ARA-DAC Weekly Analysis Result: 2161 (GFA)

Technical Report

GPS Week: 2161 (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

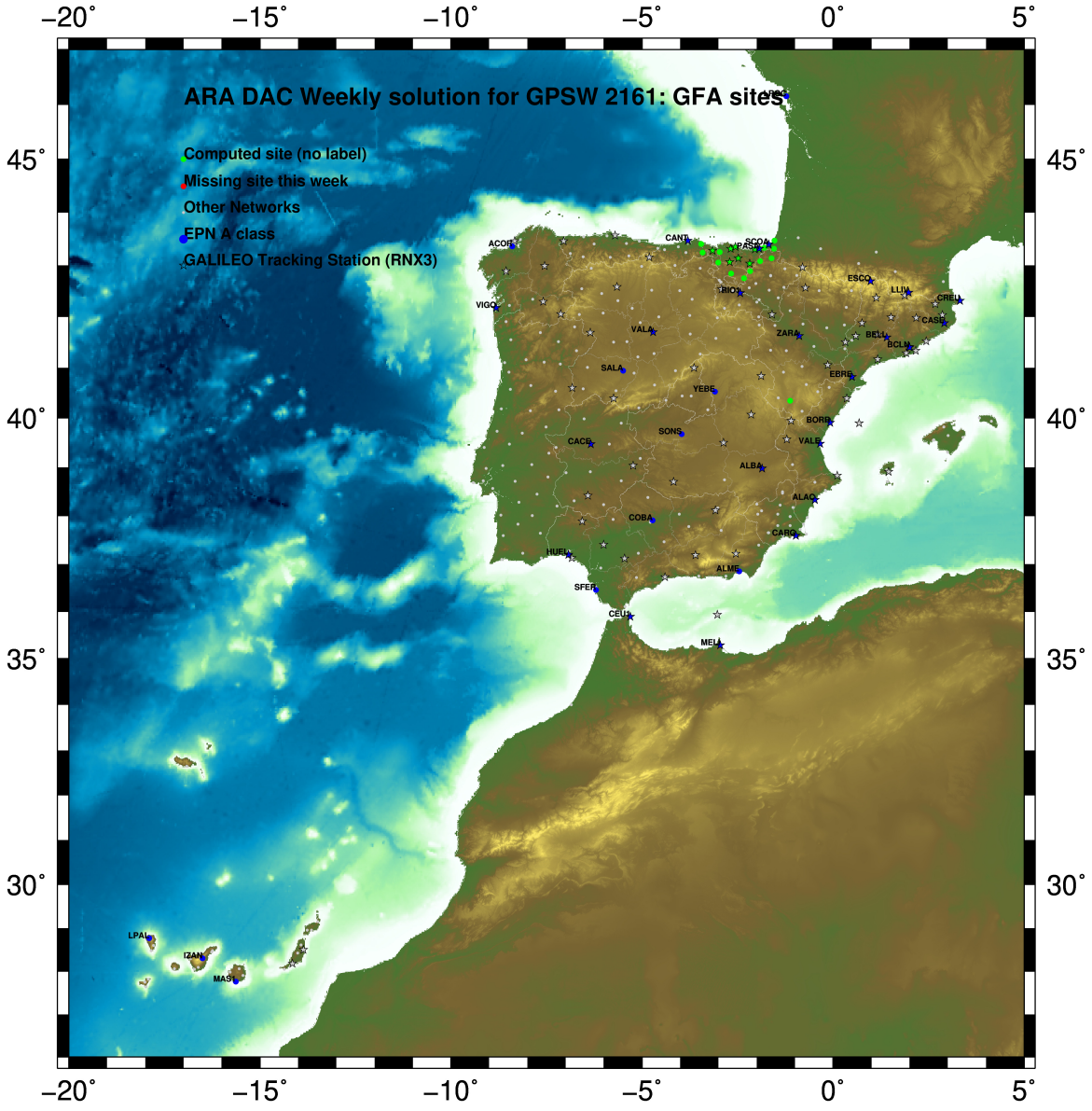


Fig.1: Computed Sites for GPS Week2161 (GFA)

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 avalaible 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 C2130.

ARA LAC 2161 WEEK FINAL COMBINATION: PRECISE ORBITS 27-JUN-21 08:52

LOCAL GEODETIC DATUM: IGb14 EPOCH: 2021-06-09 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.53586	-678367.40159	4357066.30476	W
39	ALDA 19383M001	4687280.13641	-190876.52926	4308106.98200	A
50	ALSA 19419M001	4677250.80763	-176770.35541	4319079.90108	A
53	AMUR 19388M001	4661499.42445	-244591.22045	4332269.90951	A
100	BIAZ 10074M002	4634456.02237	-124344.93872	4365785.47929	A
101	BIDA 00000M000	4644177.79391	-145778.28667	4354832.50500	A
113	BRZR 19387M001	4662220.96428	-220769.86139	4333309.46444	A
104	CACE 13447M001	4899866.48210	-544566.99904	4033770.22960	W
116	CANT 13438M001	4625924.28934	-307096.19746	4365771.57880	W
154	CHER 00000M000	4645879.99335	-125721.87146	4353624.10810	A
162	CREU 13432M001	4715420.10095	273178.09650	4271946.86357	W
204	EBRE 13410M001	4833519.96369	41537.42856	4147461.73897	W
180	ELGE 19353S001	4657557.36842	-202241.43245	4338991.91163	A
182	EMAZ 17001M001	4645924.17822	-276949.82859	4347759.59944	A
209	GERN 19389M001	4642811.29165	-217222.88747	4353278.90210	A
235	IGEL 19352S001	4645951.40454	-165574.46491	4352550.44266	A
240	ISPS 19484M001	4640596.45037	-206963.73992	4356391.93540	A
245	KAST 19499M001	4646949.05094	-240747.23547	4348015.01614	A
252	LARE 19440M001	4632831.93004	-279026.10538	4360314.45481	A
256	LAZK 19354S001	4666098.31500	-178186.15329	4330463.69611	A
261	LEIT 19428M001	4663520.91166	-155858.68091	4334519.90894	A
334	ORON 19427M001	4659695.75165	-130864.69648	4338948.90659	A
345	PAS2 19351S001	4644909.03046	-156645.03113	4353623.09942	A
493	PASA 19351S001	4644909.03090	-156645.03102	4353623.09972	W
553	RIO1 13448M002	4708446.80359	-199490.24677	4284089.76236	W
558	SALA 13469M001	4803054.46356	-462131.03298	4158379.10467	W
566	SCOA 10088M002	4639940.47086	-136224.90398	4359552.44096	W
418	SOPU 19386M001	4643997.87940	-255913.86975	4350063.16509	A
443	TERU 13487M001	4867391.28543	-95523.30779	4108341.70234	A
493	VITO 19385M001	4679397.67887	-218436.46750	4314898.39595	A
752	YEBE 13420M001	4848724.53872	-261631.88960	4123094.35064	W
755	ZARA 13462M001	4773803.13964	-73505.94553	4215454.11720	W

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).

ETRF2000 FINAL COORD. wk 2161 27-JUN-21 08:52

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2021-06-09 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.85850	-678367.97832	4357065.86094	W
39	ALDA 19383M001	4687280.51631	-190877.11528	4308106.53707	A
50	ALSA 19419M001	4677251.19010	-176770.94027	4319079.45714	A
53	AMUR 19388M001	4661499.79943	-244591.80375	4332269.46597	A
100	BIAZ 10074M002	4634456.41482	-124345.51867	4365785.03948	A
101	BIDA 00000M000	4644178.18288	-145778.86777	4354832.06413	A
113	BRZR 19387M001	4662221.34231	-220770.44471	4333309.02115	A
104	CACE 13447M001	4899866.79752	-544567.60924	4033769.76286	W
116	CANT 13438M001	4625924.65900	-307096.77697	4365771.13731	W
154	CHER 00000M000	4645880.38473	-125722.45268	4353623.66735	A
162	CREU 13432M001	4715420.53596	273177.50900	4271946.42226	W
204	EBRE 13410M001	4833520.36065	41536.82715	4147461.28519	W
180	ELGE 19353S001	4657557.74918	-202242.01520	4338991.46895	A
182	EMAZ 17001M001	4645924.55031	-276950.41026	4347759.15674	A
209	GERN 19389M001	4642811.67160	-217223.46862	4353278.46042	A
235	IGEL 19352S001	4645951.79088	-165575.04626	4352550.00139	A
240	ISPS 19484M001	4640596.83183	-206964.32080	4356391.49403	A
245	KAST 19499M001	4646949.42757	-240747.81715	4348014.57382	A
252	LARE 19440M001	4632832.30280	-279026.68558	4360314.01313	A
256	LAZK 19354S001	4666098.69813	-178186.73692	4330463.25305	A
261	LEIT 19428M001	4663521.29788	-155859.26419	4334519.46638	A
334	ORON 19427M001	4659696.14131	-130865.27926	4338948.46466	A
345	PAS2 19351S001	4644909.41799	-156645.61234	4353622.65835	A
493	PASA 19351S001	4644909.41843	-156645.61223	4353622.65865	W
553	RIO1 13448M002	4708447.18064	-199490.83515	4284089.31561	W
558	SALA 13469M001	4803054.79852	-462131.63243	4158378.64686	W
566	SCOA 10088M002	4639940.86137	-136225.48458	4359552.00055	W
418	SOPU 19386M001	4643998.25428	-255914.45113	4350062.72281	A
443	TERU 13487M001	4867391.66242	-95523.91338	4108341.24407	A
493	VITO 19385M001	4679398.05583	-218437.05272	4314897.95130	A
752	YEBE 13420M001	4848724.89609	-261632.49361	4123093.89174	W
755	ZARA 13462M001	4773803.52731	-73506.54075	4215453.66679	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).

ETRF2014 FINAL COORD. wk 2161 27-JUN-21 08:52

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2021-06-09 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.81757	-678368.01622	4357065.91200	W
39	ALDA 19383M001	4687280.47307	-190877.15447	4308106.58801	A
50	ALSA 19419M001	4677251.14691	-176770.97956	4319079.50812	A
53	AMUR 19388M001	4661499.75662	-244591.84286	4332269.51695	A
100	BIAZ 10074M002	4634456.37190	-124345.55831	4365785.09060	A
101	BIDA 00000M000	4644178.13993	-145778.90729	4354832.11521	A
113	BRZR 19387M001	4662221.29942	-220770.48391	4333309.07214	A
104	CACE 13447M001	4899866.75302	-544567.64633	4033769.81313	W
116	CANT 13438M001	4625924.61674	-307096.81601	4365771.18838	W
154	CHER 00000M000	4645880.34170	-125722.49227	4353623.71844	A
162	CREU 13432M001	4715420.49079	273177.46836	4271946.47343	W
204	EBRE 13410M001	4833520.31508	41536.78778	4147461.33587	W
180	ELGE 19353S001	4657557.70628	-202242.05448	4338991.51997	A
182	EMAZ 17001M001	4645924.50777	-276950.44933	4347759.20775	A
209	GERN 19389M001	4642811.62889	-217223.50790	4353278.51147	A
235	IGEL 19352S001	4645951.74797	-165575.08571	4352550.05246	A
240	ISPS 19484M001	4640596.78911	-206964.36013	4356391.54509	A
245	KAST 19499M001	4646949.38489	-240747.85633	4348014.62485	A
252	LARE 19440M001	4632832.26038	-279026.72470	4360314.06419	A
256	LAZK 19354S001	4666098.65506	-178186.77624	4330463.30406	A
261	LEIT 19428M001	4663521.25476	-155859.30360	4334519.51740	A
334	ORON 19427M001	4659696.09815	-130865.31877	4338948.51571	A
345	PAS2 19351S001	4644909.37506	-156645.65182	4353622.70943	A
493	PASA 19351S001	4644909.37550	-156645.65171	4353622.70973	W
553	RIO1 13448M002	4708447.13720	-199490.87423	4284089.36649	W
558	SALA 13469M001	4803054.75487	-462131.67021	4158378.69739	W
566	SCOA 10088M002	4639940.81843	-136225.52415	4359552.05165	W
418	SOPU 19386M001	4643998.21169	-255914.49028	4350062.77385	A
443	TERU 13487M001	4867391.61695	-95523.95214	4108341.29458	A
493	VITO 19385M001	4679398.01276	-218437.09185	4314898.00225	A
752	YEBE 13420M001	4848724.85136	-261632.53189	4123093.94222	W
755	ZARA 13462M001	4773803.48277	-73506.57998	4215453.71755	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 IGb14 solution and are given with respect to the Local frame (North-East-Up).

ARA LAC 2161 WEEK FINAL COMBINATION: PRECISE ORBITS 27-JUN-21 08:52

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	7	XXXXXXX	0.89	0.64	4.22
ALDA 19383M001	7	XXXXXXX	1.02	0.62	4.51
ALSA 19419M001	7	XXXXXXX	1.09	0.33	2.95
AMUR 19388M001	7	XXXXXXX	0.99	0.78	3.49
BIAZ 10074M002	7	XXXXXXX	0.56	0.49	2.38
BIDA 00000M000	7	XXXXXXX	0.78	0.53	2.19
BRZR 19387M001	7	XXXXXXX	0.78	0.68	2.36
CACE 13447M001	7	XXXXXXX	0.97	1.04	3.44
CANT 13438M001	7	XXXXXXX	0.72	0.72	4.66
CHER 00000M000	7	XXXXXXX	0.83	0.61	1.57
CREU 13432M001	6	XX XXXX	0.54	0.87	5.85
EBRE 13410M001	7	XXXXXXX	0.51	0.94	2.04
ELGE 19353S001	7	XXXXXXX	0.66	0.60	1.63
EMAZ 17001M001	7	XXXXXXX	0.85	1.05	2.99
GERN 19389M001	7	XXXXXXX	0.94	0.74	1.40
IGEL 19352S001	7	XXXXXXX	0.72	0.71	2.65
ISPS 19484M001	7	XXXXXXX	0.61	0.91	2.15
KAST 19499M001	7	XXXXXXX	0.78	0.75	2.81
LARE 19440M001	7	XXXXXXX	0.83	0.80	4.46
LAZK 19354S001	7	XXXXXXX	0.53	0.81	3.61
LEIT 19428M001	7	XXXXXXX	1.19	0.93	3.38
ORON 19427M001	7	XXXXXXX	0.95	0.82	2.30
PAS2 19351S001	7	XXXXXXX	0.87	0.66	2.57
PASA 19351S001	7	XXXXXXX	0.85	0.52	2.40
RIO1 13448M002	7	XXXXXXX	0.85	0.61	3.55
SALA 13469M001	7	XXXXXXX	1.35	1.06	3.90
SCOA 10088M002	7	XXXXXXX	0.78	1.13	3.98
SOPU 19386M001	7	XXXXXXX	0.66	0.81	3.41
TERU 13487M001	7	XXXXXXX	0.52	0.56	3.21
VITO 19385M001	7	XXXXXXX	0.81	0.73	4.92
YEBE 13420M001	7	XXXXXXX	0.87	0.82	2.07
ZARA 13462M001	7	XXXXXXX	1.22	0.39	4.48

Comparison of individual solutions:

ACOR 13434M001	N	0.89	-0.89	-0.31	1.17	-0.38	0.30	-1.13	0.98
ACOR 13434M001	E	0.64	0.78	-0.23	0.56	-0.63	-0.89	0.43	0.35
ACOR 13434M001	U	4.22	4.62	0.97	-2.85	3.97	-2.22	-6.99	2.67
ALDA 19383M001	N	1.02	-0.08	-0.88	-1.18	-0.03	1.92	-0.54	-0.22
ALDA 19383M001	E	0.62	-0.43	0.17	0.81	-0.53	-0.90	0.55	-0.25
ALDA 19383M001	U	4.51	-2.53	1.64	5.40	1.77	-6.67	-5.06	-3.28
ALSA 19419M001	N	1.09	1.05	1.09	0.55	-0.45	-1.71	-1.17	-0.31
ALSA 19419M001	E	0.33	-0.35	0.26	0.03	-0.19	0.02	0.63	0.19
ALSA 19419M001	U	2.95	-1.73	-2.90	2.20	2.47	3.95	-1.50	-3.46
AMUR 19388M001	N	0.99	0.36	-1.60	-1.02	0.68	0.92	0.90	-0.14
AMUR 19388M001	E	0.78	-0.75	-0.47	0.60	-0.54	-0.29	1.35	0.55
AMUR 19388M001	U	3.49	-3.95	-4.24	3.12	2.96	-0.48	-3.33	-3.09
BIAZ 10074M002	N	0.56	0.53	0.09	0.34	-0.14	-0.03	0.21	-1.20
BIAZ 10074M002	E	0.49	0.09	0.65	0.15	-0.41	0.86	0.11	-0.29
BIAZ 10074M002	U	2.38	-0.20	-2.31	-0.40	1.99	4.39	-1.67	1.52
BIDA 00000M000	N	0.78	0.56	-0.81	-0.91	0.55	-0.28	1.16	-0.33
BIDA 00000M000	E	0.53	-0.30	0.76	0.08	-0.62	0.29	0.74	0.01
BIDA 00000M000	U	2.19	2.42	-2.83	0.52	2.77	2.22	-1.03	-1.01
BRZR 19387M001	N	0.78	0.47	1.30	0.29	-0.68	0.98	0.12	-0.45
BRZR 19387M001	E	0.68	0.53	-0.39	-0.22	-0.38	0.04	0.62	1.33
BRZR 19387M001	U	2.36	3.05	-1.72	1.47	0.60	-1.61	-0.98	-3.87
CACE 13447M001	N	0.97	0.27	-0.12	-0.42	-1.58	0.16	1.65	0.40
CACE 13447M001	E	1.04	-0.46	-0.91	-0.32	0.42	-0.34	2.14	-0.66
CACE 13447M001	U	3.44	2.41	2.72	1.33	-4.96	-4.26	3.47	-1.07
CANT 13438M001	N	0.72	-0.30	0.85	-0.60	-1.07	0.34	0.84	0.03
CANT 13438M001	E	0.72	0.23	0.04	0.72	-0.33	-1.18	0.95	0.41
CANT 13438M001	U	4.66	4.42	-4.12	1.39	7.46	-0.83	-5.48	-2.32
CHER 00000M000	N	0.83	0.35	-0.30	-0.04	0.40	-1.13	1.39	-0.73
CHER 00000M000	E	0.61	-0.22	0.91	0.11	-0.85	0.69	0.35	0.19
CHER 00000M000	U	1.57	1.76	-2.74	-0.23	1.22	0.51	0.96	1.21
CREU 13432M001	N	0.54	0.33	-0.69		0.13	-0.85	0.30	0.11
CREU 13432M001	E	0.87	-0.91	1.11		0.33	0.43	-1.20	0.17
CREU 13432M001	U	5.85	-0.04	2.82		-10.23	7.30	1.82	-1.47
EBRE 13410M001	N	0.51	-0.16	0.39	0.13	-0.89	0.72	-0.17	-0.06
EBRE 13410M001	E	0.94	1.32	-0.77	-0.11	-0.45	1.14	-1.20	0.15
EBRE 13410M001	U	2.04	-1.74	-0.85	-0.69	0.82	1.26	3.94	-1.72
ELGE 19353S001	N	0.66	1.17	0.42	-0.60	-0.10	-0.37	0.63	0.43
ELGE 19353S001	E	0.60	-0.05	0.42	0.48	0.03	-0.47	0.18	1.23
ELGE 19353S001	U	1.63	-1.28	-0.38	1.62	-0.00	1.43	-2.97	-0.86
EMAZ 17001M001	N	0.85	-1.34	0.93	-0.23	-0.21	-0.35	1.19	0.01
EMAZ 17001M001	E	1.05	0.33	-2.06	-0.26	0.49	0.59	0.85	0.96
EMAZ 17001M001	U	2.99	1.50	0.91	5.02	1.21	-3.84	-1.78	-2.48
GERN 19389M001	N	0.94	-1.07	-0.05	0.90	-0.66	0.91	1.44	-0.03
GERN 19389M001	E	0.74	0.49	-0.64	0.44	-0.27	-0.34	0.92	1.18
GERN 19389M001	U	1.40	-0.73	2.29	-1.34	0.71	-1.58	-1.08	-0.17
IGEL 19352S001	N	0.72	-1.20	0.02	0.50	-0.02	0.06	1.07	-0.48
IGEL 19352S001	E	0.71	0.35	0.44	-0.31	-0.84	-0.47	1.18	0.56
IGEL 19352S001	U	2.65	-1.67	-0.58	1.87	1.59	4.85	-3.07	-0.12
ISPS 19484M001	N	0.61	0.41	0.66	0.31	-0.85	0.07	0.86	-0.21
ISPS 19484M001	E	0.91	-0.09	1.63	-0.93	0.07	-0.11	1.19	-0.03
ISPS 19484M001	U	2.15	2.51	-3.03	-2.19	2.31	-0.14	-0.03	-1.41
KAST 19499M001	N	0.78	0.05	1.89	0.02	0.12	0.11	-0.09	0.06
KAST 19499M001	E	0.75	-0.08	-0.78	-0.05	0.20	0.14	0.15	1.64
KAST 19499M001	U	2.81	1.89	-1.01	3.24	0.11	-5.04	-2.20	-1.47
LARE 19440M001	N	0.83	-0.70	0.65	-0.05	-1.37	1.12	0.22	0.17
LARE 19440M001	E	0.80	0.76	-0.58	-1.05	0.19	0.11	0.03	1.34
LARE 19440M001	U	4.46	0.39	-3.10	4.52	7.02	0.69	-3.66	-5.09
LAZK 19354S001	N	0.53	0.18	-0.79	-0.32	0.49	-0.36	-0.54	0.55
LAZK 19354S001	E	0.81	1.16	-0.88	0.55	-0.71	-0.56	0.34	0.78

LAZK	19354S001	U	3.61	6.50	-3.48	1.01	0.58	-0.72	-4.66	-0.67
LEIT	19428M001	N	1.19	2.15	0.70	-0.83	0.06	-0.86	-1.12	-0.86
LEIT	19428M001	E	0.93	0.57	0.81	-0.46	-0.98	-0.64	0.53	1.54
LEIT	19428M001	U	3.38	1.73	3.89	-1.53	0.42	4.22	-5.40	-0.94
ORON	19427M001	N	0.95	0.80	-1.04	-0.55	0.15	0.47	1.46	-0.99
ORON	19427M001	E	0.82	-0.64	0.47	0.12	-0.55	-0.35	0.32	1.68
ORON	19427M001	U	2.30	0.87	-4.21	2.58	-1.80	1.28	-0.49	-1.25
PAS2	19351S001	N	0.87	1.19	-0.72	0.86	-0.36	-0.93	0.55	-0.73
PAS2	19351S001	E	0.66	0.99	-0.23	-0.30	-0.86	0.29	0.46	0.71
PAS2	19351S001	U	2.57	1.78	-2.32	1.43	4.42	1.64	-2.17	-1.49
PASA	19351S001	N	0.85	1.17	-0.99	0.33	0.18	-0.73	0.84	-0.79
PASA	19351S001	E	0.52	0.49	-0.12	-0.35	-0.54	0.17	0.43	0.85
PASA	19351S001	U	2.40	1.16	-2.11	1.73	3.42	2.67	-2.29	-1.29
RIO1	13448M002	N	0.85	-0.15	0.16	-0.16	1.39	0.44	-1.44	-0.13
RIO1	13448M002	E	0.61	1.23	0.17	0.12	-0.40	-0.66	-0.10	0.22
RIO1	13448M002	U	3.55	0.65	-0.43	1.75	-6.77	2.62	3.08	-3.13
SALA	13469M001	N	1.35	-0.76	0.96	2.61	-0.26	-1.41	-0.55	-0.51
SALA	13469M001	E	1.06	0.75	1.89	-0.30	-0.27	0.53	-1.31	-0.70
SALA	13469M001	U	3.90	-4.72	4.43	4.70	-3.70	-2.43	1.00	2.56
SCOA	10088M002	N	0.78	-0.00	-0.13	-1.00	0.89	-0.65	1.18	-0.17
SCOA	10088M002	E	1.13	-0.53	-0.83	1.42	0.05	0.68	1.71	-1.12
SCOA	10088M002	U	3.98	2.39	-0.74	1.21	0.91	4.67	-7.92	1.39
SOPU	19386M001	N	0.66	0.48	0.77	0.66	0.18	-0.28	0.82	-0.74
SOPU	19386M001	E	0.81	-0.17	0.15	0.01	-0.53	-0.21	0.16	1.87
SOPU	19386M001	U	3.41	-4.51	-1.83	3.69	1.15	1.17	-5.25	1.44
TERU	13487M001	N	0.52	-0.14	-0.93	-0.21	-0.41	0.09	-0.10	0.69
TERU	13487M001	E	0.56	-0.19	0.27	0.30	-1.05	-0.45	-0.13	0.58
TERU	13487M001	U	3.21	0.03	3.58	-1.62	2.80	-2.13	-5.51	-1.87
VITO	19385M001	N	0.81	-0.33	-0.97	-0.24	0.89	-0.25	1.39	-0.14
VITO	19385M001	E	0.73	-0.39	1.09	-0.29	-0.79	-0.04	1.07	0.03
VITO	19385M001	U	4.92	0.34	-3.47	0.04	4.23	1.70	-10.14	-3.05
YEBE	13420M001	N	0.87	1.19	-0.68	-0.67	0.44	-0.71	0.81	-0.92
YEBE	13420M001	E	0.82	0.77	0.21	-1.34	0.67	0.59	0.25	-0.85
YEBE	13420M001	U	2.07	-0.16	0.73	2.43	-2.61	-2.24	2.01	1.82
ZARA	13462M001	N	1.22	0.46	-0.24	-0.33	0.35	0.74	-2.76	0.49
ZARA	13462M001	E	0.39	0.05	0.20	0.84	0.07	-0.20	-0.27	0.18
ZARA	13462M001	U	4.48	-4.48	-3.31	2.61	-2.68	3.26	8.03	0.40

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	-0.65	0.18	1.75
12	ALAC 13433M001	I W	-0.13	0.45	0.85
15	ALBA 13452M001	I W	0.25	-0.62	-3.93
21	ALME 13437M001	I W	-1.19	-0.08	3.49
47	BCLN 13412M001	I W	-0.47	-1.37	-1.39
52	BELL 13431M001	I W	0.11	0.20	5.38
71	BORR 13480M001	I W	-0.81	0.19	-1.81
76	BRST 10004M004	I W	-1.48	-0.62	0.13
104	CACE 13447M001	I W	0.38	1.04	2.80
116	CANT 13438M001	I W	-0.25	1.01	-1.23
117	CARG 19412M001	I W	0.61	0.75	-2.89
122	CASE 13494M001	I W	-2.15	-0.57	-3.94
128	CEU1 13449M002	I W	0.36	-0.97	-1.92
143	COBA 13453M001	I W	1.00	0.13	-1.67
162	CREU 13432M001	I W	-0.49	1.68	2.74
204	EBRE 13410M001	I W	-0.07	0.93	0.52
222	ESCO 13435M001	I W	-0.85	2.12	-1.57
299	HUEL 13451M001	I W	1.64	-3.78	-2.95
316	IZAN 31309M002	I W	1.02	0.49	-3.11
385	LLIV 13436M001	I W	0.11	0.21	-0.66
390	LPAL 81701M001	I W	-2.08	-0.03	-3.24
392	LROC 10023M001	I W	1.18	0.13	-0.36
421	MAS1 31303M002	I W	1.69	1.60	-2.11
432	MELI 19379M001	I W	2.83	-1.00	-3.75
493	PASA 19351S001	I W	-0.46	-0.31	1.13
553	RIO1 13448M002	I W	-1.61	0.13	-3.37
558	SALA 13469M001	I W	0.92	0.85	-5.75
566	SCOA 10088M002	I W	-3.90	-0.72	-3.36
574	SFER 13402M004	I W	0.60	-0.94	1.24
599	SONS 13446M001	I W	-0.68	2.89	3.28
700	VALA 13463M002	I W	0.76	0.42	0.50
704	VALE 13439M001	I W	0.59	0.07	-1.47
715	VIGO 13450M001	I W	3.43	-2.56	4.10
752	YEBE 13420M001	I W	-1.37	-2.00	9.92
755	ZARA 13462M001	I W	-0.21	-0.52	4.32
764	ZIMM 14001M004	I W	1.35	0.61	8.34
	RMS / COMPONENT		1.40	1.26	3.54
	MEAN		-0.00	-0.00	0.00
	MIN		-3.90	-3.78	-5.75
	MAX		3.43	2.89	9.92

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 108
RMS OF TRANSFORMATION : 2.31 MM

BARYCENTER COORDINATES:

LATITUDE : 40 0 32.53
LONGITUDE : - 3 31 28.72
HEIGHT : -36.203 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                       19434020
 NUMBER OF UNKNOWNS                             241377
 NUMBER OF DEGREES OF FREEDOM                 19192643
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                     2.126855055932264
```

Helmert Transformation Parameters With Respect to Combined Solution:

		Translation (m)			Rotation (")			
Sol	Rms (m)	X	Y	Z	X	Y	Z	Scale (ppm)
1	0.00186	-0.0054	-0.0012	0.0064	-0.0000	-0.0003	-0.0001	0.00010
2	0.00185	0.0096	0.0130	-0.0171	-0.0001	0.0006	0.0004	0.00066
3	0.00192	0.0052	0.0011	-0.0099	-0.0000	0.0004	0.0000	0.00046
4	0.00206	-0.0201	-0.0195	0.0203	0.0004	-0.0009	-0.0005	0.00027
5	0.00218	-0.0094	0.0005	0.0156	-0.0001	-0.0006	-0.0000	-0.00034
6	0.00221	0.0032	-0.0066	0.0038	0.0001	-0.0000	-0.0002	-0.00093
7	0.00244	0.0271	0.0158	-0.0335	-0.0002	0.0014	0.0005	0.00020

Statistics of individual solutions:

File	RMS (m)	DOF	Chi**2/DOF	#Observations authentic	/ pseudo	#Parameters explicit	/ implicit	/ singular
1	0.00141	2797148	1.99	2831859	3	975	33739	0
2	0.00145	2763088	2.10	2799355	3	975	35295	0
3	0.00147	2704369	2.15	2737950	3	951	32633	0
4	0.00146	2742440	2.12	2778324	3	984	34903	0
5	0.00144	2764728	2.09	2801875	3	978	36172	0
6	0.00148	2689890	2.19	2725112	3	972	34253	0
7	0.00149	2725181	2.22	2759545	3	972	33395	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 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 ALDA  A    1 P 21:157:00000 21:163:86370 LEICA GR10           ----- -----------
 ALSA  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 21:157:00000 21:163:86370 LEICA GR10           ----- -----------
 BIAZ  A    1 P 21:157:00000 21:163:82770 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 21:157:00000 21:163:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 21:157:00000 21:163:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 21:157:00000 21:163:86370 LEICA GR10           ----- -----------
 CHER  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 CREU  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 EMAZ  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 IGEL  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 21:157:00000 21:163:86370 TRIMBLE NETR9        ----- -----------
 KAST  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 LARE  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 LAZK  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 LEIT  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 PAS2  A    1 P 21:157:00030 21:163:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 21:157:00000 21:163:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 21:157:00000 21:163:86370 LEICA GRX1200+GNSS   ----- -----------
 SCOA  A    1 P 21:157:00000 21:163:86370 LEICA GR25           ----- -----------
 SOPU  A    1 P 21:157:00000 21:163:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 VITO  A    1 P 21:157:00000 21:163:86370 LEICA GR10           ----- -----------
 YEBE  A    1 P 21:157:00000 21:163:86370 LEICA GR50           ----- -----------
 ZARA  A    1 P 21:157:00000 21:163:86370 TRIMBLE NETR9        ----- -----------
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are vailable.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__
 ACOR  A    1 P 21:157:00000 21:163:86370 LEIAT504        LEIS -----
 ALDA  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 ALSA  A    1 P 21:157:00000 21:163:86370 LEIAR10         NONE -----
 AMUR  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
```

```
 BIAZ  A    1 P 21:157:00000 21:163:82770 LEIAR25         LEIT -----
 BIDA  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 BRZR  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 CACE  A    1 P 21:157:00000 21:163:86370 TRM29659.00     NONE -----
 CANT  A    1 P 21:157:00000 21:163:86370 LEIAR25.R4      LEIT 25066
 CHER  A    1 P 21:157:00000 21:163:86370 LEIAR10         NONE -----
 CREU  A    1 P 21:157:00000 21:163:86370 LEIAR25.R4      NONE 26357
 EBRE  A    1 P 21:157:00000 21:163:86370 LEIAR25.R4      NONE 26359
 ELGE  A    1 P 21:157:00000 21:163:86370 LEIAR25.R4      LEIT -----
 EMAZ  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 GERN  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 IGEL  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 ISPS  A    1 P 21:157:00000 21:163:86370 TRM59900.00     SCIS -----
 KAST  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 LARE  A    1 P 21:157:00000 21:163:86370 LEIAR20         LEIM -----
 LAZK  A    1 P 21:157:00000 21:163:86370 LEIAR25.R4      LEIT -----
 LEIT  A    1 P 21:157:00000 21:163:86370 LEIAR10         NONE -----
 ORON  A    1 P 21:157:00000 21:163:86370 LEIAR10         NONE -----
 PAS2  A    1 P 21:157:00030 21:163:86370 LEIAR20         LEIM 73034
 PASA  A    1 P 21:157:00000 21:163:86370 LEIAR20         LEIM 73034
 RIO1  A    1 P 21:157:00000 21:163:86370 LEIAR25.R4      LEIT 25138
 SALA  A    1 P 21:157:00000 21:163:86370 LEIAR25         NONE -----
 SCOA  A    1 P 21:157:00000 21:163:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 TERU  A    1 P 21:157:00000 21:163:86370 LEIAR20         LEIM 49044
 VITO  A    1 P 21:157:00000 21:163:86370 LEIAS10         NONE -----
 YEBE  A    1 P 21:157:00000 21:163:86370 LEIAR20         LEIM 49016
 ZARA  A    1 P 21:157:00000 21:163:86370 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 21:157:00000 21:163:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 21:157:00000 21:163:82770 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 21:157:00000 21:163:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 21:157:00000 21:163:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 21:157:00000 21:163:86370 UNE   3.0490   0.0000   0.0000
 CHER  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 CREU  A    1 P 21:157:00000 21:163:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 21:157:00000 21:163:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 EMAZ  A    1 P 21:157:00000 21:163:86370 UNE   0.0350   0.0000   0.0000
 GERN  A    1 P 21:157:00000 21:163:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 21:157:00000 21:163:86370 UNE   0.0350   0.0000   0.0000
 KAST  A    1 P 21:157:00000 21:163:86370 UNE   0.0350   0.0000   0.0000
 LARE  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 LAZK  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 LEIT  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 ORON  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 PAS2  A    1 P 21:157:00030 21:163:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 21:157:00000 21:163:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 21:157:00000 21:163:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 21:157:00000 21:163:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 21:157:00000 21:163:86370 UNE   0.0600   0.0000   0.0000
 VITO  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 YEBE  A    1 P 21:157:00000 21:163:86370 UNE   0.0000   0.0000   0.0000
 ZARA  A    1 P 21:157:00000 21:163:86370 UNE   3.2590   0.0000   0.0000
```

8 References

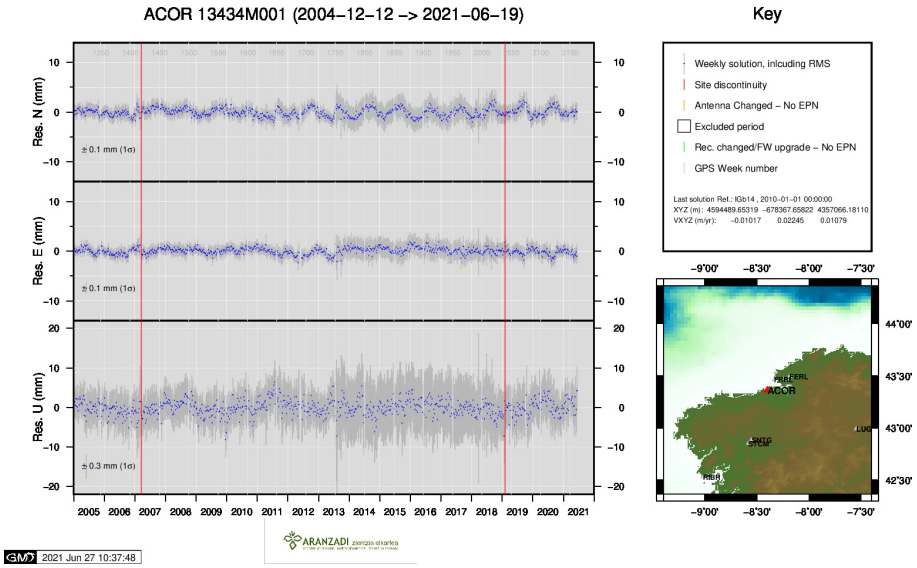
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

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

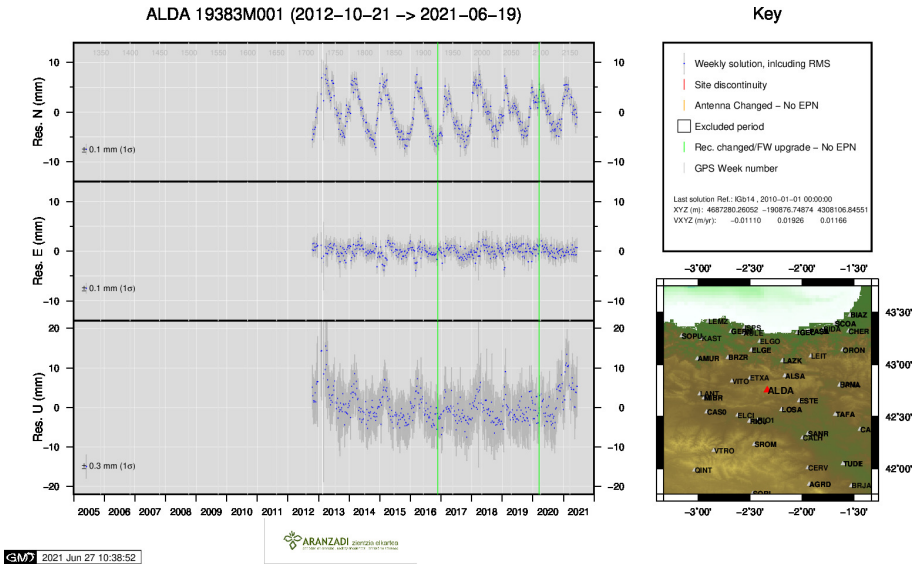
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

9 Cumulative Time Series

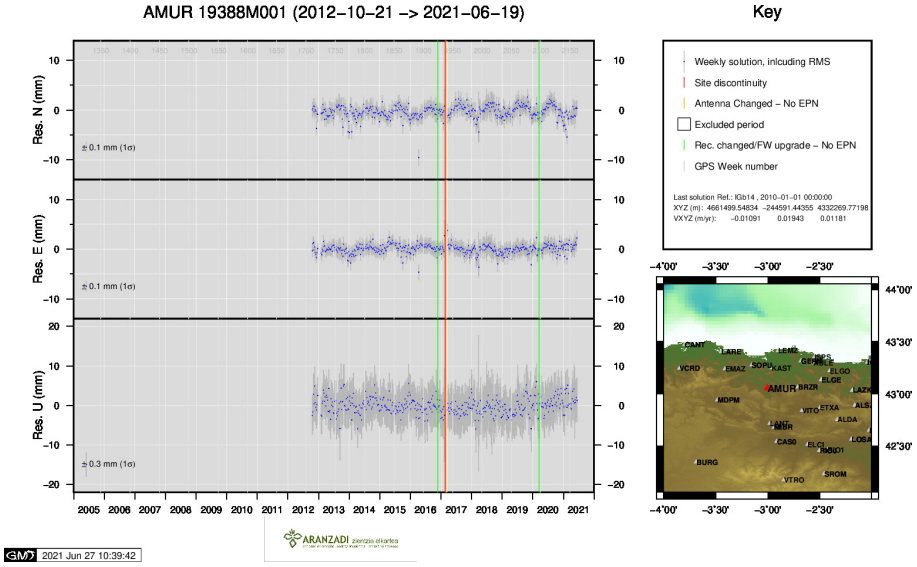
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



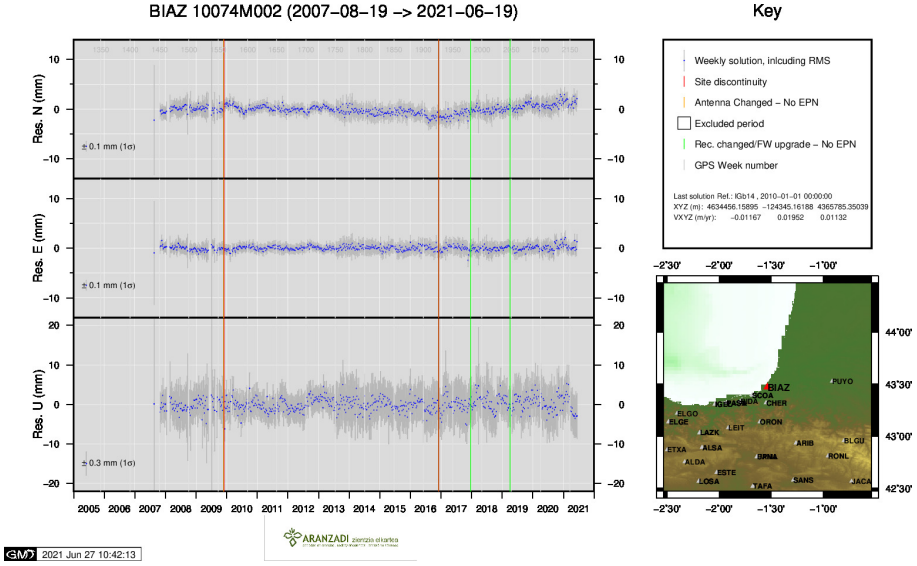
1) ACOR



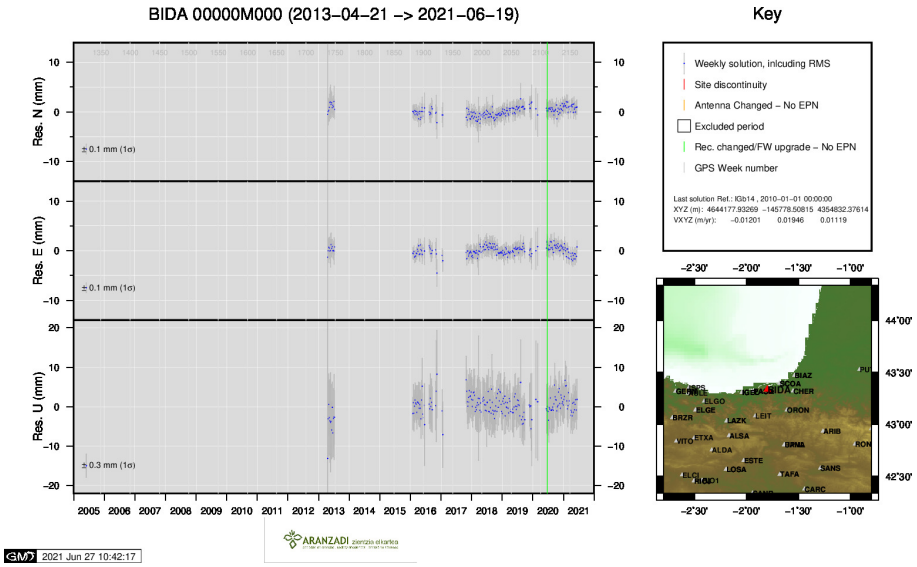
2) ALDA



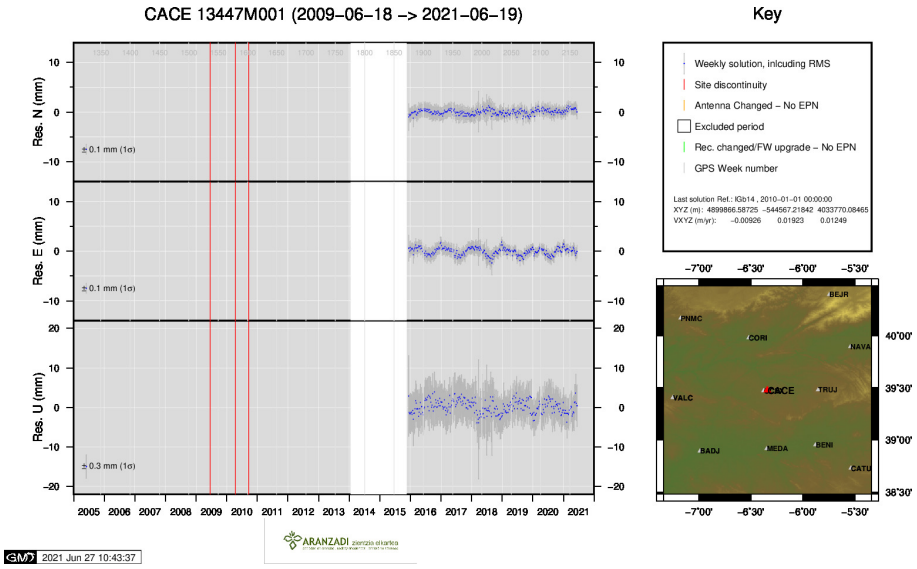
3) AMUR



4) BIAZ



5) BIDA



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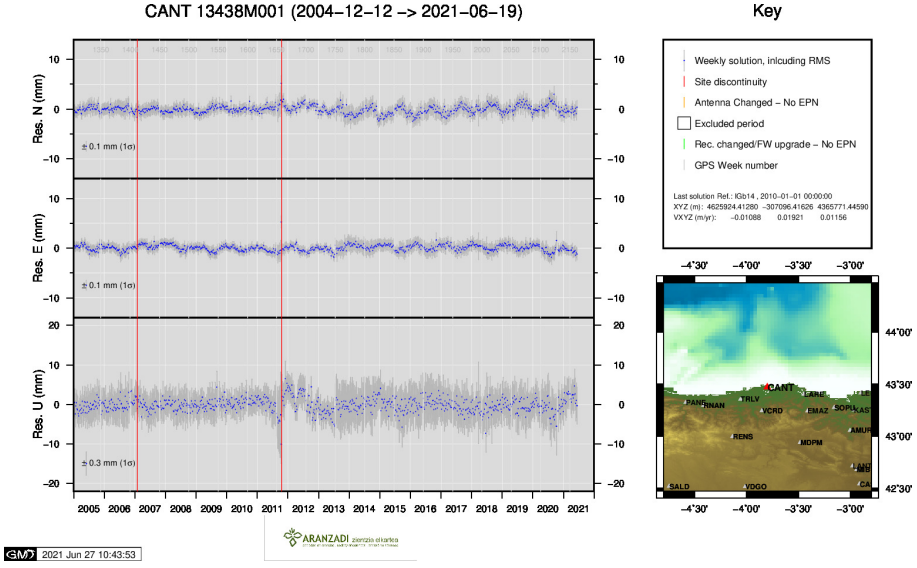

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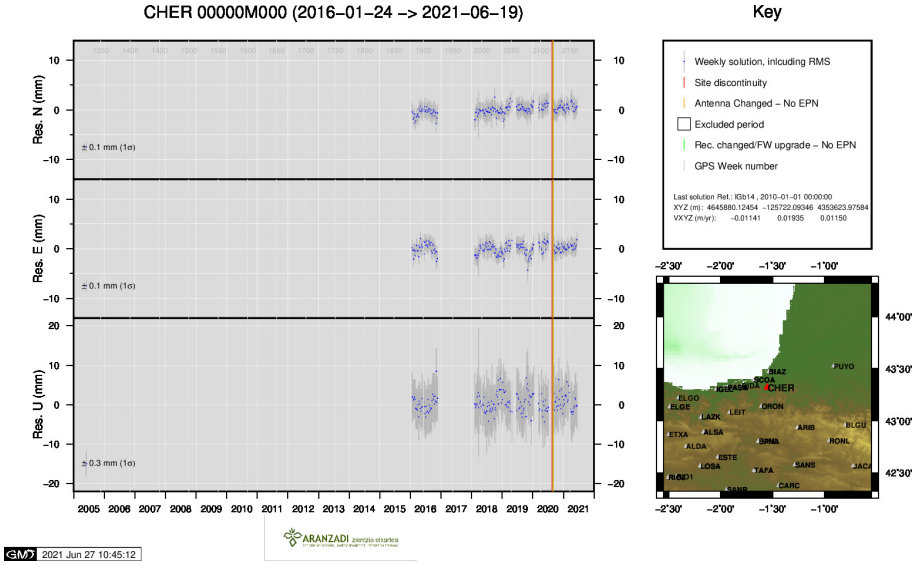

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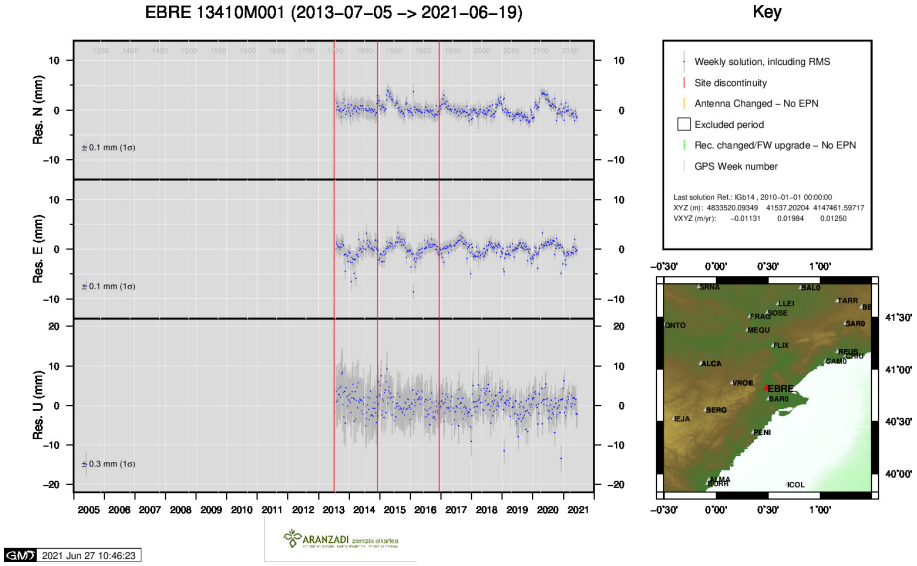

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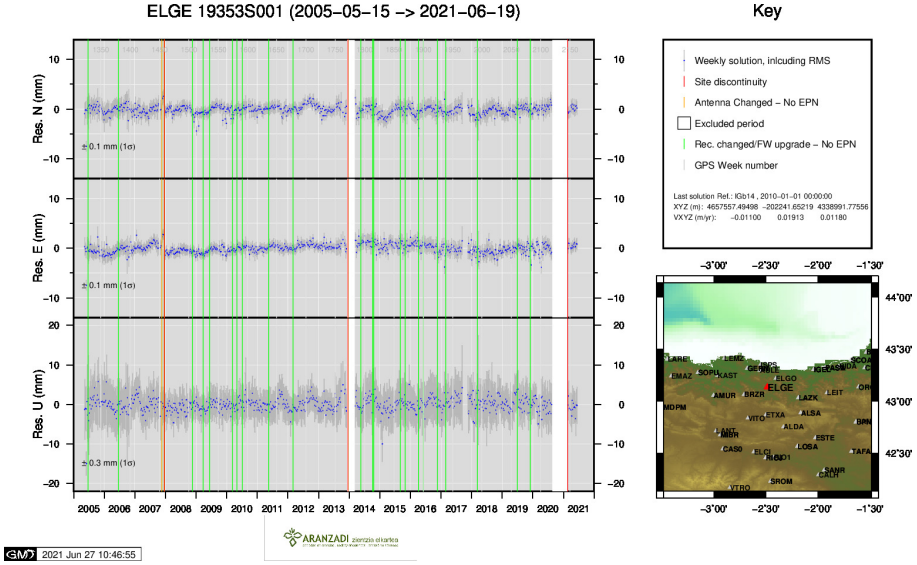

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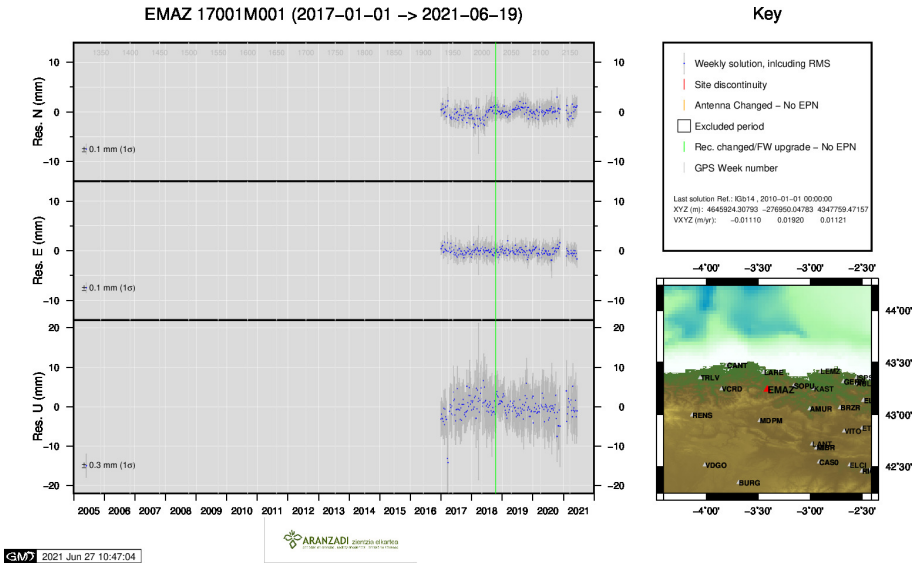

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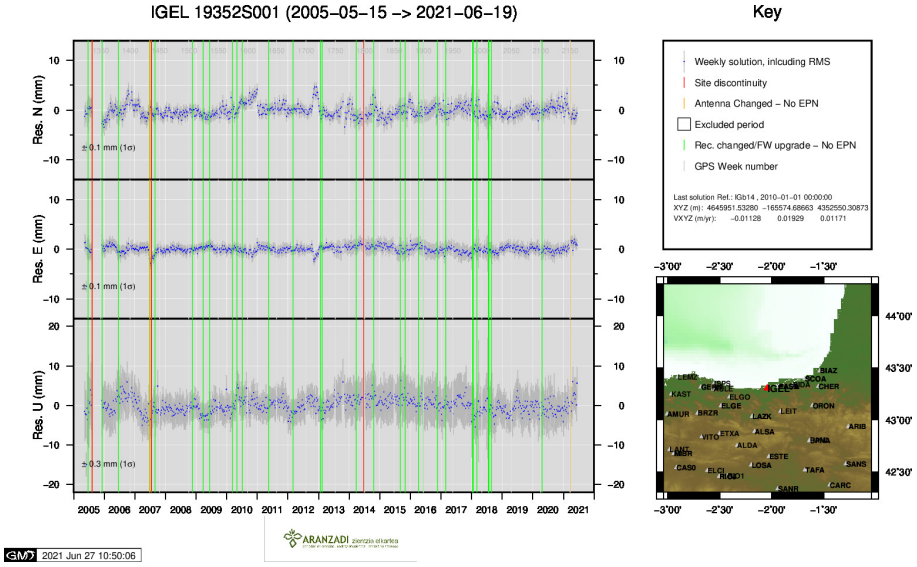

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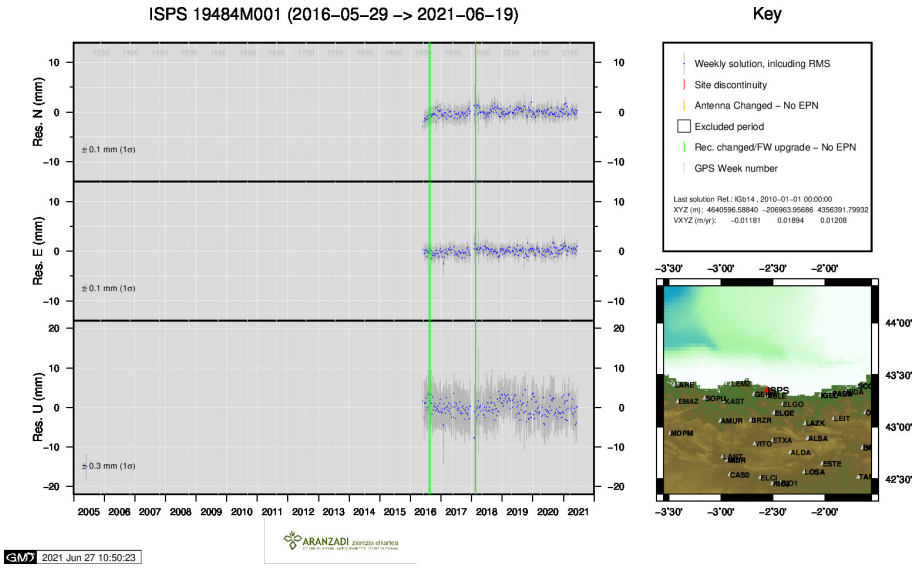

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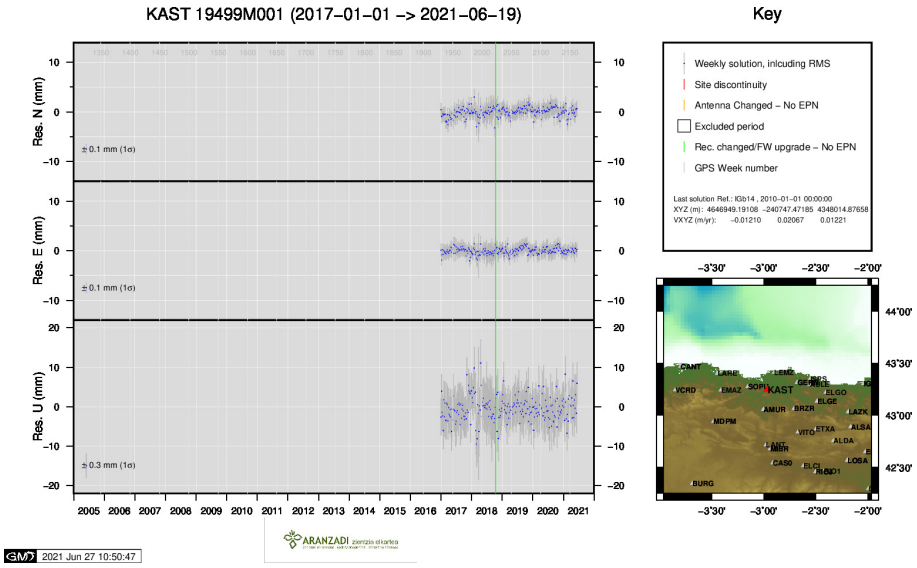

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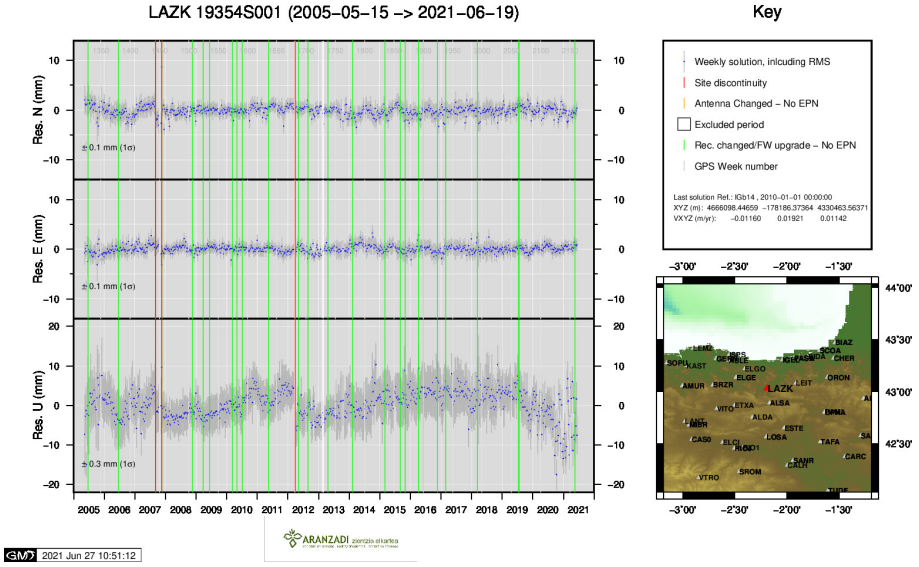

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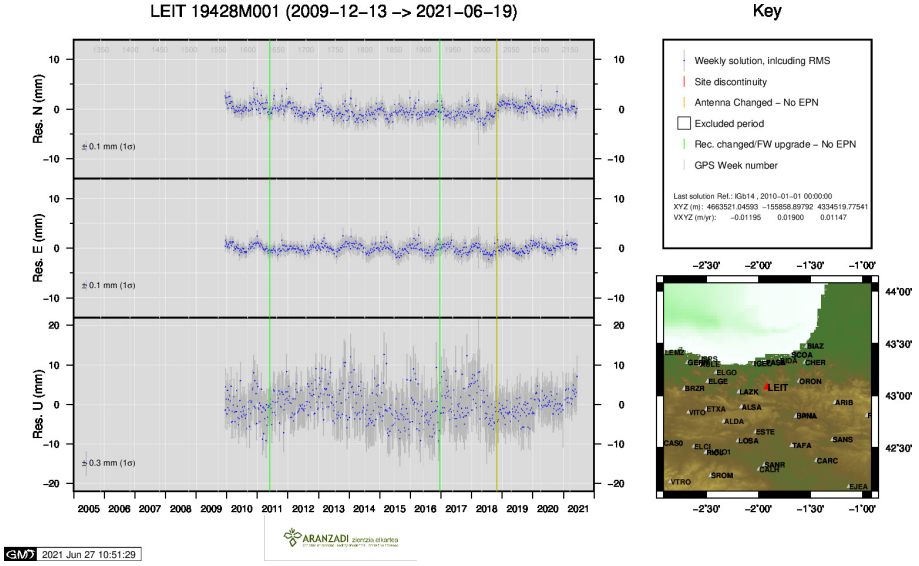

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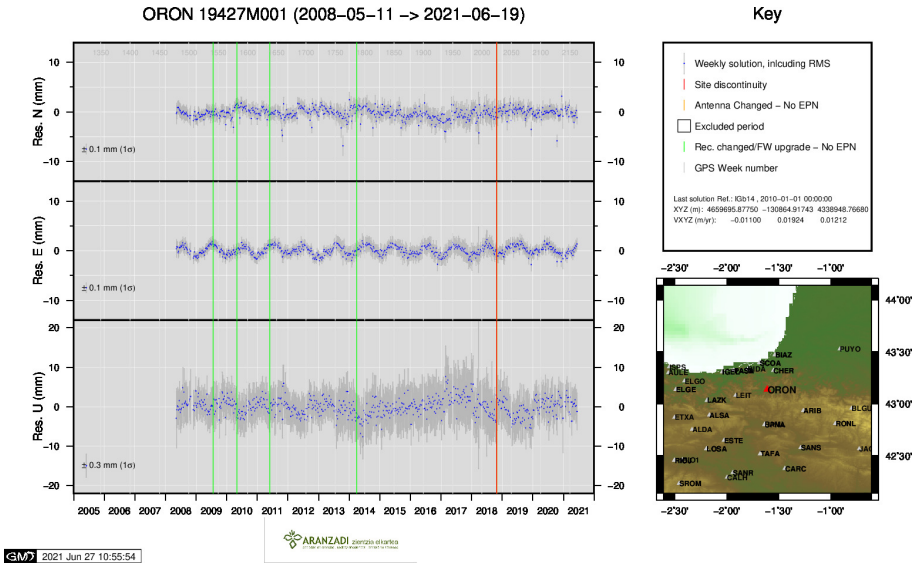

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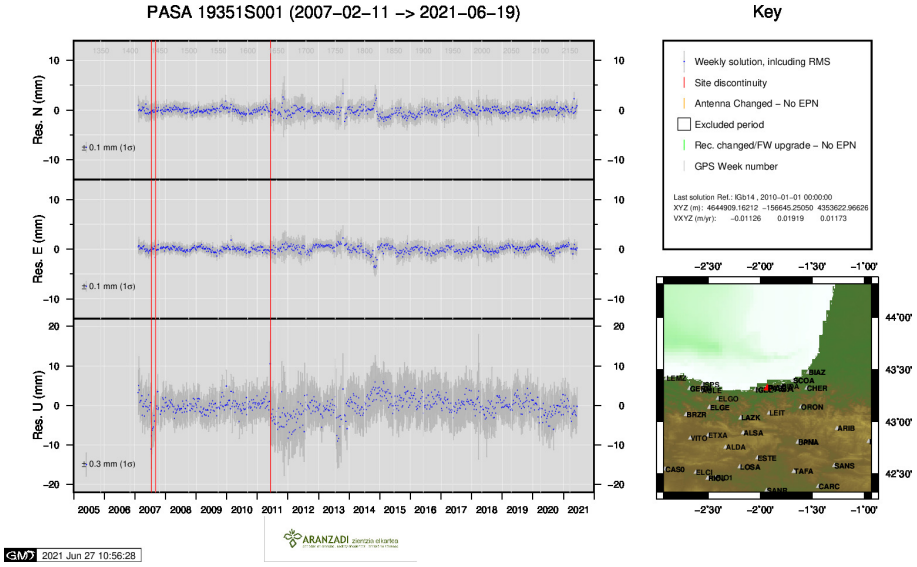

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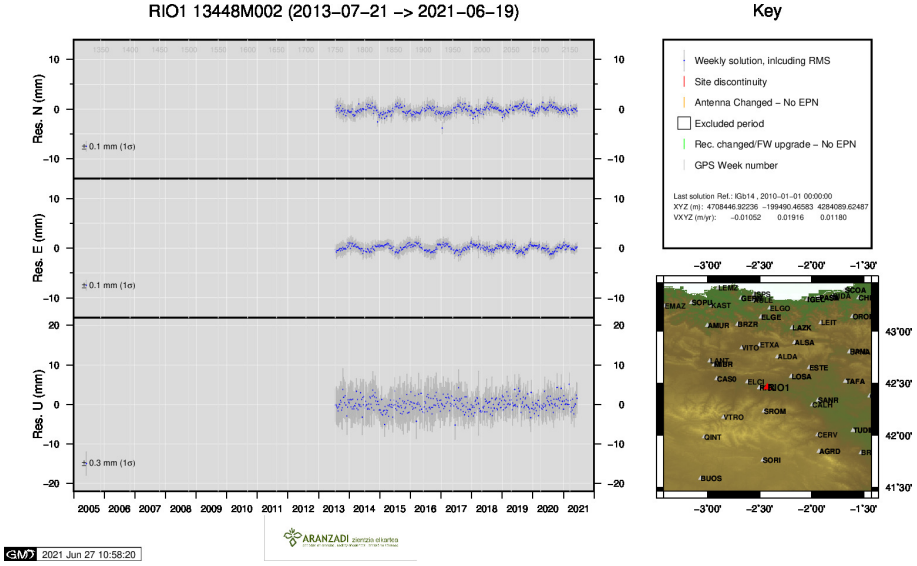

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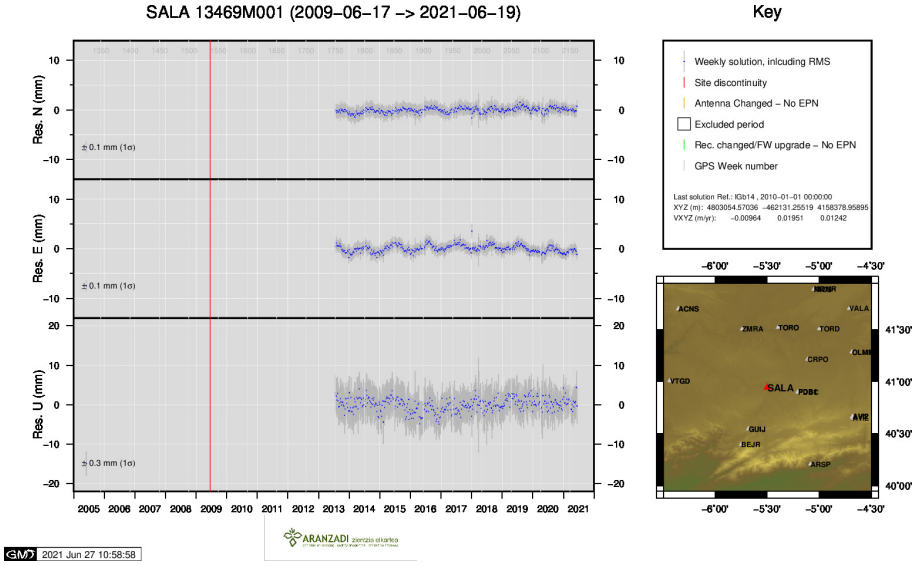

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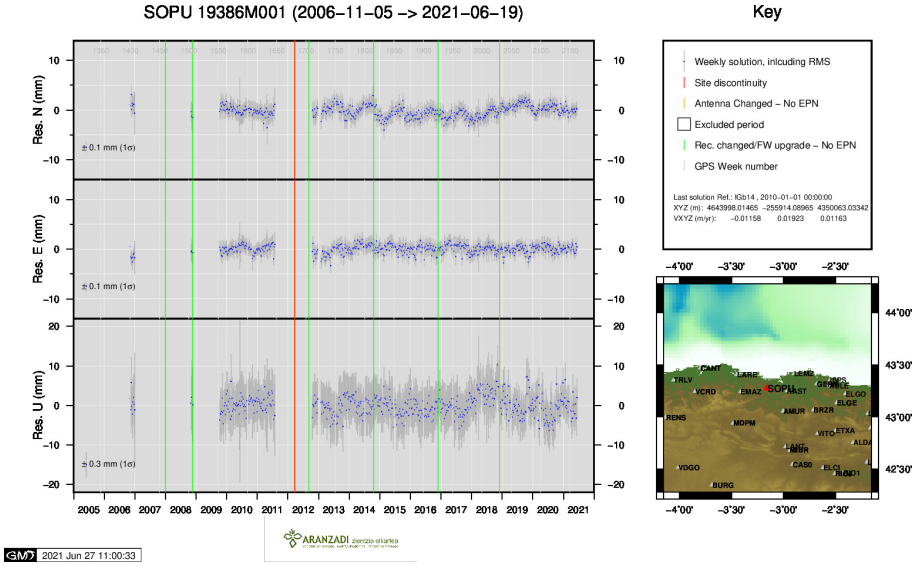

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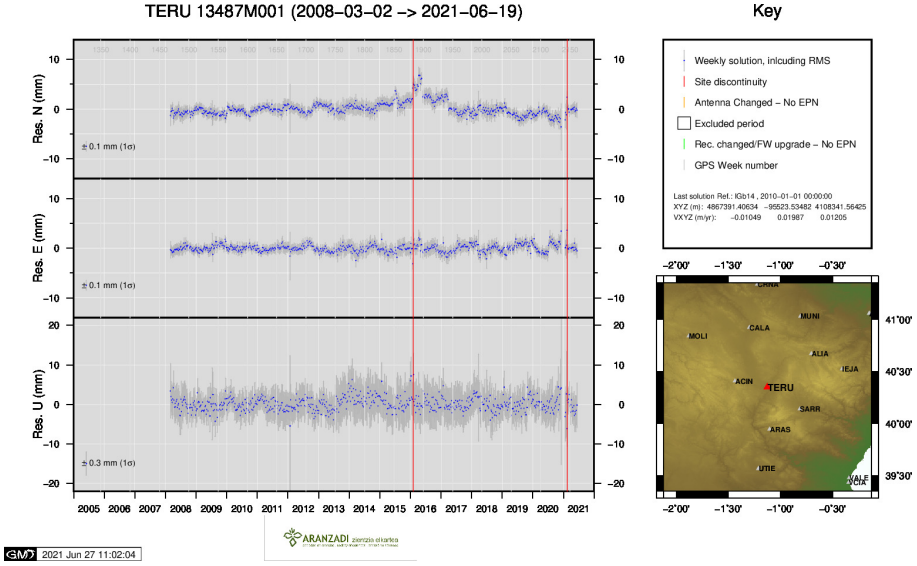

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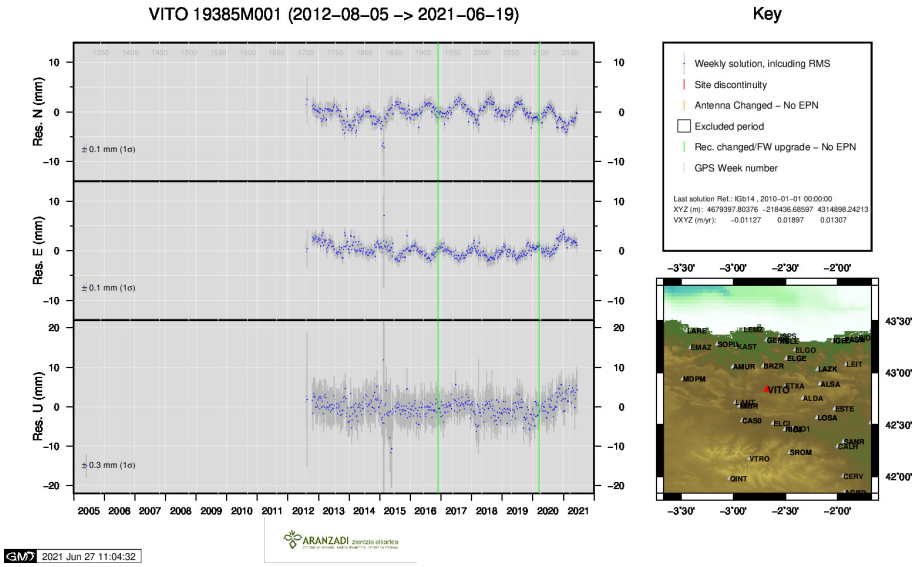

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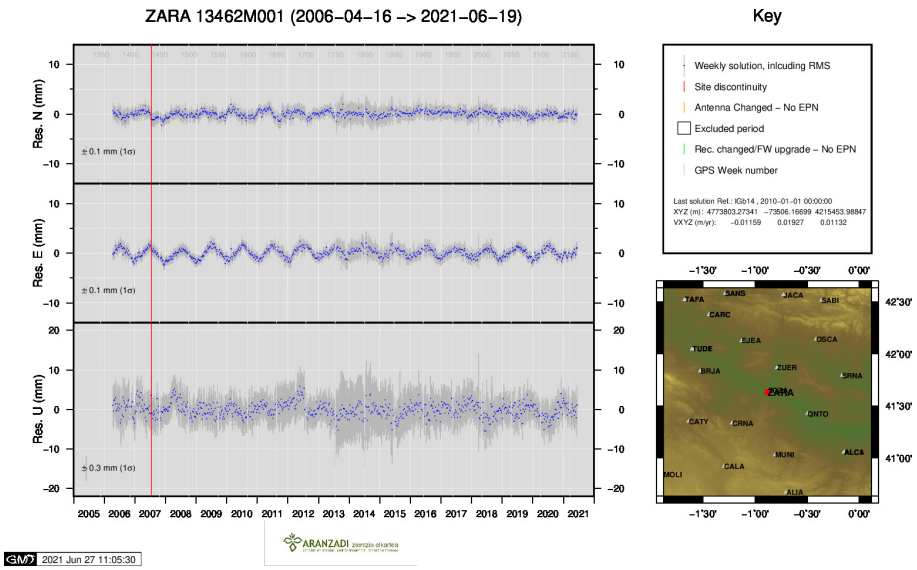
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Res. E (mm)
Res. U (mm)
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±0.1 mm (1σ)
±0.3 mm (1σ)
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Weekly solution, inlcuding RMS
Site discontinuity
Antenna Changed – No EPN
Excluded period
Rec. changed/FW upgrade – No EPN
GPS Week number
Last solution Ref.: IGb14 , 2010-01-01 00:00:00
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VXYZ (m/yr): −0.01159 0.01927 0.01132
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41°00'
TAFA
SANS
JACA
SABI
CARC
EJEA
OSCA
TUDE
BRJA
ZUER
SRNA
ZARA
QNTO
CATY
CRNA
MUNI
ALCA
CALA
MOLI
AUA
2021 Jun 27 11:05:30
ARANZADI

24) ZARA