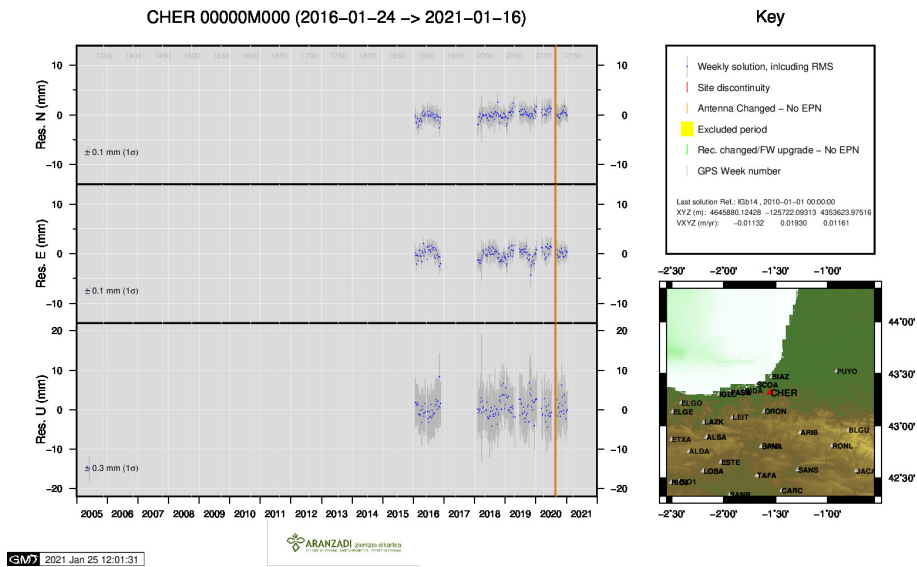
5) BIDA



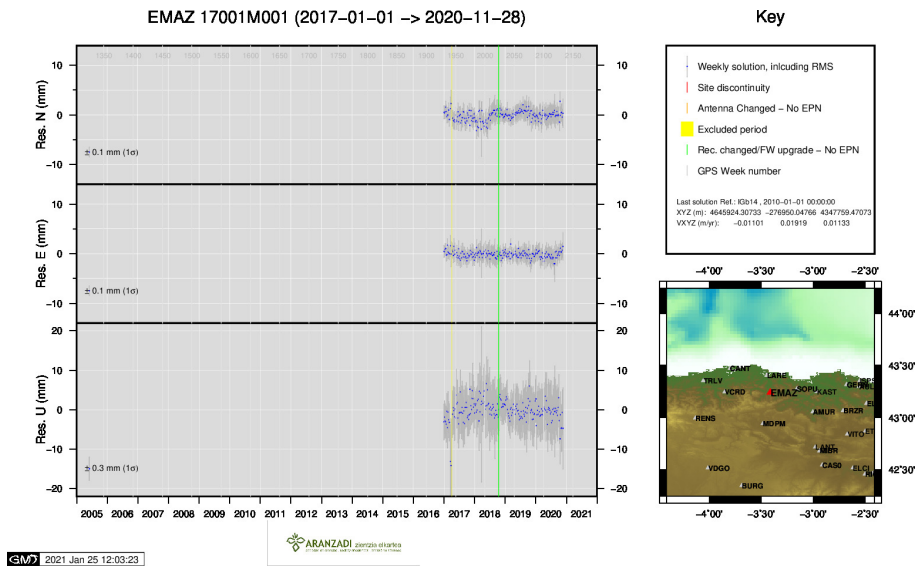
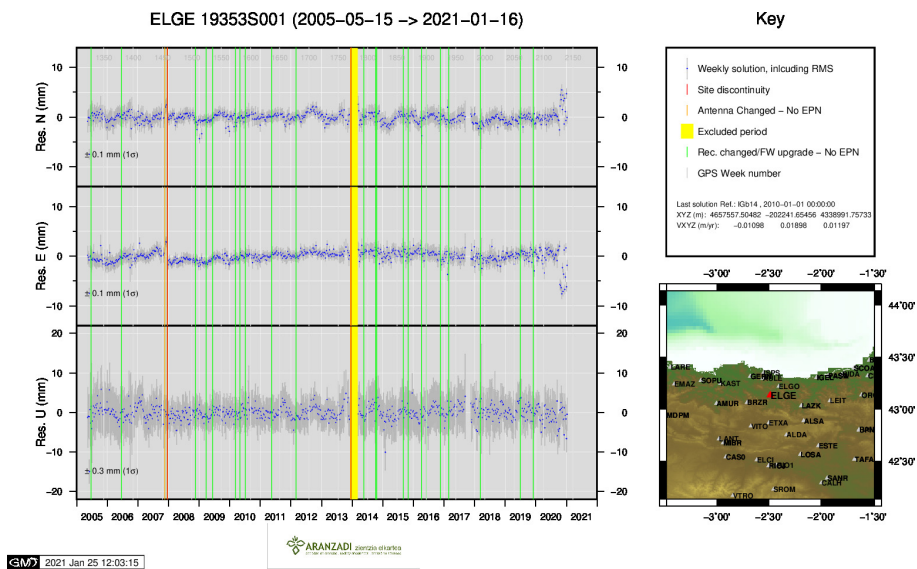
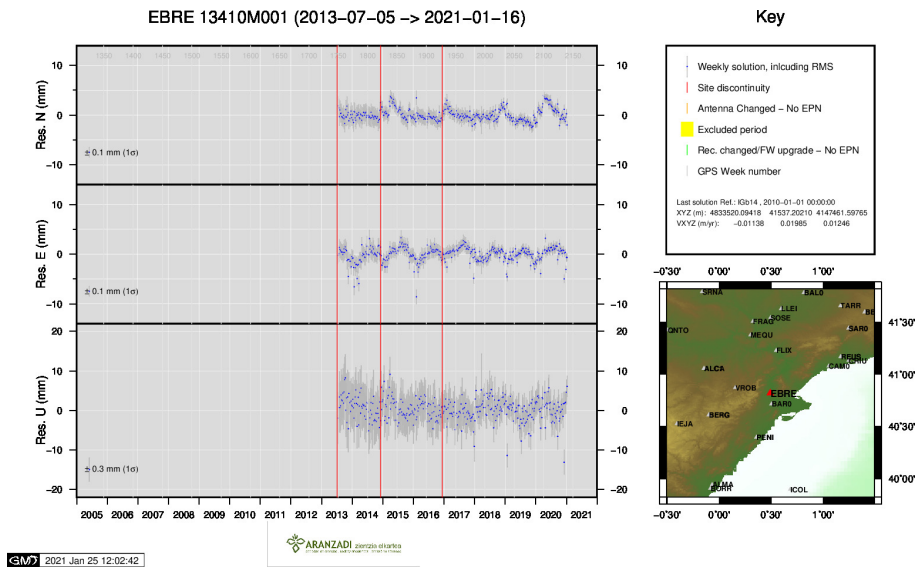
6) CACE

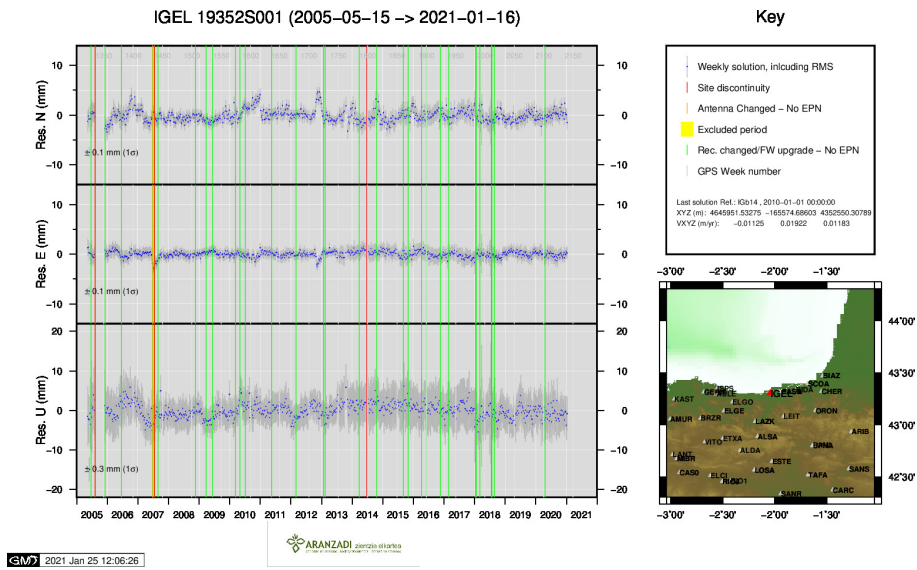


7) CANT

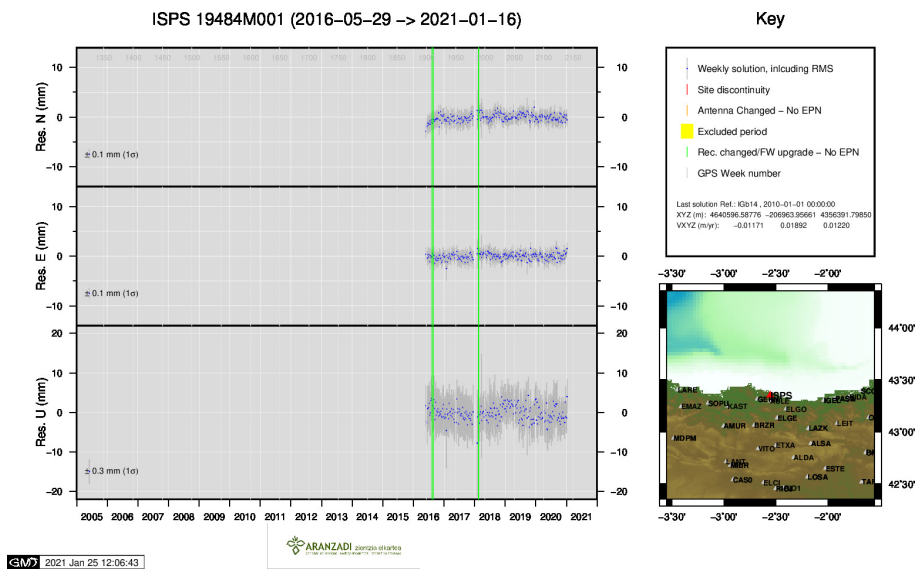


8) CHER

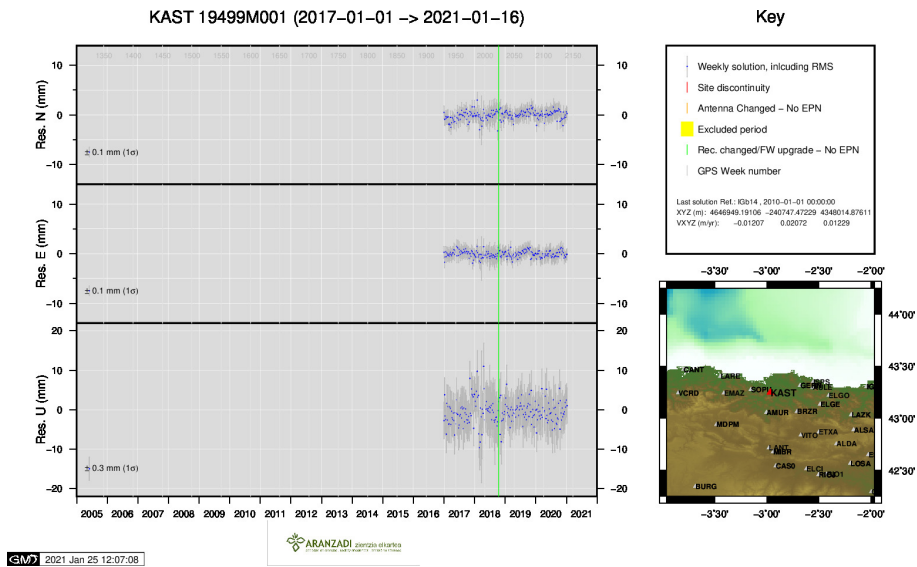




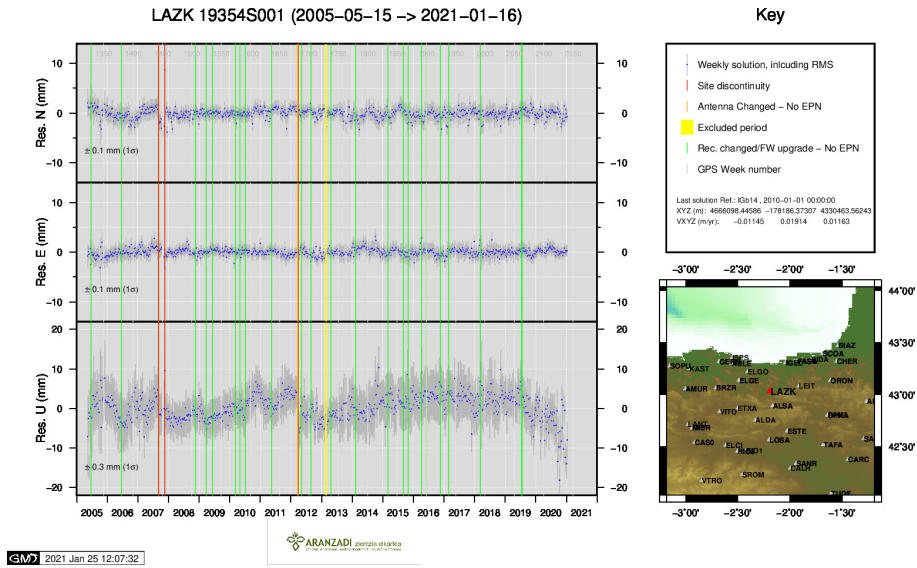
12) IGEL



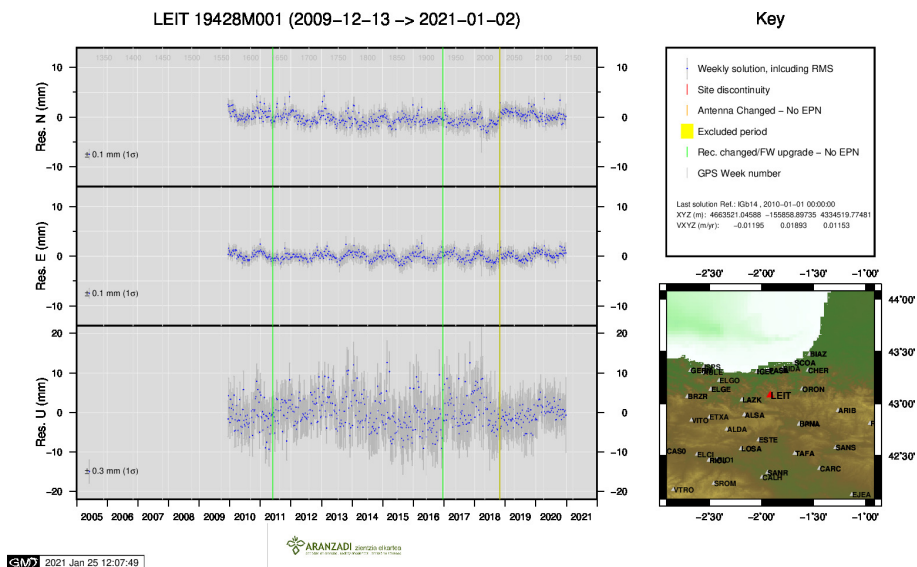
13) ISPS



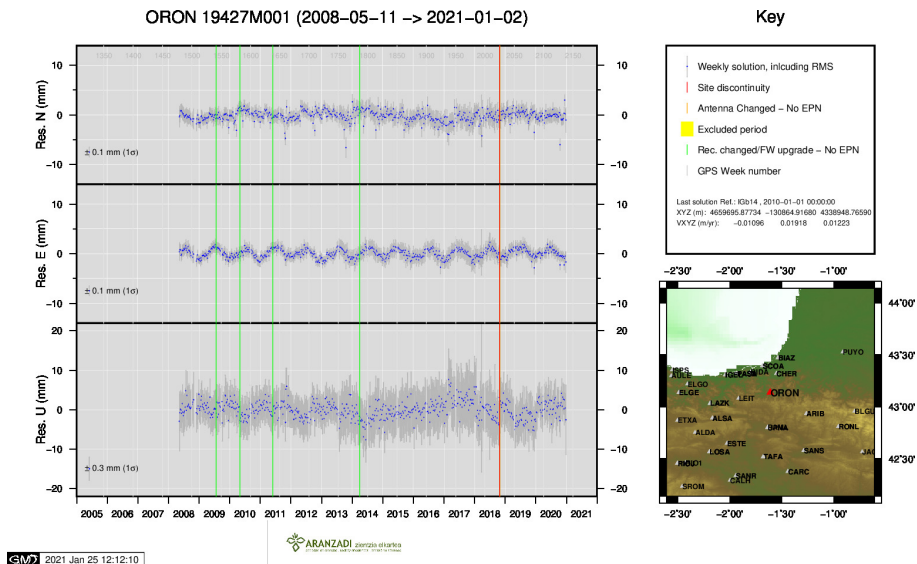
14) KAST



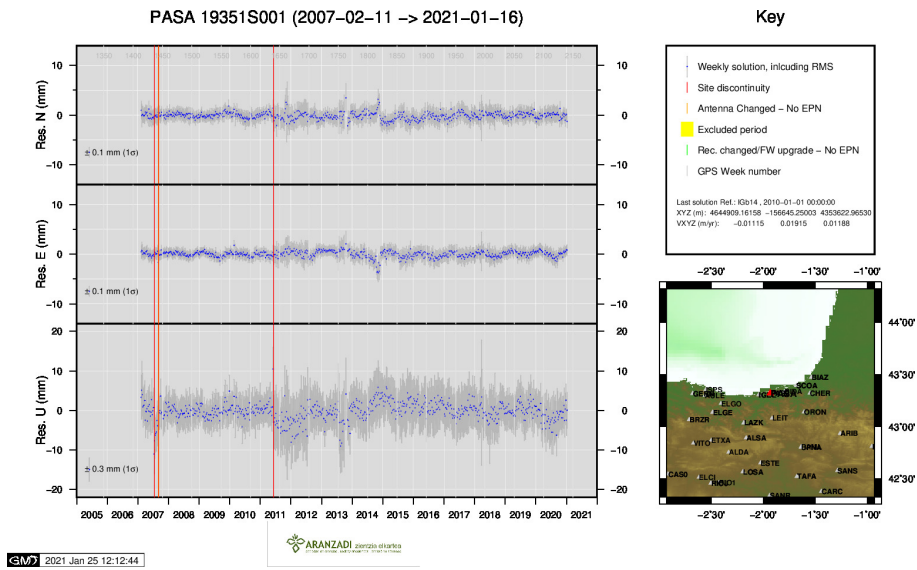
15) LAZK



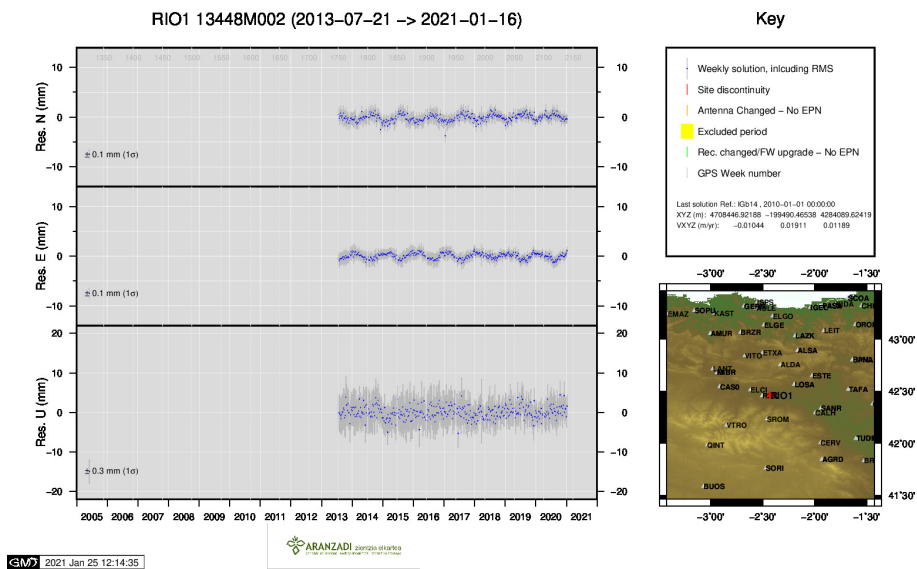
16) LEIT



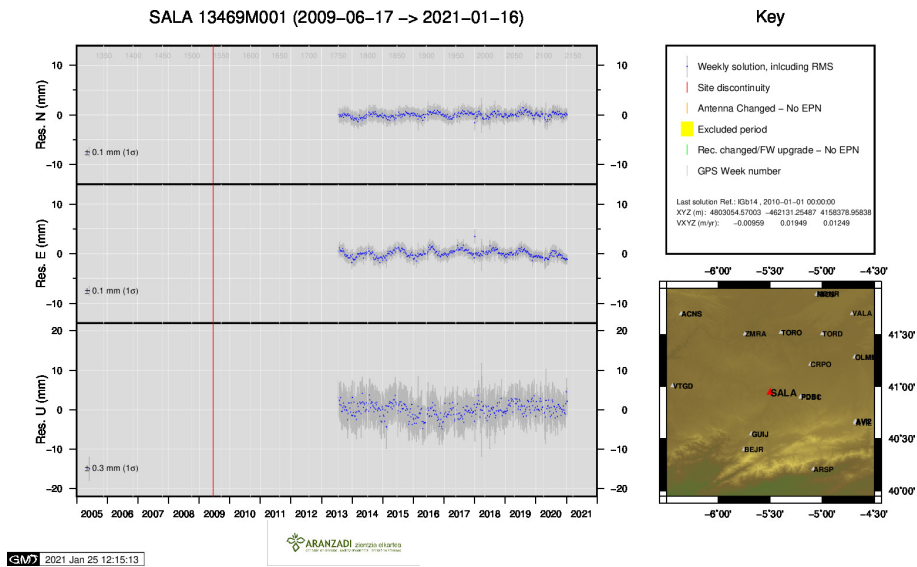
17) ORON



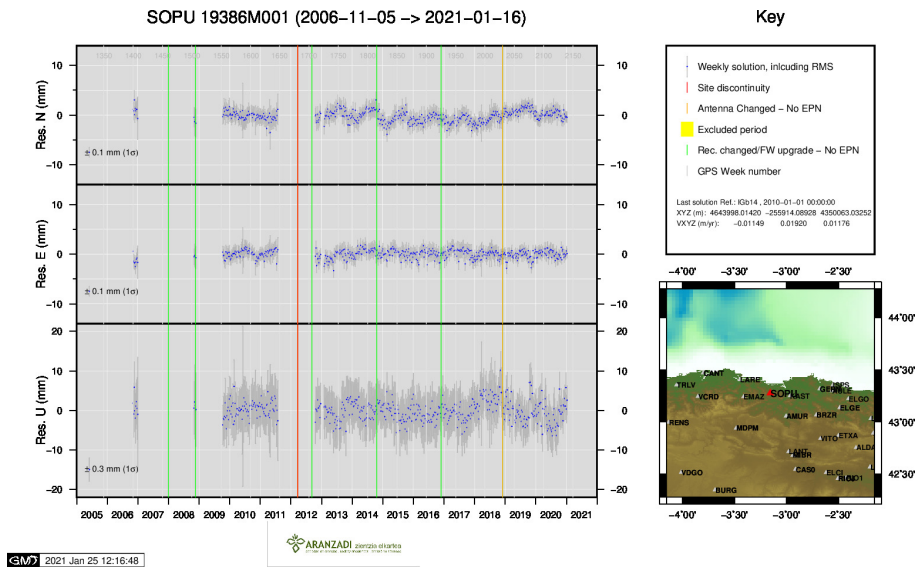
18) PASA



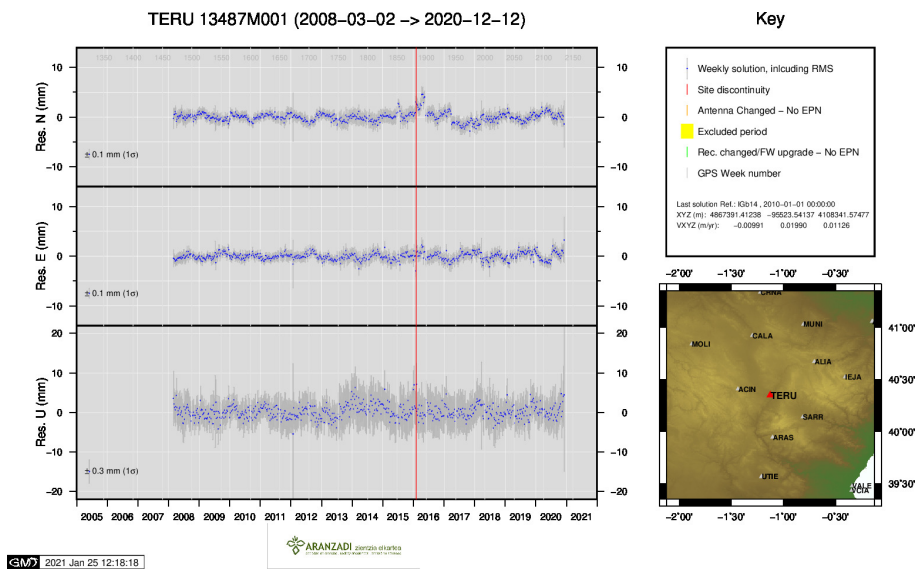
19) RIO1



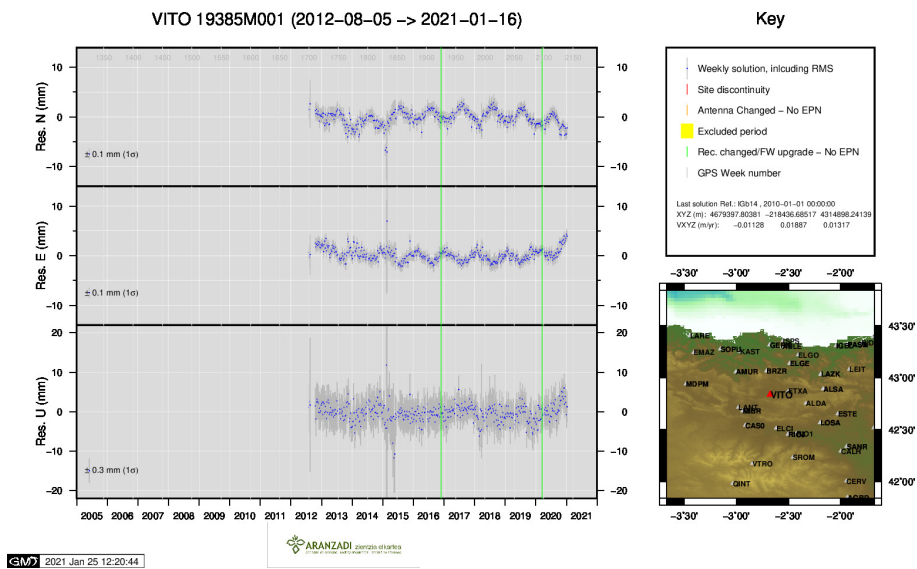
20) SALA



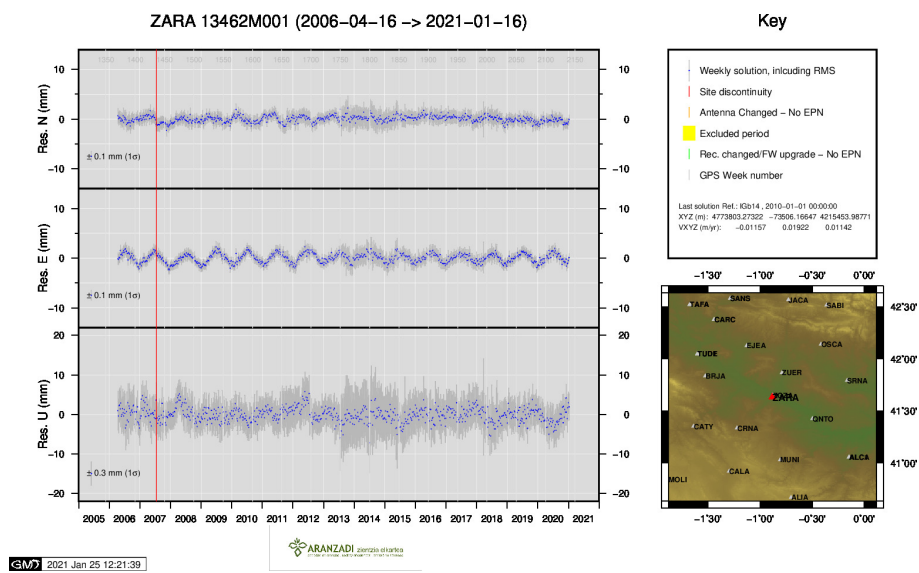
21) SOPU



22) TERU



23) VITO



24) ZARA