

# ARA-DAC Weekly Analysis Result: 2163 (GFA)

## Technical Report

**GPS Week: 2163 (GFA)**

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

**ARA-DAC details:**

Contact person: J. Zurutuza

Contact mail: [geodesia@aranzadi.eus](mailto:geodesia@aranzadi.eus)

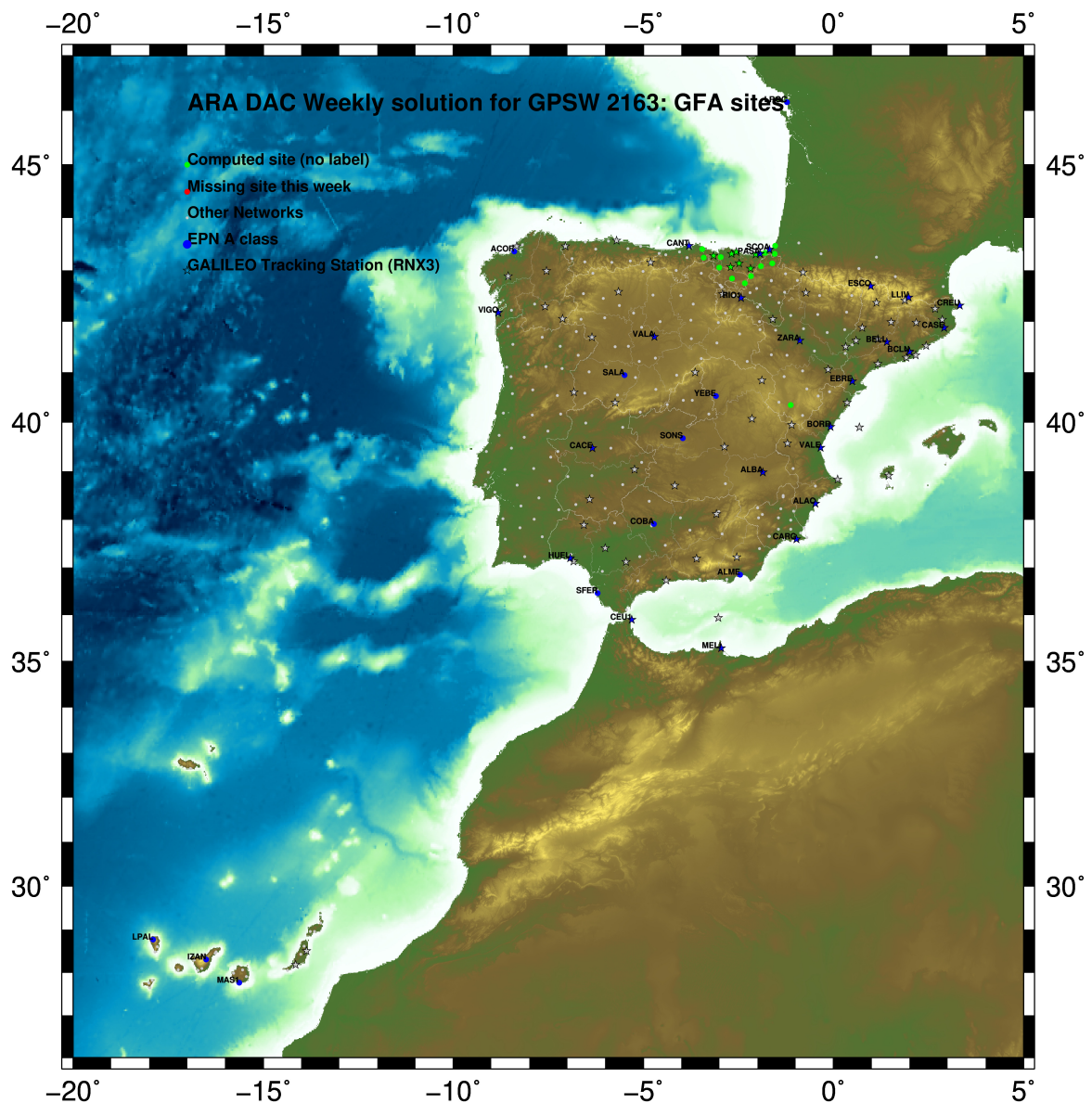
Report generated on 2021/07/11 at 02:56:08



# 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 Jul 11 02:56:00

Fig.1: Computed Sites for GPS Week2163 (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 Wideline (WL) AR for baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane and narrow-lane AR is computed.
  - Phase-Based Wideline ( $L_5$ ) 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 C2130.

ARA LAC 2163 WEEK FINAL COMBINATION: PRECISE ORBITS 10-JUL-21 23:25

-----

LOCAL GEODETIC DATUM: IGB14 EPOCH: 2021-06-23 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.53593	-678367.40121	4357066.30607	W
39	ALDA 19383M001	4687280.13742	-190876.52866	4308106.98228	A
50	ALSA 19419M001	4677250.80791	-176770.36423	4319079.90060	A
53	AMUR 19388M001	4661499.42338	-244591.21880	4332269.90723	A
100	BLAZ 10074M002	4634456.02263	-124344.93695	4365785.48141	A
101	BIDA 00000M000	4644177.79439	-145778.28629	4354832.50669	A
113	BRZR 19387M001	4662220.96206	-220769.86174	4333309.46120	A
104	CACE 13447M001	4899866.48238	-544566.99777	4033770.23136	W
116	CANT 13438M001	4625924.28777	-307096.19655	4365771.58068	W
154	CHER 00000M000	4645879.99441	-125721.87235	4353624.10894	A
162	CREU 13432M001	4715420.10056	273178.09707	4271946.86347	W
204	EBRE 13410M001	4833519.96673	41537.43065	4147461.74187	W
180	ELGE 19353S001	4657557.36803	-202241.43129	4338991.91027	A
182	EMAZ 17001M001	4645924.18109	-276949.82761	4347759.60121	A
209	GERN 19389M001	4642811.29166	-217222.88703	4353278.90348	A
235	IGEL 19352S001	4645951.40761	-165574.46437	4352550.44617	A
240	ISPS 19484M001	4640596.45058	-206963.73972	4356391.93511	A
245	KAST 19499M001	4646949.05367	-240747.23444	4348015.01794	A
252	LARE 19440M001	4632831.92967	-279026.10554	4360314.45606	A
256	LAZK 19354S001	4666098.30849	-178186.15152	4330463.69104	A
261	LEIT 19428M001	4663520.91180	-155858.67916	4334519.91186	A
334	ORON 19427M001	4659695.75168	-130864.69664	4338948.90598	A
345	PAS2 19351S001	4644909.03144	-156645.03024	4353623.10082	A
493	PASA 19351S001	4644909.03179	-156645.03020	4353623.10114	W
553	RID1 13448M002	4708446.79977	-199490.24575	4284089.75990	W
558	SALA 13469M001	4803054.46046	-462131.03217	4158379.10404	W
566	SCDA 10088M002	4639940.47185	-136224.90426	4359552.44129	W
418	SOPU 19386M001	4643997.88002	-255913.87034	4350063.16652	A
443	TERU 13487M001	4867391.28456	-95523.30564	4108341.70187	A
493	VITO 19385M001	4679397.67559	-218436.46595	4314898.39327	A
752	YEBE 13420M001	4848724.53727	-261631.88881	4123094.35047	W
755	ZARA 13462M001	4773803.14120	-73505.94529	4215454.11964	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 2163 10-JUL-21 23:25

-----

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2021-06-23 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.85889	-678367.97869	4357065.86177	W
39	ALDA 19383M001	4687280.51771	-190877.11543	4308106.53687	A
50	ALSA 19419M001	4677251.19077	-176770.93985	4319079.45618	A
53	AMUR 19388M001	4661499.79874	-244591.80285	4332269.46320	A
100	BLAZ 10074M002	4634456.41548	-124345.51765	4365785.04112	A
101	BIDA 00000M000	4644178.18376	-145778.86813	4354832.06534	A
113	BRZR 19387M001	4662221.34048	-220770.44581	4333309.01743	A
104	CACE 13447M001	4899866.79811	-544567.60875	4033769.76411	W
116	CANT 13438M001	4625924.65780	-307096.77680	4365771.13871	W
154	CHER 00000M000	4645880.38619	-125722.45432	4353623.66771	A
162	CREU 13432M001	4715420.53602	273177.50882	4271946.42168	W
204	EBRE 13410M001	4833520.36410	41536.82847	4147461.28760	W
180	ELGE 19353S001	4657557.74918	-202242.01479	4338991.46711	A
182	EMAZ 17001M001	4645924.55356	-276950.41002	4347759.15803	A
209	GERN 19389M001	4642811.67200	-217223.46892	4353278.46132	A
235	IGEL 19352S001	4645951.79434	-165575.04647	4352550.00442	A
240	ISPS 19484M001	4640596.83243	-206964.32134	4356391.49326	A
245	KAST 19499M001	4646949.43068	-240747.81686	4348014.57514	A
252	LARE 19440M001	4632832.30281	-279026.68649	4360314.01390	A
256	LAZK 19354S001	4666098.69201	-178186.73589	4330463.24750	A
261	LEIT 19428M001	4663521.29841	-155859.26319	4334519.46882	A
334	ORON 19427M001	4659696.14174	-130865.28016	4338948.46357	A
345	PAS2 19351S001	4644909.41936	-156645.61219	4353622.65927	A
493	PASA 19351S001	4644909.41971	-156645.61215	4353622.65959	W
553	RID1 13448M002	4708447.17720	-199490.83489	4284089.31266	W
558	SALA 13469M001	4803054.79576	-462131.63239	4158378.64573	W
566	SCDA 10088M002	4639940.86276	-136225.48560	4359552.00040	W
418	SOPU 19386M001	4643998.25529	-255914.45247	4350062.72376	A
443	TERU 13487M001	4867391.66193	-95523.91200	4108341.24310	A
493	VITO 19385M001	4679398.05294	-218437.05192	4314897.94814	A
752	YEBE 13420M001	4848724.89500	-261632.49360	4123093.89107	W
755	ZARA 13462M001	4773803.52927	-73506.54127	4215453.66874	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 2163		10-JUL-21 23:25			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2021-06-23 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.81798	-678368.01657	4357065.91285	W
39	ALDA 19383M001	4687280.47448	-190877.15461	4308106.58782	A
50	ALSA 19419M001	4677251.14759	-176770.97911	4319079.50717	A
53	AMUR 19388M001	4661499.75594	-244591.84195	4332269.51421	A
100	BIAZ 10074M002	4634456.37258	-124345.55727	4365785.09226	A
101	BIDA 00000M000	4644178.14082	-145778.90764	4354832.11644	A
113	BRZR 19387M001	4662221.29760	-220770.48499	4333309.06844	A
104	CACE 13447M001	4899866.75362	-544567.64582	4033769.81440	W
116	CANT 13438M001	4625924.61556	-307096.81584	4365771.18980	W
154	CHER 00000M000	4645880.34317	-125722.49389	4353623.71882	A
162	CREU 13432M001	4715420.49086	273177.46819	4271946.47287	W
204	EBRE 13410M001	4833520.31853	41536.78912	4147461.33830	W
180	ELGE 19353S001	4657557.70629	-202242.05405	4338991.51815	A
182	EMAZ 17001M001	4645924.51103	-276950.44908	4347759.20906	A
209	GERN 19389M001	4642811.62930	-217223.50820	4353278.51239	A
235	IGEL 19352S001	4645951.75145	-165575.08591	4352550.05551	A
240	ISPS 19484M001	4640596.78972	-206964.36066	4356391.54434	A
245	KAST 19499M001	4646949.38802	-240747.85604	4348014.62619	A
252	LARE 19440M001	4632832.26040	-279026.72559	4360314.06498	A
256	LAZK 19354S001	4666098.64895	-178186.77520	4330463.29853	A
261	LEIT 19428M001	4663521.25531	-155859.30259	4334519.51986	A
334	ORON 19427M001	4659696.09859	-130865.31966	4338948.51463	A
345	PAS2 19351S001	4644909.37645	-156645.65166	4353622.71037	A
493	PASA 19351S001	4644909.37680	-156645.65162	4353622.71069	W
553	RI01 13448M002	4708447.13377	-199490.87395	4284089.36356	W
558	SALA 13469M001	4803054.75211	-462131.67015	4158378.69627	W
566	SOA 10088M002	4639940.81983	-136225.52516	4359552.05152	W
418	SOPU 19386M001	4643998.21270	-255914.49161	4350062.77481	A
443	TERU 13487M001	4867391.61647	-95523.95076	4108341.29363	A
493	VITO 19385M001	4679398.00987	-218437.09104	4314897.99910	A
752	YEBE 13420M001	4848724.85028	-261632.53186	4123093.94157	W
755	ZARA 13462M001	4773803.48474	-73506.58049	4215453.71952	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 2163 WEEK FINAL COMBINATION: PRECISE ORBITS 10-JUL-21 23:25

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.82	1.31	2.67
ALDA 19383M001	7	XXXXXX	0.90	1.24	6.75
ALSA 19419M001	7	XXXXXX	1.17	2.03	5.29
AMUR 19388M001	7	XXXXXX	2.63	2.61	3.15
BLAZ 10074M002	7	XXXXXX	1.76	2.82	5.42
BIDA 00000M000	7	XXXXXX	1.15	1.83	7.25
BRZR 19387M001	7	XXXXXX	3.34	4.54	6.10
CACE 13447M001	7	XXXXXX	0.60	1.35	5.55
CANT 13438M001	7	XXXXXX	0.89	1.05	6.05
CHER 00000M000	7	XXXXXX	1.69	3.62	6.53
CREU 13432M001	7	XXXXXX	237.59	371.68	251.30
EBRE 13410M001	7	XXXXXX	1.03	2.55	8.98
ELGE 19353S001	7	XXXXXX	2.40	1.49	4.83
EMAZ 17001M001	7	XXXXXX	2.04	1.37	9.14
GERN 19389M001	7	XXXXXX	1.20	1.67	5.26
IGEL 19352S001	7	XXXXXX	1.20	2.09	8.32
ISPS 19484M001	7	XXXXXX	0.92	2.02	4.49
KAST 19499M001	7	XXXXXX	1.90	2.12	6.93
LARE 19440M001	7	XXXXXX	1.31	1.22	6.03
LAZK 19354S001	7	XXXXXX	0.38	0.99	13.35
LEIT 19428M001	7	XXXXXX	1.32	1.20	9.85
ORON 19427M001	7	XXXXXX	2.16	2.73	7.04
PAS2 19351S001	7	XXXXXX	0.66	2.11	7.29
PASA 19351S001	7	XXXXXX	0.69	2.24	6.99
RI01 13448M002	7	XXXXXX	0.87	1.62	6.14
SALA 13469M001	7	XXXXXX	0.34	1.65	4.61
SC0A 10088M002	7	XXXXXX	1.50	1.82	7.14
SOPU 19386M001	7	XXXXXX	1.22	2.17	5.50
TERU 13487M001	7	XXXXXX	0.81	2.74	8.88
VITD 19385M001	5	XXXXX	0.58	1.19	3.53
YEBE 13420M001	7	XXXXXX	0.80	1.95	4.39
ZARA 13462M001	7	XXXXXX	0.97	2.48	8.47

Comparison of individual solutions:

ACOR 13434M001	N	0.82	-1.12	-0.66	-0.52	-0.32	0.68	0.20	1.22
ACOR 13434M001	E	1.31	-2.60	-0.18	0.95	1.20	-0.29	0.92	-0.56
ACOR 13434M001	U	2.67	-1.87	-2.27	3.72	-3.83	0.74	2.19	0.57
ALDA 19383M001	N	0.90	-1.45	0.20	-0.79	-0.28	0.80	1.15	0.13
ALDA 19383M001	E	1.24	-2.78	-0.13	0.41	-0.54	0.67	-0.79	0.04
ALDA 19383M001	U	6.75	14.40	-4.40	-0.54	0.78	4.95	-4.53	-1.05
ALSA 19419M001	N	1.17	-2.48	0.04	-0.03	0.68	1.09	0.60	-0.04
ALSA 19419M001	E	2.03	-4.34	-1.61	0.14	1.20	0.03	0.26	1.31
ALSA 19419M001	U	5.29	11.60	-2.00	2.96	-1.56	1.93	-0.40	-3.81
AMUR 19388M001	N	2.63	-6.16	1.37	0.80	0.42	0.60	0.24	0.65
AMUR 19388M001	E	2.61	-5.43	2.79	0.12	-0.89	-1.26	-0.50	-0.99
AMUR 19388M001	U	3.15	4.41	0.46	4.34	0.13	2.39	1.25	-3.72
BLAZ 10074M002	N	1.76	-2.03	2.16	-0.36	2.49	0.33	-1.79	0.03
BLAZ 10074M002	E	2.82	-5.43	0.78	0.34	3.80	-0.03	-0.78	-1.61
BLAZ 10074M002	U	5.42	8.75	-1.67	-3.18	6.39	2.92	-5.90	-1.68
BIDA 00000M000	N	1.15	-2.49	0.38	0.33	0.88	0.58	0.41	0.48
BIDA 00000M000	E	1.83	-3.99	-0.17	-1.13	0.38	1.03	0.62	1.07
BIDA 00000M000	U	7.25	13.26	-2.94	-3.05	5.31	2.38	-2.81	-8.92
BRZR 19387M001	N	3.34	-7.37	-1.93	0.13	0.58	1.14	2.17	1.59
BRZR 19387M001	E	4.54	-10.43	1.51	2.56	0.47	0.55	1.48	1.82
BRZR 19387M001	U	6.10	-7.50	-3.73	7.75	6.66	6.13	3.31	0.14
CACE 13447M001	N	0.60	-0.12	-1.07	0.44	-0.78	-0.13	0.09	-0.44
CACE 13447M001	E	1.35	-3.03	-0.02	0.34	-0.77	-0.69	0.63	-0.37
CACE 13447M001	U	2.55	2.33	-2.86	-4.41	-0.24	0.69	2.20	0.75
CANT 13438M001	N	0.89	-0.96	-1.07	0.21	-0.53	-1.06	-0.86	-0.71
CANT 13438M001	E	1.05	-1.89	-0.42	0.53	1.21	0.03	-0.62	-0.88
CANT 13438M001	U	5.05	9.50	-0.27	0.37	-5.36	-1.36	3.02	4.77
CHER 00000M000	N	1.69	-2.17	2.10	2.22	0.55	0.18	-1.63	0.17
CHER 00000M000	E	3.62	-8.28	-0.09	1.51	1.38	1.19	0.55	2.02
CHER 00000M000	U	6.53	8.06	-10.01	3.71	6.78	-0.46	-3.14	-4.60
CREU 13432M001	N	237.59	581.96	-3.25	1.07	-0.05	1.28	1.03	-0.40
CREU 13432M001	E	371.68	910.41	-2.77	0.79	2.31	0.02	-0.66	1.46
CREU 13432M001	U	251.30	-615.48	-4.08	-1.41	5.18	-0.90	5.63	3.28
EBRE 13410M001	N	1.03	0.56	-0.97	1.19	-1.41	-0.67	1.05	-0.40
EBRE 13410M001	E	2.55	-5.94	1.46	-0.26	0.97	-0.50	-0.40	-0.46
EBRE 13410M001	U	8.98	20.22	-1.99	-0.93	7.27	3.33	-2.40	0.62
ELGE 19353S001	N	2.40	-5.09	-1.47	-1.22	-0.09	1.54	0.86	1.36
ELGE 19353S001	E	1.49	-3.22	1.45	0.61	-0.35	-0.65	-0.16	0.02
ELGE 19353S001	U	4.83	7.71	7.22	2.24	-2.15	0.63	1.59	-3.96
EMAZ 17001M001	N	2.04	-1.73	-1.77	-3.15	-1.48	0.13	2.37	1.01
EMAZ 17001M001	E	1.37	-2.77	-0.75	0.85	1.08	-0.96	0.05	0.37
EMAZ 17001M001	U	9.14	11.76	8.14	12.43	-2.17	-4.91	-6.86	-8.11
GERN 19389M001	N	1.20	-1.75	2.16	0.01	0.75	0.22	0.07	0.56
GERN 19389M001	E	1.67	-3.74	0.03	0.49	-0.09	-0.29	1.16	1.07
GERN 19389M001	U	5.26	3.53	-2.36	7.93	7.76	0.86	-2.72	-4.10
IGEL 19352S001	N	1.20	-0.82	1.27	-0.82	1.79	-0.54	-1.10	0.96
IGEL 19352S001	E	2.09	-4.53	-1.27	0.04	1.52	1.08	0.58	0.50
IGEL 19352S001	U	8.32	13.07	0.60	-1.64	10.04	-6.96	-2.58	-9.23
ISPS 19484M001	N	0.92	-0.85	0.10	-0.67	1.19	0.63	0.15	1.42
ISPS 19484M001	E	2.02	-3.87	-2.19	0.33	0.66	1.18	0.95	1.39
ISPS 19484M001	U	4.49	1.47	-4.78	1.67	1.48	6.40	6.70	-2.28
KAST 19499M001	N	1.90	-3.39	-0.19	-0.19	0.43	1.41	2.18	1.81
KAST 19499M001	E	2.12	-4.33	-0.49	2.42	0.97	-0.68	0.88	-0.16
KAST 19499M001	U	6.93	-1.73	2.35	10.34	10.74	-2.91	-3.16	-6.23
LARE 19440M001	N	1.31	-1.81	-0.86	-1.76	-1.62	0.51	0.57	0.12
LARE 19440M001	E	1.22	-2.75	-0.53	0.05	0.47	0.90	0.02	-0.30
LARE 19440M001	U	6.03	13.18	4.35	1.01	-3.00	-2.47	0.98	-2.91
LAZK 19354S001	N	0.38	-0.28	0.60	0.05	-0.29	-0.48	0.13	-0.28
LAZK 19354S001	E	0.99	0.04	-0.81	-1.63	1.03	-1.09	-0.60	0.04

LAZK	19354S001	U	13.35	27.53	-2.72	-0.32	-16.88	-2.55	0.58	3.52
LEIT	19428M001	N	1.32	0.91	2.40	-0.86	-0.34	0.05	-1.40	-1.02
LEIT	19428M001	E	1.20	-1.09	1.50	-1.03	-0.61	-0.23	-1.76	0.78
LEIT	19428M001	U	9.85	19.65	0.83	-0.72	-12.90	1.09	-0.90	-5.18
ORDN	19427M001	N	2.16	-4.85	0.87	0.27	0.75	0.37	0.49	1.63
ORDN	19427M001	E	2.73	-6.44	0.50	0.71	-0.22	0.17	0.88	1.23
ORDN	19427M001	U	7.04	16.81	-1.95	0.22	-3.04	-0.37	-0.99	-0.84
PAS2	19351S001	N	0.66	-1.06	0.89	0.14	0.28	-0.14	-0.17	0.76
PAS2	19351S001	E	2.11	-4.79	-0.32	-0.57	1.18	0.85	0.54	1.01
PAS2	19351S001	U	7.29	12.97	-6.15	0.42	7.43	-3.56	-0.92	-6.61
PASA	19351S001	N	0.69	-1.28	0.74	0.45	0.16	0.28	-0.08	0.58
PASA	19351S001	E	2.24	-5.13	-0.05	-0.48	1.31	0.90	0.56	0.79
PASA	19351S001	U	6.99	11.34	-5.55	0.48	8.67	-3.69	-0.79	-6.63
RID1	13448M002	N	0.87	1.06	0.49	-0.66	-0.68	-1.34	-0.30	0.62
RID1	13448M002	E	1.62	-3.86	0.16	-0.00	0.65	-0.29	0.35	-0.34
RID1	13448M002	U	6.14	14.01	1.90	0.99	-2.20	2.01	-3.91	-1.14
SALA	13469M001	N	0.34	0.39	-0.27	0.27	-0.59	0.04	0.06	0.16
SALA	13469M001	E	1.65	-3.95	0.43	0.18	0.30	-0.11	0.57	-0.28
SALA	13469M001	U	4.61	5.17	0.68	0.30	-5.18	-3.41	0.19	7.86
SCDA	10088M002	N	1.50	0.36	1.80	-0.74	-1.69	-0.67	-1.11	2.23
SCDA	10088M002	E	1.82	-3.05	-1.12	-0.85	1.28	1.02	-1.46	1.96
SCDA	10088M002	U	7.14	16.03	-0.89	-3.10	-3.16	-2.25	-0.50	-4.84
SOPU	19386M001	N	1.22	-1.64	0.60	-0.36	1.42	-0.01	0.16	1.92
SOPU	19386M001	E	2.17	-2.86	-2.24	0.34	-1.78	1.63	2.92	0.75
SOPU	19386M001	U	5.50	9.16	1.08	6.49	-0.79	-0.19	0.81	-7.28
TERU	13487M001	N	0.81	0.14	1.10	1.06	0.93	-0.22	0.16	-0.82
TERU	13487M001	E	2.74	-6.17	0.79	-0.73	-2.22	-0.83	-0.48	0.21
TERU	13487M001	U	8.88	20.89	2.39	-1.40	1.03	-0.43	2.86	-4.39
VITO	19385M001	N	0.58			0.47	-0.22	-0.40	0.28	0.90
VITO	19385M001	E	1.19			1.08	-0.75	0.17	1.15	-1.60
VITO	19385M001	U	3.53			4.52	-2.93	3.80	-1.73	-1.85
YEBE	13420M001	N	0.80	1.18	-0.08	-0.70	0.80	0.28	-0.58	-0.96
YEBE	13420M001	E	1.95	-4.35	0.30	1.31	-0.59	-1.29	0.21	0.26
YEBE	13420M001	U	4.39	9.59	0.17	1.53	-1.43	-3.47	1.88	1.88
ZARA	13462M001	N	0.97	-0.50	0.97	0.07	-0.97	0.47	0.53	-1.72
ZARA	13462M001	E	2.48	-5.85	0.58	1.01	0.46	-0.22	0.81	0.66
ZARA	13462M001	U	8.47	19.50	0.47	-1.73	-1.31	-5.70	-3.50	1.03

## 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	-1.03	0.65	0.79
12	ALAC 13433M001	I W	-0.29	0.14	2.73
15	ALBA 13452M001	I W	-0.30	-0.44	-2.12
21	ALME 13437M001	I W	-0.82	-0.22	2.35
47	BCLN 13412M001	I W	-0.58	-2.37	-0.58
52	BELL 13431M001	I W	0.97	-2.01	3.76
71	BORR 13480M001	I W	-0.71	-0.46	-2.02
76	BRST 10004M004	I W	-2.39	-0.28	2.15
104	CACE 13447M001	I W	-0.21	0.49	1.53
116	CANT 13438M001	I W	-2.09	0.91	-1.26
117	CARG 19412M001	I W	0.92	0.27	-0.53
122	CASE 13494M001	I W	-1.80	-1.41	-1.50
128	CEU1 13449M002	I W	0.82	-0.46	-3.72
143	COBA 13453M001	I W	0.65	0.08	-2.76
162	CREU 13432M001	I W	0.00	1.88	3.02
204	EBRE 13410M001	I W	0.22	-0.64	-3.63
222	ESCO 13435M001	I W	-1.70	1.80	-1.76
299	HUEL 13451M001	I W	2.34	-2.59	-6.48
316	IZAN 31309M002	I W	2.29	1.39	-5.24
385	LLIV 13436M001	I W	0.83	0.98	2.76
390	LPAL 81701M001	I W	-1.08	1.00	-3.57
392	LRDC 10023M001	I W	0.85	0.58	2.17
421	MAS1 31303M002	I W	1.75	1.32	0.45
432	MELI 19379M001	I W	2.32	-0.23	-0.73
493	PASA 19351S001	I W	-0.36	-0.48	-0.52
501	PDEL 31906M004	I W	0.74	-0.73	-2.26
553	RID1 13448M002	I W	-1.58	0.07	1.13
558	SALA 13469M001	I W	0.02	0.93	-2.97
566	SCOA 10088M002	I W	-2.86	0.18	-4.46
574	SFER 13402M004	I W	2.69	0.41	1.39
599	SONS 13446M001	I W	-0.22	3.10	3.68
700	VALA 13463M002	I W	0.29	0.54	2.65
704	VALE 13439M001	I W	0.30	-0.07	-4.12
715	VIGO 13450M001	I W	1.96	-1.98	3.44
752	YEBE 13420M001	I W	-1.58	-1.88	11.18
755	ZARA 13462M001	I W	-0.44	-0.13	1.50
764	ZIMM 14001M004	I W	0.09	-0.36	3.55
	RMS / COMPONENT		1.39	1.22	3.40
	MEAN		0.00	0.00	-0.00
	MIN		-2.86	-2.59	-6.48
	MAX		2.69	3.10	11.18

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 111  
RMS OF TRANSFORMATION : 2.23 MM

BARYCENTER COORDINATES:

LATITUDE : 40 0 16.55  
LONGITUDE : - 4 7 51.74  
HEIGHT : -42.854 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.37 MM  
TRANSLATION IN E : 0.00 +- 0.37 MM  
TRANSLATION IN U : -0.00 +- 0.37 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          19137749
NUMBER OF UNKNOWN               235779
NUMBER OF DEGREES OF FREEDOM    18901970
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.011333344461029

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
  1  0.14324     0.0367  0.1418 -0.0263  -0.0030  0.0011  0.0038  -0.00378
  2  0.00211     0.0139  0.0043 -0.0206  -0.0001  0.0008  0.0001  0.00033
  3  0.00202     -0.0016 -0.0131 -0.0016   0.0003  0.0000 -0.0003  0.00011
  4  0.00272     0.0019  0.0014 -0.0033   0.0000  0.0001  0.0001  0.00016
  5  0.00210     -0.0172  0.0132  0.0195  -0.0001 -0.0009  0.0004  0.00013
  6  0.00198     -0.0081 -0.0025  0.0126   0.0001 -0.0005  0.0000  -0.00001
  7  0.00225     0.0062  0.0003 -0.0034   0.0001  0.0002  0.0001  -0.00036
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00154     2678120    2.38          2712711      3          951      33643      0
  2  0.00143     2715152    2.04          2750249      3          972      34128      0
  3  0.00135     2735169    1.83          2767130      3          981      30983      0
  4  0.00138     2703859    1.90          2738406      3          975      33575      0
  5  0.00135     2722734    1.83          2756699      3          975      32993      0
  6  0.00137     2659767    1.88          2695575      3          975      34836      0
  7  0.00147     2681376    2.16          2716979      3          972      34634      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 21:171:00000 21:177:86370 LEICA GR50      -----
ALDA  A   1 P 21:171:00000 21:177:86370 LEICA GR10      -----
ALSA  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
AMUR  A   1 P 21:171:00000 21:177:86370 LEICA GR10      -----
BIAZ  A   1 P 21:171:00000 21:177:82770 SPECTRA SP90M   -----
BIDA  A   1 P 21:171:00000 21:177:86370 LEICA GR10      -----
BRZR  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
CACE  A   1 P 21:171:00000 21:177:86370 TRIMBLE NETR9   -----
CANT  A   1 P 21:171:00000 21:177:86370 LEICA GR10      -----
CHER  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
CREU  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
EBRE  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
ELGE  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
EMAZ  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
GERN  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
IGEL  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
ISPS  A   1 P 21:171:00000 21:177:86370 TRIMBLE NETR9   -----
KAST  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
LARE  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
LAZK  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
LEIT  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
ORON  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
PAS2  A   1 P 21:171:00030 21:177:86370 STONEX SC2200   -----
PASA  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
RIO1  A   1 P 21:171:00000 21:177:86370 LEICA GR25      -----
SALA  A   1 P 21:171:00000 21:177:86370 LEICA GRX1200+GNSS -----
SCOA  A   1 P 21:171:00000 21:177:86370 LEICA GR25      -----
SOPU  A   1 P 21:171:00000 21:177:86370 LEICA GR30      -----
TERU  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
VITO  A   1 P 21:173:30870 21:177:86370 LEICA GR10      -----
YEBE  A   1 P 21:171:00000 21:177:86370 LEICA GR50      -----
ZARA  A   1 P 21:171:00000 21:177:86370 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 21:171:00000 21:177:86370 LEIAT504      LEIS -----
ALDA  A   1 P 21:171:00000 21:177:86370 LEIAS10      NONE -----
ALSA  A   1 P 21:171:00000 21:177:86370 LEIAR10      NONE -----
AMUR  A   1 P 21:171:00000 21:177:86370 LEIAS10      NONE -----
```

```

BIAZ A 1 P 21:171:00000 21:177:82770 LEIAR25 LEIT -----
BIDA A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
BRZR A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
CACE A 1 P 21:171:00000 21:177:86370 TRM29659.00 NONE -----
CANT A 1 P 21:171:00000 21:177:86370 LEIAR25.R4 LEIT 25066
CHER A 1 P 21:171:00000 21:177:86370 LEIAR10 NONE -----
CREU A 1 P 21:171:00000 21:177:86370 LEIAR25.R4 NONE 26357
EBRE A 1 P 21:171:00000 21:177:86370 LEIAR25.R4 NONE 26359
ELGE A 1 P 21:171:00000 21:177:86370 LEIAR25.R4 LEIT -----
EMAZ A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
GERN A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
IGEL A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
ISPS A 1 P 21:171:00000 21:177:86370 TRM59900.00 SCIS -----
KAST A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
LARE A 1 P 21:171:00000 21:177:86370 LEIAR20 LEIM -----
LAZK A 1 P 21:171:00000 21:177:86370 LEIAR25.R4 LEIT -----
LEIT A 1 P 21:171:00000 21:177:86370 LEIAR10 NONE -----
ORDN A 1 P 21:171:00000 21:177:86370 LEIAR10 NONE -----
PAS2 A 1 P 21:171:00030 21:177:86370 LEIAR20 LEIM 73034
PASA A 1 P 21:171:00000 21:177:86370 LEIAR20 LEIM 73034
RIO1 A 1 P 21:171:00000 21:177:86370 LEIAR25.R4 LEIT 25138
SALA A 1 P 21:171:00000 21:177:86370 LEIAR25 NONE -----
SCOA A 1 P 21:171:00000 21:177:86370 TRM55971.00 NONE -----
SOPU A 1 P 21:171:00000 21:177:86370 LEIAS10 NONE -----
TERU A 1 P 21:171:00000 21:177:86370 LEIAR20 LEIM 49044
VITO A 1 P 21:173:30870 21:177:86370 LEIAS10 NONE -----
YEBE A 1 P 21:171:00000 21:177:86370 LEIAR20 LEIM 49016
ZARA A 1 P 21:171:00000 21:177:86370 TRM29659.00 NONE -----

```

### 7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START_ DATA_END_ AXE ARP->BENCHMARK(M) UP_----- NORTH_-- EAST_----
ACOR A 1 P 21:171:00000 21:177:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 21:171:00000 21:177:82770 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 21:171:00000 21:177:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 21:171:00000 21:177:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 21:171:00000 21:177:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 21:171:00000 21:177:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 21:171:00000 21:177:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 21:171:00000 21:177:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 21:171:00000 21:177:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 21:171:00000 21:177:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 21:171:00000 21:177:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 21:171:00030 21:177:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
RIO1 A 1 P 21:171:00000 21:177:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 21:171:00000 21:177:86370 UNE 0.0600 0.0000 0.0000
SCOA A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 21:171:00000 21:177:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 21:171:00000 21:177:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 21:173:30870 21:177:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 21:171:00000 21:177:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 21:171:00000 21:177:86370 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](http://etrs89.ensg.ign.fr/memo-V8.pdf)

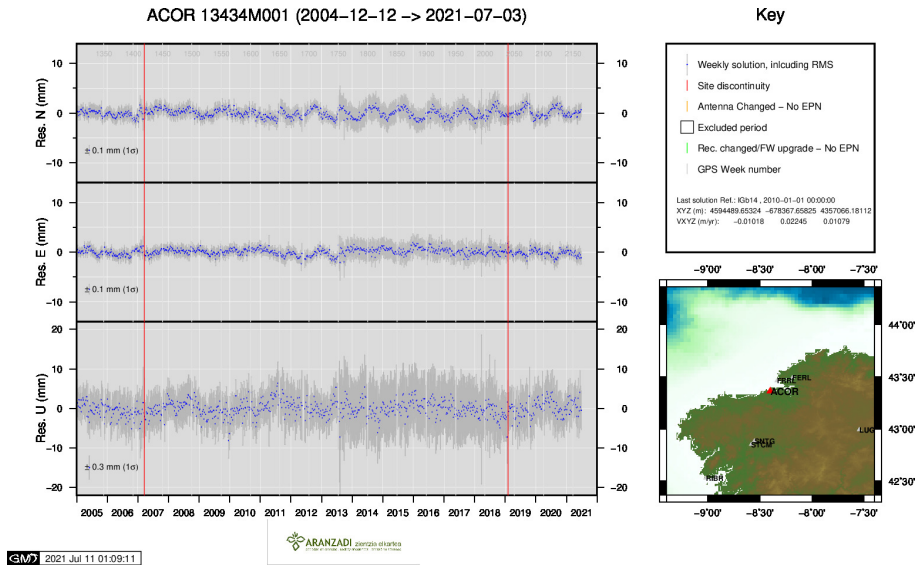
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](http://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

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](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

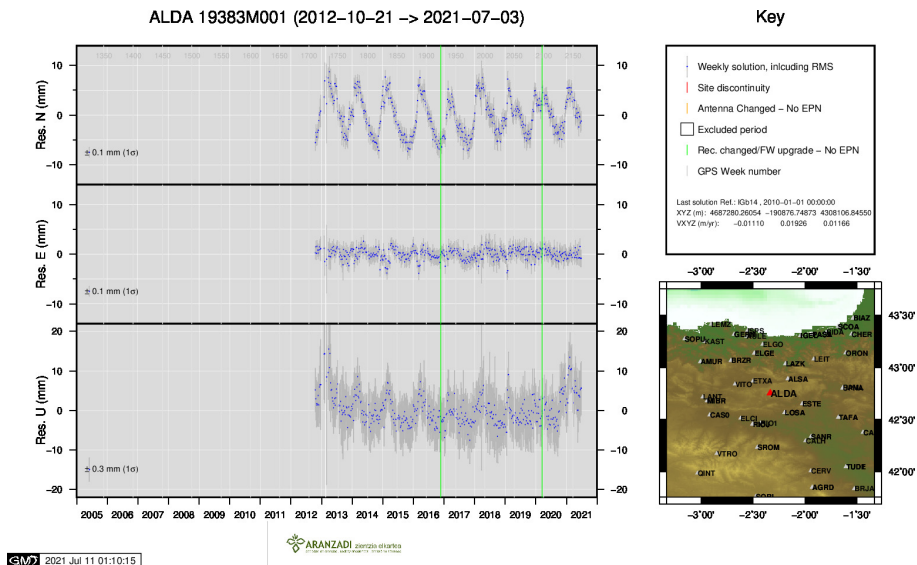


## 9 Cumulative Time Series

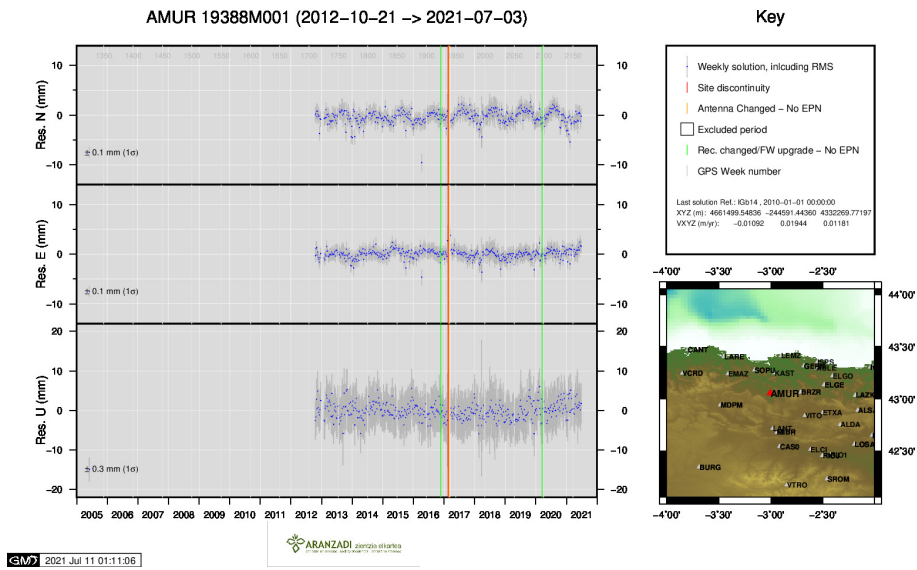
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



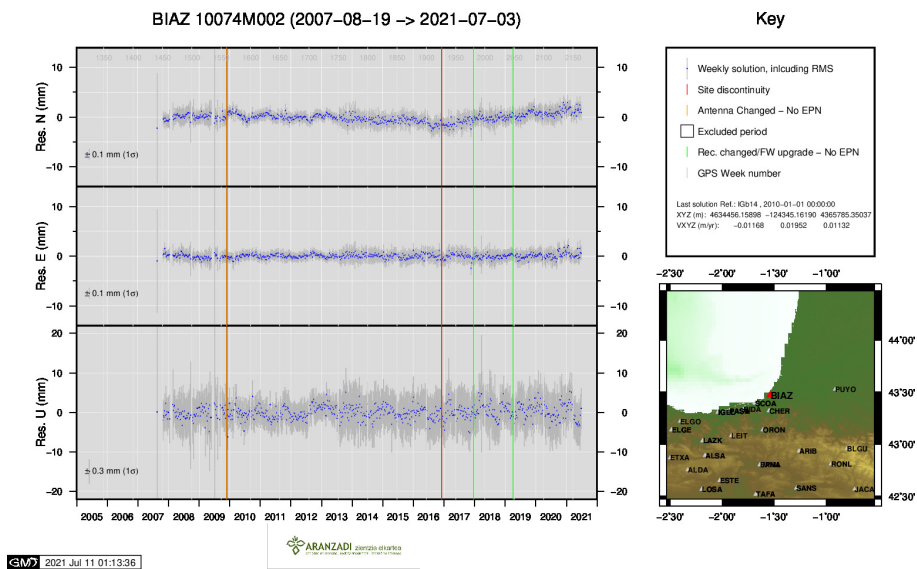
1 ) ACOR



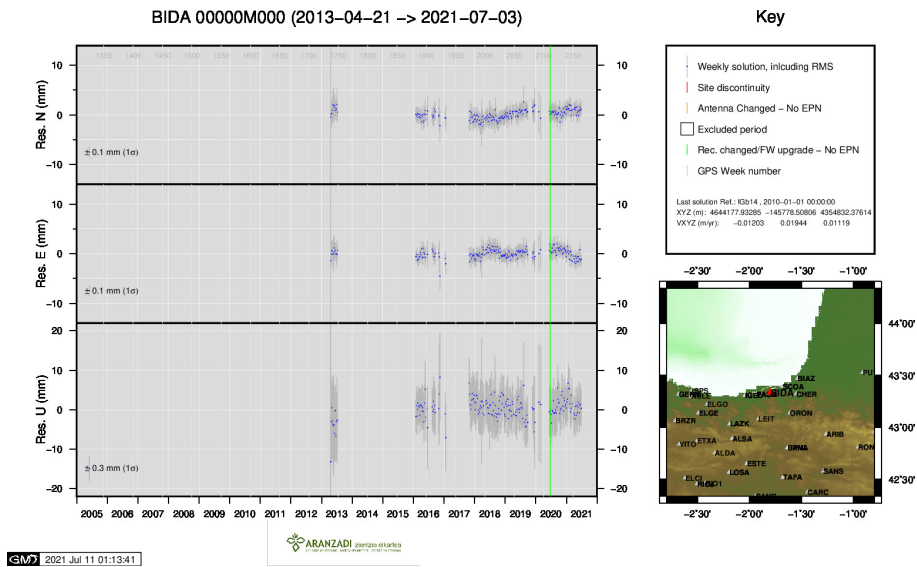
2 ) ALDA



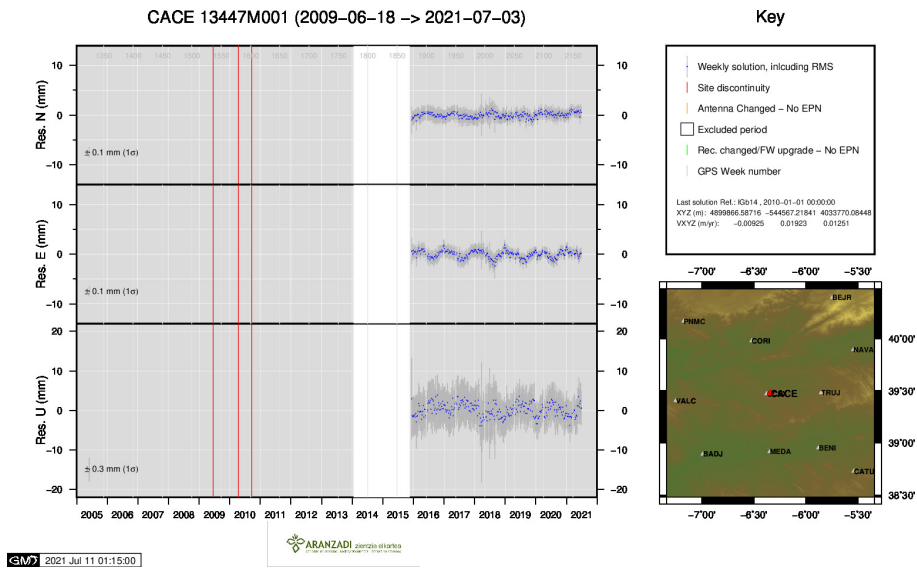
3 ) AMUR



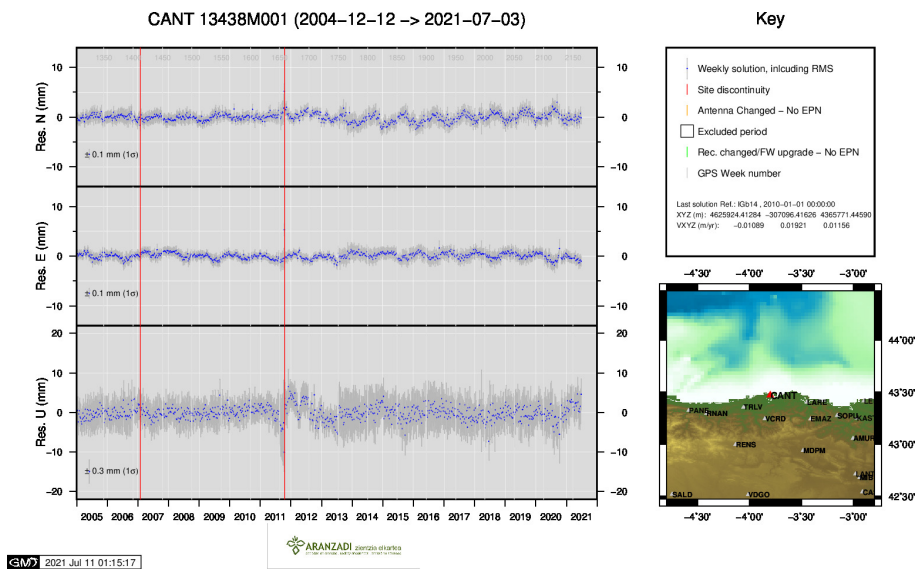
4 ) BIAZ



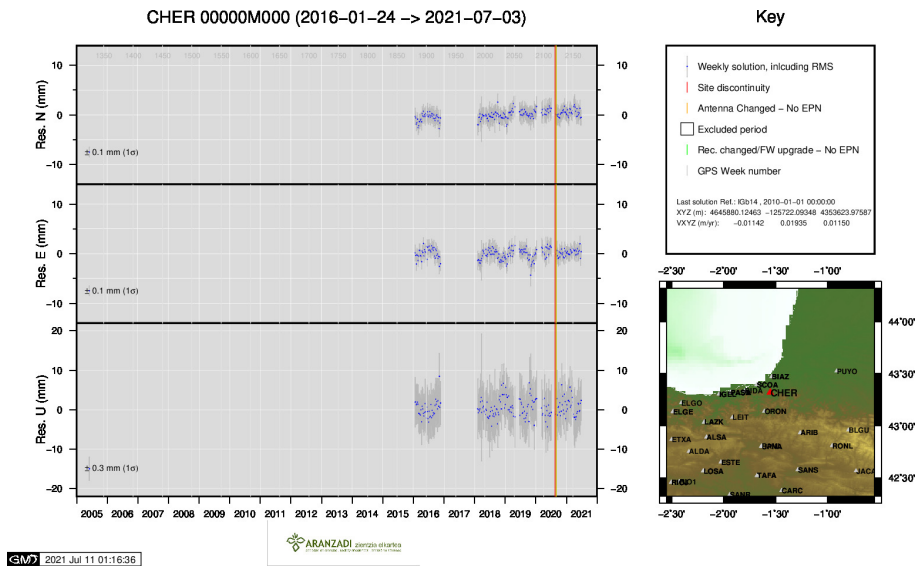
5 ) BIDA



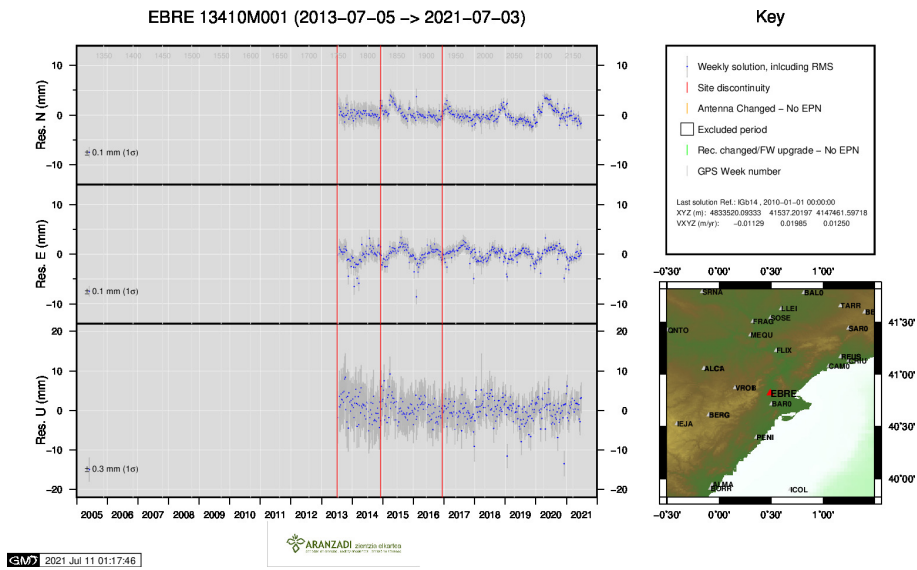
6 ) CACE



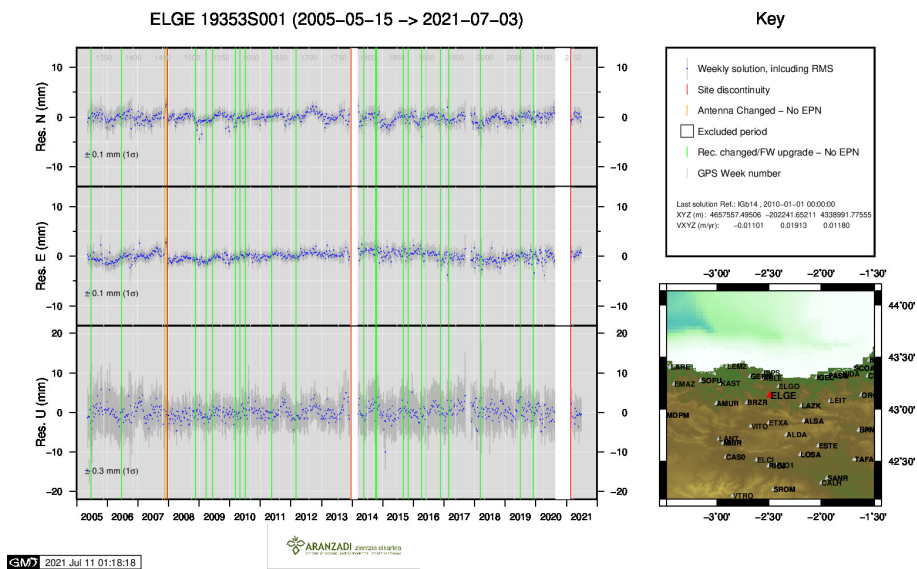
7 ) CANT



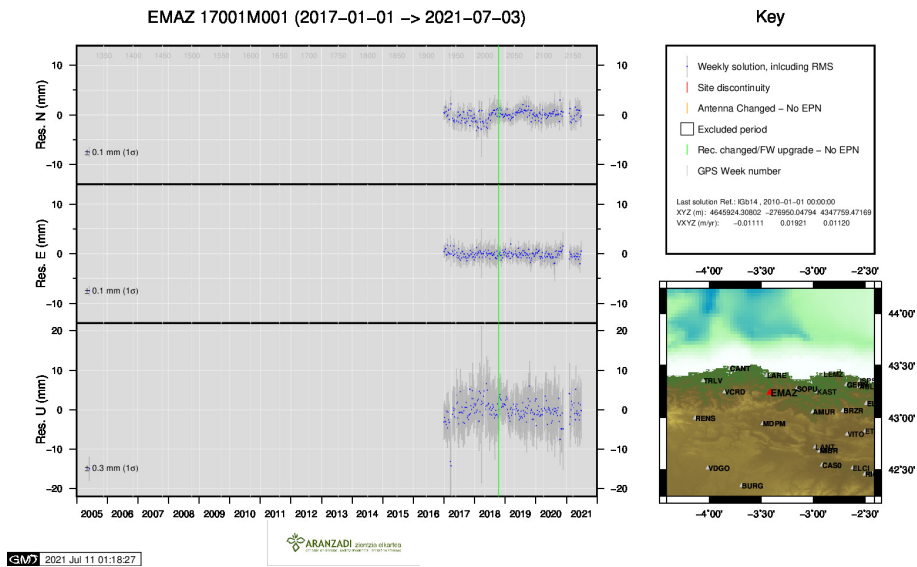
8 ) CHER



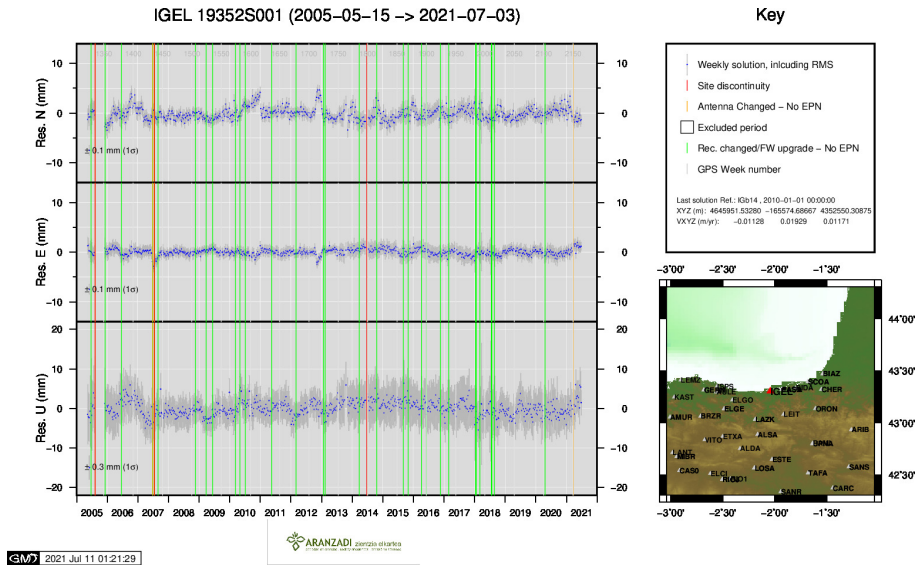
9 ) EBRE



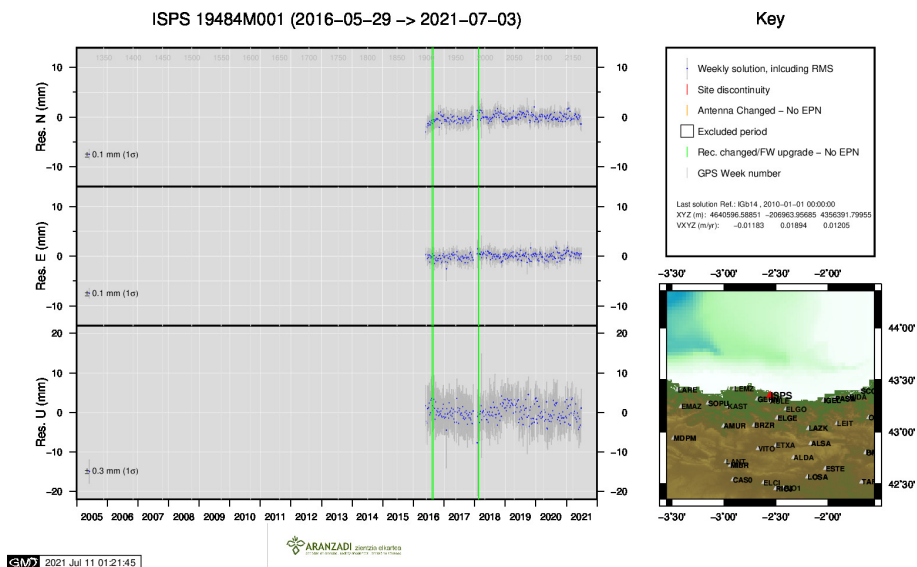
10 ) ELGE



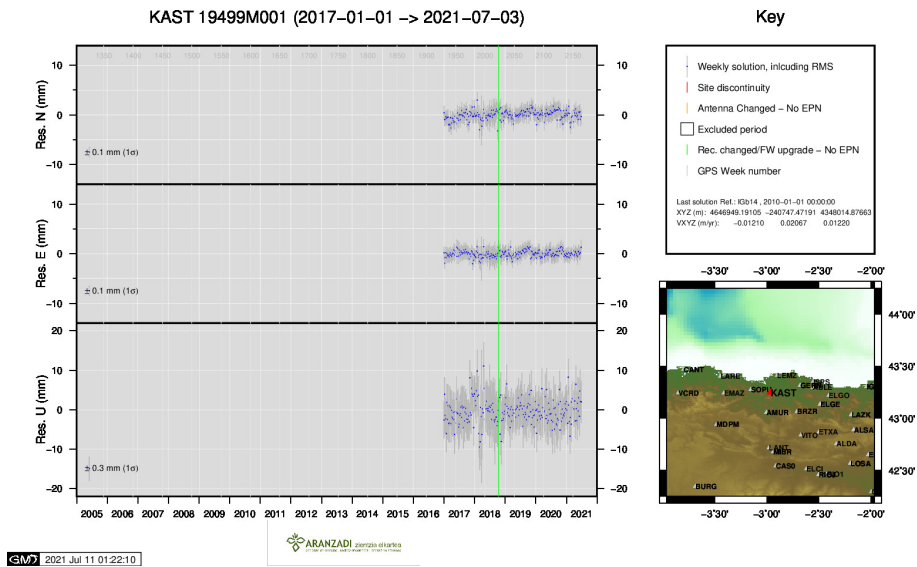
11 ) EMAZ



12 ) IGEL

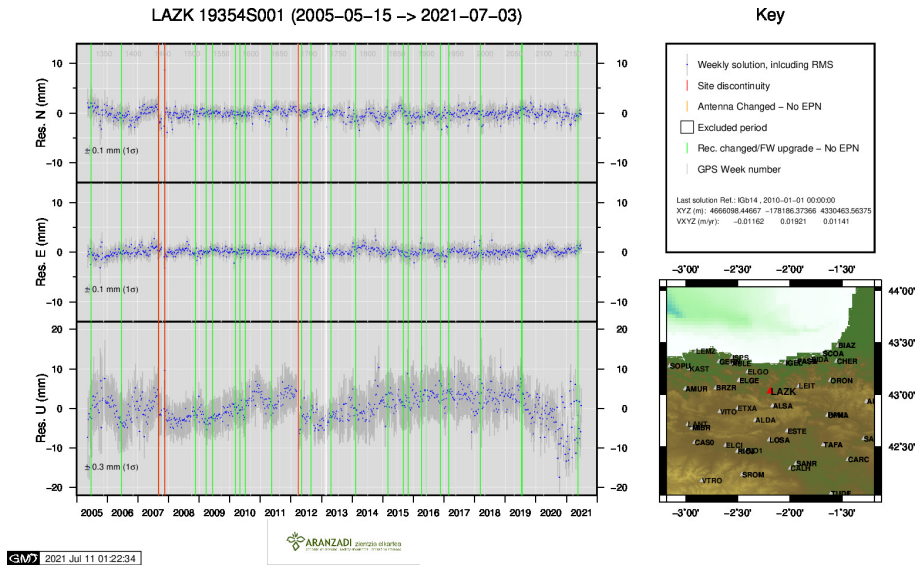


13 ) ISPS

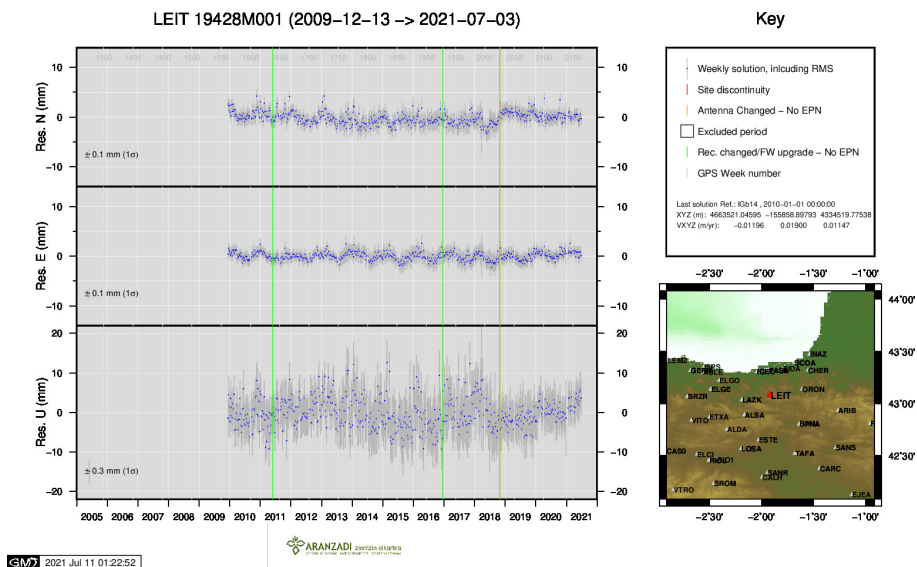


14 ) KAST

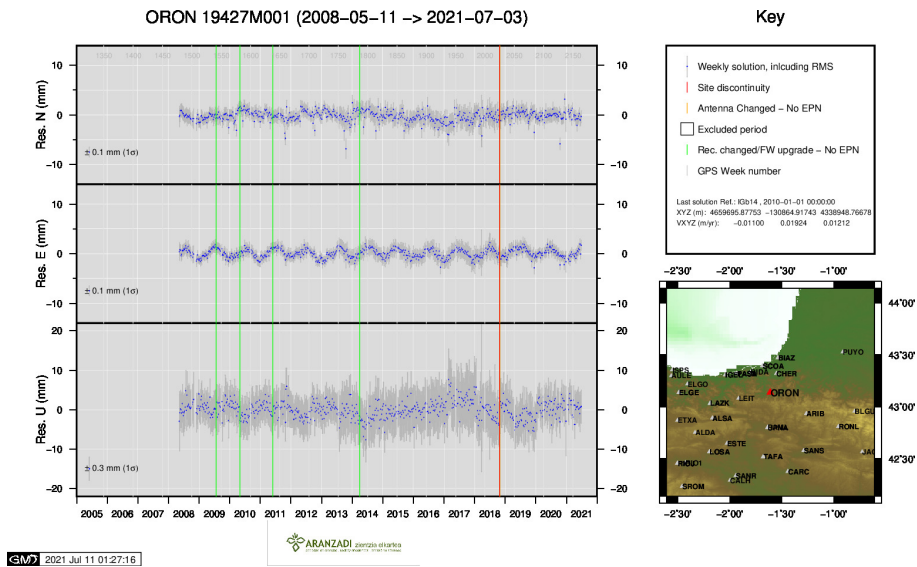




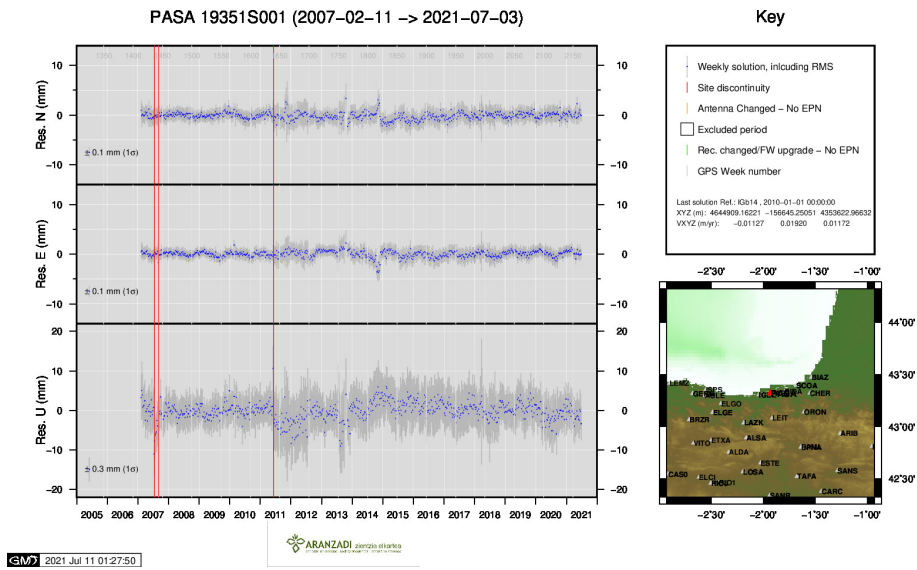
15 ) LAZK



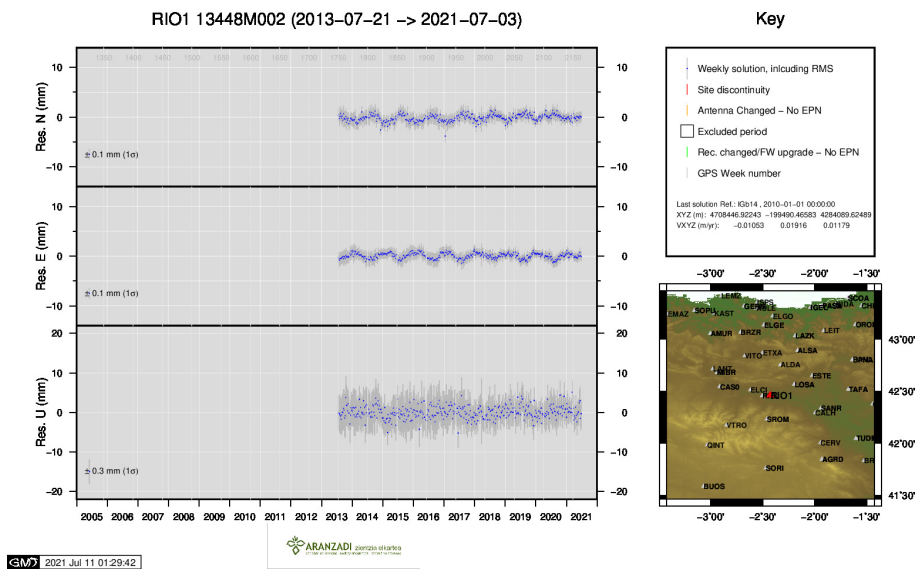
16 ) LEIT



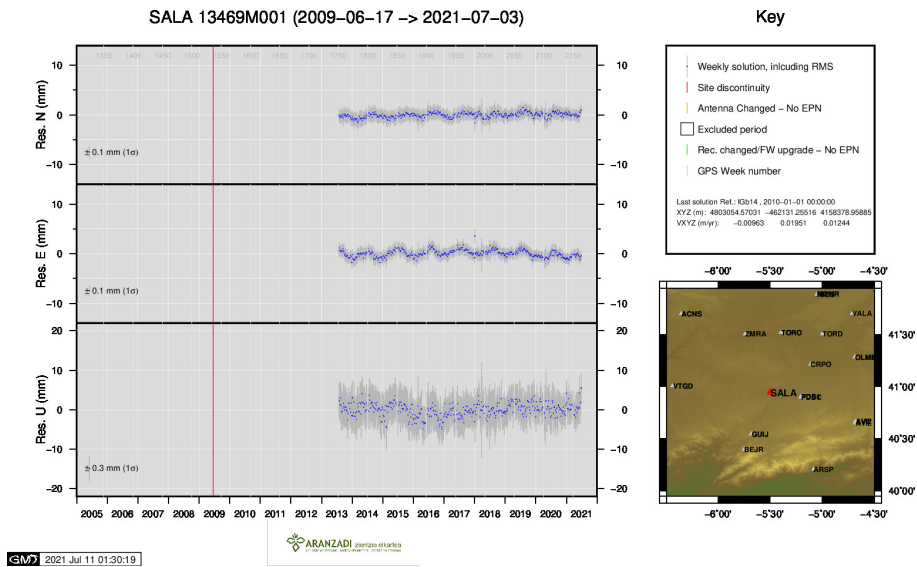
17 ) ORON



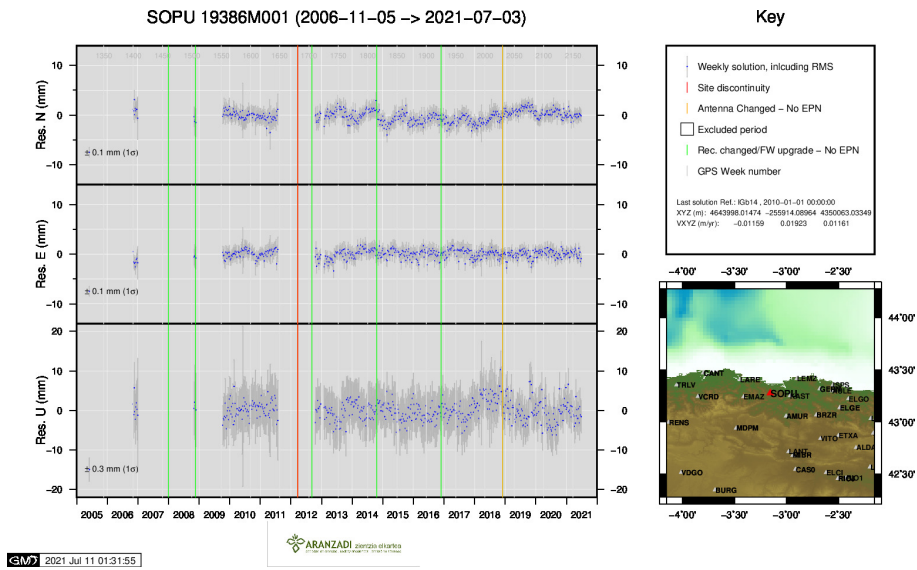
18 ) PASA



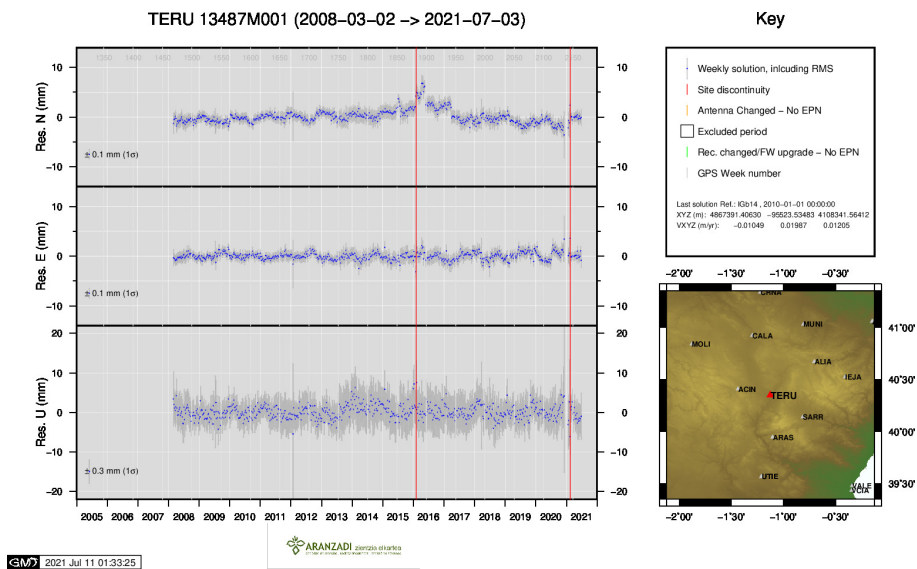
19 ) RIO1



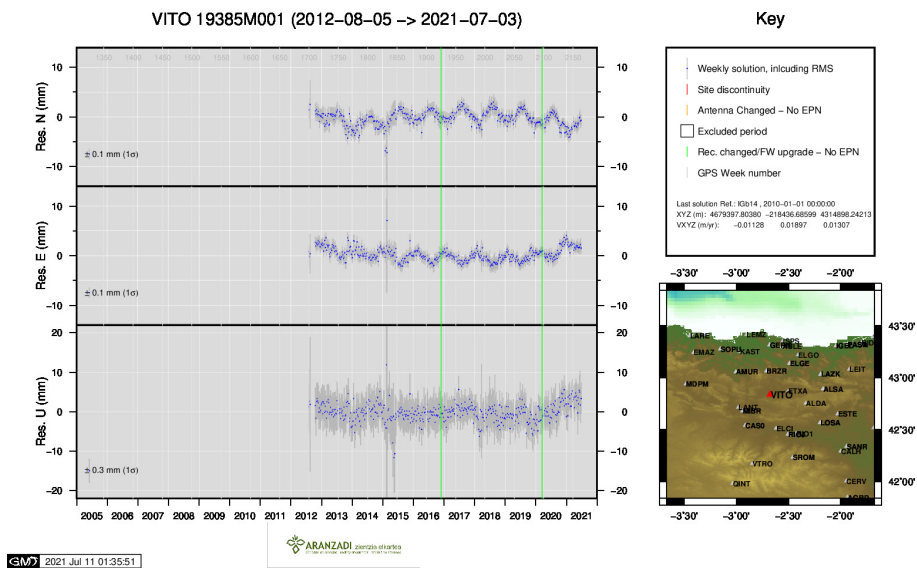
20 ) SALA



21 ) SOPU

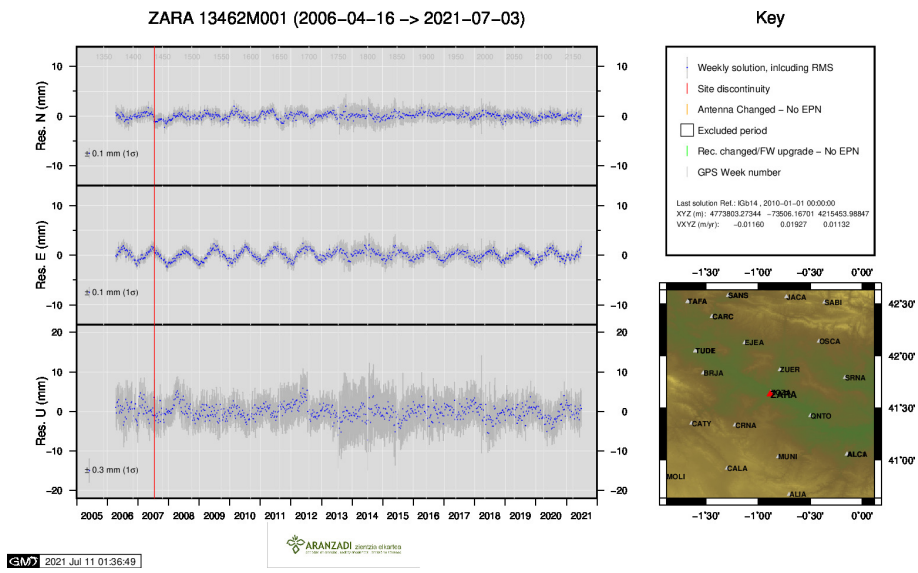


22 ) TERU



23 ) VITO





24 ) ZARA