

# ARA-DAC Weekly Analysis Result: 2054 (GFA)

## Technical Report

**GPS Week: 2054 (GFA)**

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

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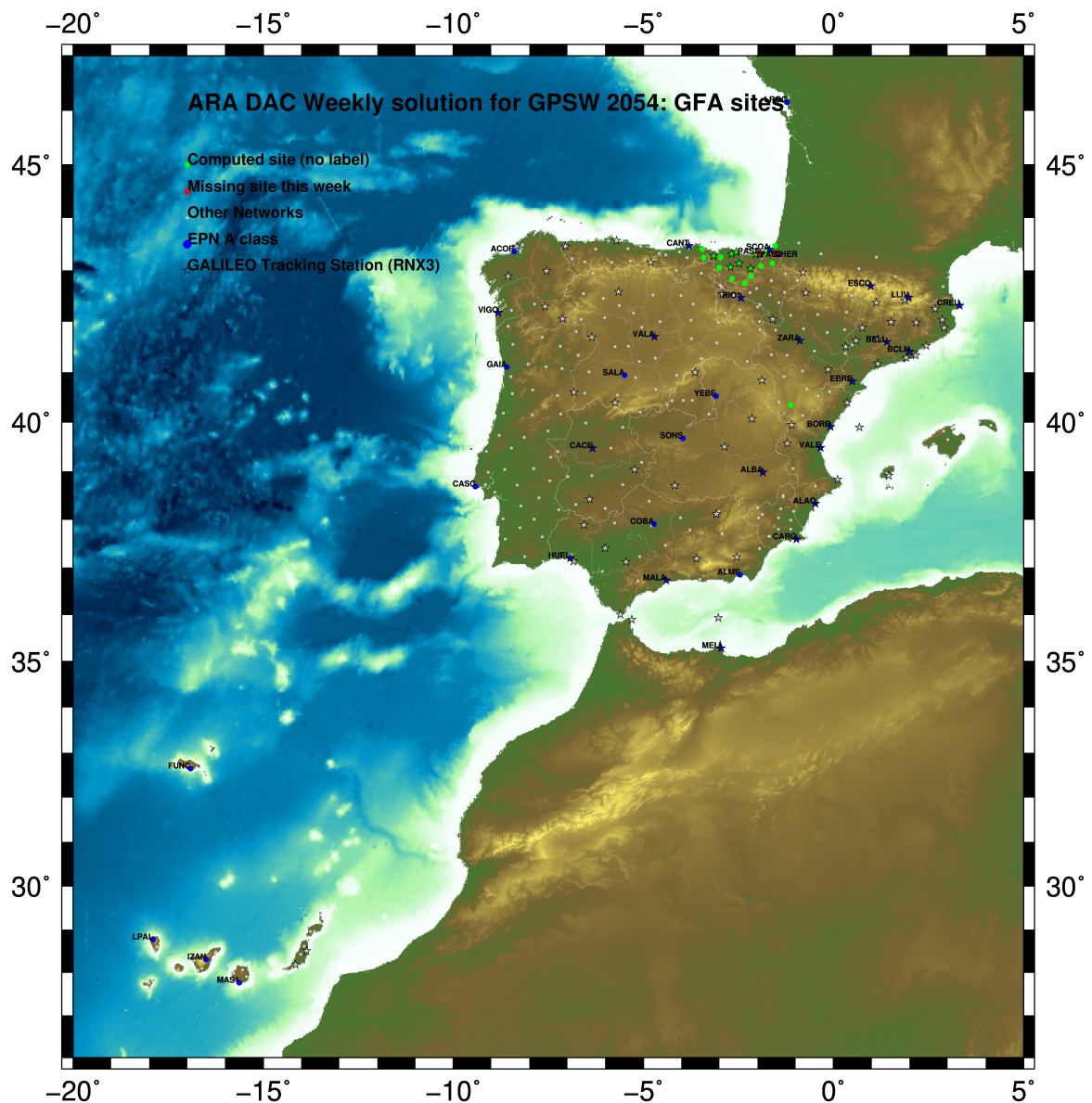
Report generated on 2019/06/09 at 01:00:53



# 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 2019 Jun 09 01:00:44

Fig.1: Computed Sites for GPS Week2054 (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) IGS14 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 IGS14

The Reference Frame considered in this section is IGS14, release C2010.

ARA LAC 2054 WEEK FINAL COMBINATION: PRECISE ORBITS 08-JUN-19 23:11

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LOCAL GEODETIC DATUM: IGS14 EPOCH: 2019-05-22 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.55810	-678367.44753	4357066.28339	W
33	ALDA 19383M001	4687280.15407	-190876.56778	4308106.95465	A
42	ALSA 19419M001	4677250.82646	-176770.39424	4319079.87057	A
44	AMUR 19388M001	4661499.44465	-244591.26069	4332269.88260	A
78	BLAZ 10074M002	4634456.04928	-124344.97850	4365785.45698	A
79	BIDA 00000M000	4644177.81865	-145778.32529	4354832.48185	A
89	BRZR 19387M001	4662220.99360	-220769.90235	4333309.44370	A
9	CACE 13447M001	4899866.50194	-544567.03795	4033770.20437	W
10	CANT 13438M001	4625924.31250	-307096.23501	4365771.55534	W
15	CREU 13432M001	4715420.12818	273178.05726	4271946.83979	W
16	EBRE 13410M001	4833519.98920	41537.38833	4147461.71519	W
135	ELGE 19353S001	4657557.40261	-202241.47560	4338991.87042	A
137	EMAZ 17001M001	4645924.20406	-276949.86761	4347759.57856	A
157	GERN 19389M001	4642811.31855	-217222.92555	4353278.88095	A
177	IGEL 19352S001	4645951.42790	-165574.50491	4352550.41818	A
182	ISPS 19484M001	4640596.47955	-206963.77878	4356391.91517	A
187	KAST 19499M001	4646949.07825	-240747.27769	4348014.99227	A
192	LARE 19440M001	4632831.94858	-279026.13958	4360314.42648	A
193	LAZK 19354S001	4666098.33955	-178186.19336	4330463.67343	A
197	LEIT 19428M001	4663520.93136	-155858.71971	4334519.88279	A
253	ORON 19427M001	4659695.77245	-130864.73652	4338948.88155	A
30	PASA 19351S001	4644909.05770	-156645.06950	4353623.07830	W
33	R101 13448M002	4708446.82392	-199490.28558	4284089.73652	W
34	SALA 13469M001	4803054.48222	-462131.07151	4158379.07826	W
35	SCDA 10088M002	4639940.49358	-136224.94202	4359552.41268	W
313	SOPU 19386M001	4643997.90424	-255913.90900	4350063.14341	A
333	TERU 13487M001	4867391.31960	-95523.35473	4108341.68109	A
366	VITO 19385M001	4679397.69858	-218436.50784	4314898.36704	A
43	YEBE 13420M001	4848724.56585	-261631.93178	4123094.32943	W
44	ZARA 13462M001	4773803.16619	-73505.98546	4215454.09630	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 2054 08-JUN-19 23:11

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LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2019-05-22 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.86452	-678367.98471	4357065.86706	W
33	ALDA 19383M001	4687280.51416	-190877.11354	4308106.53727	A
42	ALSA 19419M001	4677251.18895	-176770.93891	4319079.45412	A
44	AMUR 19388M001	4661499.80013	-244591.80391	4332269.46652	A
78	BLAZ 10074M002	4634456.42112	-124345.51856	4365785.04441	A
79	BIDA 00000M000	4644178.18723	-145778.86642	4354832.06828	A
89	BRZR 19387M001	4662221.35193	-220770.44559	4333309.02786	A
9	CACE 13447M001	4899866.80168	-544567.60645	4033769.76649	W
10	CANT 13438M001	4625924.66298	-307096.77469	4365771.14120	W
15	CREU 13432M001	4715420.53990	273177.51024	4271946.42579	W
16	EBRE 13410M001	4833520.36531	41536.82822	4147461.28948	W
135	ELGE 19353S001	4657557.76350	-202242.01830	4338991.45516	A
137	EMAZ 17001M001	4645924.55683	-276950.40931	4347759.16327	A
157	GERN 19389M001	4642811.67867	-217223.46675	4353278.46662	A
177	IGEL 19352S001	4645951.79401	-165575.04629	4352550.00424	A
182	ISPS 19484M001	4640596.84109	-206964.31972	4356391.50113	A
187	KAST 19499M001	4646949.43526	-240747.81939	4348014.57734	A
192	LARE 19440M001	4632832.30197	-279026.67991	4360314.01216	A
193	LAZK 19354S001	4666098.70266	-178186.73687	4330463.25781	A
197	LEIT 19428M001	4663521.29736	-155859.26289	4334519.46763	A
253	ORON 19427M001	4659696.14167	-130865.27922	4338948.46698	A
30	PASA 19351S001	4644909.42492	-156645.61074	4353622.66454	W
33	R101 13448M002	4708447.18134	-199490.83355	4284089.31743	W
34	SALA 13469M001	4803054.80024	-462131.62992	4158378.64877	W
35	SCDA 10088M002	4639940.86360	-136225.48268	4359551.99955	W
313	SOPU 19386M001	4643998.25962	-255914.45043	4350062.72852	A
333	TERU 13487M001	4867391.67701	-95523.91879	4108341.25116	A
366	VITO 19385M001	4679398.05592	-218437.05285	4314897.94992	A
43	YEBE 13420M001	4848724.90488	-261632.49441	4123093.89892	W
44	ZARA 13462M001	4773803.53358	-73506.53981	4215453.67376	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 2054		08-JUN-19 23:11			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2019-05-22 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACDR 13434M001	4594489.82200	-678368.02331	4357065.91546	W
33	ALDA 19383M001	4687280.46945	-190877.15347	4308106.58557	A
42	ALSA 19419M001	4677251.14430	-176770.97893	4319079.50245	A
44	AMUR 19388M001	4661499.75582	-244591.84376	4332269.51486	A
78	BLAZ 10074M002	4634456.37672	-124345.55892	4365785.09286	A
79	BIDA 00000M000	4644178.14280	-145778.90668	4354832.11670	A
89	BRZR 19387M001	4662221.30756	-220770.48551	4333309.07620	A
9	CACE 13447M001	4899866.75573	-544567.64432	4033769.81423	W
10	CANT 13438M001	4625924.61920	-307096.81446	4365771.18960	W
15	CREU 13432M001	4715420.49337	273177.46883	4271946.47432	W
16	EBRE 13410M001	4833520.31837	41536.78806	4147461.33758	W
135	ELGE 19353S001	4657557.71911	-202242.05831	4338991.50352	A
137	EMAZ 17001M001	4645924.51277	-276950.44911	4347759.21163	A
157	GERN 19389M001	4642811.63447	-217223.50676	4353278.51501	A
177	IGEL 19352S001	4645951.74962	-165575.08647	4352550.05265	A
182	ISPS 19484M001	4640596.79688	-206964.36978	4356391.54954	A
187	KAST 19499M001	4646949.39109	-240747.85931	4348014.62572	A
192	LARE 19440M001	4632832.25804	-279026.71975	4360314.06055	A
193	LAZK 19354S001	4666098.65812	-178186.77693	4330463.30616	A
197	LEIT 19428M001	4663521.25278	-155859.30304	4334519.51600	A
253	ORON 19427M001	4659696.09705	-130865.31947	4338948.51538	A
30	PASA 19351S001	4644909.38052	-156645.65095	4353622.71296	W
33	RI01 13448M002	4708447.13644	-199490.87337	4284089.36567	W
34	SALA 13469M001	4803054.75511	-462131.66846	4158378.69672	W
35	SOA 10088M002	4639940.81918	-136225.52298	4359552.04798	W
313	SOPU 19386M001	4643998.21552	-255914.49031	4350062.77690	A
333	TERU 13487M001	4867391.63017	-95523.95835	4108341.29911	A
366	VITO 19385M001	4679398.01136	-218437.09272	4314897.99823	A
43	YEBE 13420M001	4848724.85873	-261632.53347	4123093.94683	W
44	ZARA 13462M001	4773803.48763	-73506.57981	4215453.72192	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 IGS14 solution and are given with respect the Local frame (North-East-Up).

ARA LAC 2054 WEEK FINAL COMBINATION: PRECISE ORBITS 08-JUN-19 23:11

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.80	0.59	3.09
ALDA 19383M001	7	XXXXXX	1.09	0.76	3.04
ALSA 19419M001	7	XXXXXX	1.39	0.51	2.48
AMUR 19388M001	7	XXXXXX	0.71	0.97	2.94
BLAZ 10074M002	7	XXXXXX	0.69	0.86	1.22
BIDA 00000M000	4	XXXX	1.00	0.72	3.17
BRZR 19387M001	7	XXXXXX	1.60	0.84	6.54
CACE 13447M001	7	XXXXXX	0.58	0.21	1.55
CANT 13438M001	7	XXXXXX	0.99	0.57	1.91
CREU 13432M001	7	XXXXXX	0.76	0.83	4.88
EBRE 13410M001	7	XXXXXX	1.24	0.84	4.80
ELGE 19353S001	7	XXXXXX	0.53	0.57	1.19
EMAZ 17001M001	7	XXXXXX	1.12	1.14	4.27
GERN 19389M001	7	XXXXXX	0.31	1.07	5.24
IGEL 19352S001	7	XXXXXX	0.86	0.78	2.56
ISPS 19484M001	7	XXXXXX	0.52	0.64	2.40
KAST 19499M001	7	XXXXXX	0.83	0.94	2.20
LARE 19440M001	7	XXXXXX	0.61	1.11	4.06
LAZK 19354S001	7	XXXXXX	0.75	0.78	2.24
LEIT 19428M001	7	XXXXXX	0.64	0.79	2.10
ORDN 19427M001	7	XXXXXX	0.61	0.78	2.18
PASA 19351S001	7	XXXXXX	0.58	0.58	3.60
RI01 13448M002	7	XXXXXX	1.08	0.44	2.84
SALA 13469M001	7	XXXXXX	0.18	0.63	3.01
SCDA 10088M002	7	XXXXXX	0.51	0.56	2.01
SOPU 19386M001	7	XXXXXX	0.74	1.23	3.01
TERU 13487M001	7	XXXXXX	0.92	0.39	2.97
VITO 19385M001	7	XXXXXX	0.59	0.65	3.32
YEBE 13420M001	7	XXXXXX	0.91	0.97	4.47
ZARA 13462M001	7	XXXXXX	0.51	0.60	4.36

Comparison of individual solutions:

ACOR 13434M001	N	0.80	0.71	-0.42	0.02	0.12	0.53	-1.68	0.29
ACOR 13434M001	E	0.59	0.06	-0.81	0.44	0.52	0.71	-0.69	0.12
ACOR 13434M001	U	3.09	-1.03	-1.10	4.81	2.22	-4.88	1.01	-1.45
ALDA 19383M001	N	1.09	0.50	1.44	1.72	-0.61	0.24	-0.88	-0.76
ALDA 19383M001	E	0.76	0.07	-0.52	-1.13	0.83	0.41	0.68	0.80
ALDA 19383M001	U	3.04	-1.96	-3.09	-2.20	-0.68	4.91	-0.32	3.57
ALSA 19419M001	N	1.39	0.99	0.17	1.01	0.11	0.59	1.83	-2.40
ALSA 19419M001	E	0.51	-0.68	0.52	-0.61	0.53	-0.21	0.13	0.30
ALSA 19419M001	U	2.48	-0.03	-2.65	-3.51	-3.18	-0.62	0.85	2.51
AMUR 19388M001	N	0.71	1.02	0.05	-0.30	0.12	0.92	1.01	-0.23
AMUR 19388M001	E	0.97	-0.96	-0.74	-0.49	-1.33	-0.61	1.22	0.58
AMUR 19388M001	U	2.94	-0.28	-2.54	-2.27	-2.83	-5.24	-0.26	-2.15
BLAZ 10074M002	N	0.69	1.36	0.02	-0.00	0.38	0.45	-0.04	-0.79
BLAZ 10074M002	E	0.86	1.53	0.36	-0.22	-0.70	-1.12	-0.40	0.18
BLAZ 10074M002	U	1.22	-0.35	0.88	0.65	-0.47	-2.07	-1.20	1.29
BIDA 00000M000	N	1.00				-1.12	-0.51	0.59	1.07
BIDA 00000M000	E	0.72				0.73	0.01	0.14	-1.00
BIDA 00000M000	U	3.17				3.09	1.14	-0.07	-4.38
BRZR 19387M001	N	1.60	-1.57	1.36	1.18	0.85	1.90	-0.69	-2.21
BRZR 19387M001	E	0.84	-1.70	-0.17	-0.60	0.36	0.66	0.02	0.64
BRZR 19387M001	U	6.54	4.73	-4.94	-2.68	-6.90	-4.59	9.45	6.70
CACE 13447M001	N	0.58	0.83	-0.15	0.17	-0.43	-0.85	-0.40	-0.49
CACE 13447M001	E	0.21	0.02	0.11	0.01	-0.38	0.24	-0.04	0.22
CACE 13447M001	U	1.55	-0.15	-0.42	1.04	3.22	-1.68	-0.02	0.00
CANT 13438M001	N	0.99	0.96	0.83	-1.26	1.03	1.11	0.57	0.29
CANT 13438M001	E	0.57	0.24	-0.00	-0.79	-1.11	-0.19	-0.12	0.06
CANT 13438M001	U	1.91	0.83	-2.54	-3.48	0.90	0.61	0.18	1.24
CREU 13432M001	N	0.76	0.33	-0.52	-0.52	0.88	1.06	0.18	-0.97
CREU 13432M001	E	0.83	1.42	-0.10	-0.95	-0.57	-0.46	-0.77	0.32
CREU 13432M001	U	4.88	4.45	-1.38	-4.97	-1.95	-3.14	-0.43	9.08
EBRE 13410M001	N	1.24	0.98	-2.05	0.53	-1.36	1.19	0.42	0.61
EBRE 13410M001	E	0.84	-0.30	1.18	0.31	0.32	-1.07	-0.14	-1.17
EBRE 13410M001	U	4.80	6.15	0.85	-6.39	-2.88	-3.73	3.58	4.87
ELGE 19353S001	N	0.53	-0.18	0.34	-0.21	0.83	-0.42	0.77	-0.26
ELGE 19353S001	E	0.57	0.13	-0.01	-1.05	-0.50	-0.26	0.72	0.12
ELGE 19353S001	U	1.19	0.14	-0.89	2.05	-0.93	1.45	-0.62	-0.31
EMAZ 17001M001	N	1.12	-1.24	0.64	1.59	-0.77	-1.26	0.20	0.87
EMAZ 17001M001	E	1.14	1.73	-0.55	0.39	-0.45	1.35	-1.15	-0.98
EMAZ 17001M001	U	4.27	5.25	-3.17	-7.59	0.34	-0.76	3.50	1.23
GERN 19389M001	N	0.31	-0.16	-0.00	-0.04	0.18	0.41	0.57	-0.15
GERN 19389M001	E	1.07	-0.66	1.76	-0.56	-0.01	-1.70	0.27	0.10
GERN 19389M001	U	5.24	11.15	-0.81	-1.09	-5.57	-1.61	0.99	-2.04
IGEL 19352S001	N	0.86	-1.15	0.78	0.04	1.23	0.76	-0.49	-0.37
IGEL 19352S001	E	0.78	-0.11	0.30	-0.87	-0.14	-1.08	-0.01	1.27
IGEL 19352S001	U	2.56	3.73	-4.00	-0.78	1.06	0.11	-0.76	2.66
ISPS 19484M001	N	0.52	0.24	0.54	-0.95	0.23	0.19	-0.00	0.54
ISPS 19484M001	E	0.64	-0.20	-0.46	0.05	-0.97	-0.56	0.70	0.67
ISPS 19484M001	U	2.40	0.03	-2.27	4.49	2.01	-0.45	-0.12	-2.21
KAST 19499M001	N	0.83	0.09	0.59	0.19	1.17	0.57	-0.47	-1.36
KAST 19499M001	E	0.94	-0.29	0.39	-0.20	-0.76	-1.16	1.70	-0.53
KAST 19499M001	U	2.20	0.69	-3.03	3.34	-2.18	1.59	0.45	0.85
LARE 19440M001	N	0.61	-0.60	1.04	0.70	0.02	-0.25	-0.32	-0.38
LARE 19440M001	E	1.11	1.51	-0.42	1.42	-1.18	-0.32	-1.08	0.43
LARE 19440M001	U	4.06	-1.62	-3.54	-6.40	-0.49	4.41	4.10	2.56
LAZK 19354S001	N	0.75	0.99	-0.01	-0.08	-0.41	0.93	0.55	-1.01
LAZK 19354S001	E	0.78	-1.41	0.53	-0.46	0.53	-0.38	-0.40	0.74
LAZK 19354S001	U	2.24	1.30	-0.93	0.50	-3.54	1.70	-1.63	3.03
LEIT 19428M001	N	0.64	0.77	-0.17	0.94	0.87	-0.32	0.22	-0.02
LEIT 19428M001	E	0.79	-0.79	-0.09	-0.10	0.10	-1.08	1.04	0.92
LEIT 19428M001	U	2.10	1.87	-2.50	-1.38	-0.49	1.00	-2.08	-3.05
ORDN 19427M001	N	0.61	0.99	-0.26	0.68	-0.28	0.18	0.36	0.71

ORDN 19427M001	E	0.78	-1.49	0.07	0.49	0.28	0.33	0.85	-0.55
ORDN 19427M001	U	2.18	1.51	-2.97	-0.49	-1.64	-1.76	1.45	-3.02
PASA 19351S001	N	0.58	0.49	1.04	-0.26	0.18	-0.03	0.14	-0.78
PASA 19351S001	E	0.58	-0.05	-0.20	-0.51	0.17	-1.09	0.43	0.55
PASA 19351S001	U	3.60	7.78	-1.80	0.36	-3.58	0.29	-0.74	-0.76
RIO1 13448M002	N	1.08	0.84	0.76	-0.36	1.52	0.13	-1.25	1.28
RIO1 13448M002	E	0.44	-0.03	0.16	-0.07	-0.12	-1.02	-0.02	0.25
RIO1 13448M002	U	2.84	3.42	-2.74	1.01	-4.92	-0.98	1.21	-1.28
SALA 13469M001	N	0.18	0.07	0.27	-0.04	-0.08	-0.17	0.29	-0.06
SALA 13469M001	E	0.63	0.92	-0.95	0.50	0.29	0.28	-0.42	-0.26
SALA 13469M001	U	3.01	-1.68	-3.86	-3.08	2.62	-2.11	3.24	2.31
SCDA 10088M002	N	0.51	1.00	-0.21	0.62	-0.31	-0.11	0.07	0.00
SCDA 10088M002	E	0.56	-0.59	-0.42	-0.20	0.70	-0.84	-0.02	0.37
SCDA 10088M002	U	2.01	-2.20	0.47	1.34	2.46	-1.41	-2.65	1.48
SOPU 19386M001	N	0.74	-1.01	0.70	-0.40	-0.26	1.04	0.67	0.10
SOPU 19386M001	E	1.23	-2.46	1.31	0.07	0.07	-0.88	0.63	0.46
SOPU 19386M001	U	3.01	2.80	-1.86	4.74	-0.53	2.03	-3.29	-2.31
TERU 13487M001	N	0.92	0.14	0.64	0.07	-0.52	1.70	-0.26	-1.17
TERU 13487M001	E	0.39	-0.61	0.57	0.18	-0.19	0.08	-0.09	-0.36
TERU 13487M001	U	2.97	4.20	-1.17	-1.45	-3.25	0.36	3.66	2.75
VITO 19385M001	N	0.59	0.32	0.99	0.13	-0.08	0.64	-0.28	0.70
VITO 19385M001	E	0.65	-0.41	0.05	-0.03	-0.79	-0.91	0.96	0.13
VITO 19385M001	U	3.32	1.11	-3.46	-1.63	-3.75	-5.56	2.27	-0.47
YEBE 13420M001	N	0.91	-0.87	0.27	0.64	0.31	-1.67	0.53	-0.74
YEBE 13420M001	E	0.97	1.50	-0.49	-1.29	0.57	0.36	-0.67	0.81
YEBE 13420M001	U	4.47	0.25	6.05	-0.24	2.61	1.15	-8.21	-2.75
ZARA 13462M001	N	0.51	0.37	0.41	-0.32	0.98	0.34	0.12	0.25
ZARA 13462M001	E	0.60	-0.02	0.75	-0.82	0.40	-0.46	-0.37	0.65
ZARA 13462M001	U	4.36	-0.10	-3.04	2.18	-7.55	0.16	1.89	-6.26



## 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: IGS14  
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-1.67	-0.10	0.67
2	ALAC 13433M001	I W	0.39	-0.05	-0.01
3	ALBA 13452M001	I W	-0.10	-0.88	-0.41
4	ALME 13437M001	I W	-2.41	-0.13	4.52
5	BCLN 13412M001	I W	0.35	0.93	3.56
6	BELL 13431M001	I W	1.03	1.79	-0.20
7	BORR 13480M001	I W	-0.89	-1.46	-0.08
8	BRST 10004M004	I W	-1.82	-0.13	0.94
9	CACE 13447M001	I W	0.13	0.85	1.03
10	CANT 13438M001	I W	0.46	-0.46	0.54
11	CARG 19412M001	I W	0.83	0.45	-0.33
12	CASC 13909S001	I W	2.81	-1.67	-2.41
14	COBA 13453M001	I W	1.54	0.02	-4.70
15	CREU 13432M001	I W	-0.15	1.45	1.86
16	EBRE 13410M001	I W	0.35	1.03	-1.28
17	ESCO 13435M001	I W	-0.89	-1.86	1.98
18	FUNC 13911S001	I W	1.90	0.15	-4.83
19	GAI A 13902M001	I W	-0.12	-0.42	3.17
21	HUEL 13451M001	I W	0.85	-2.15	1.23
22	IZAN 31309M002	I W	0.40	0.69	-5.71
23	LLIV 13436M001	I W	-0.31	0.24	2.26
24	LPAL 81701M001	I W	-1.55	0.68	-5.59
25	LROC 10023M001	I W	0.94	-0.97	3.54
26	MALA 13443M001	I W	0.37	-1.76	-1.45
27	MAS1 31303M002	I W	1.13	1.46	-3.98
29	MELI 19379M001	I W	0.77	-0.06	-0.56
30	PASA 19351S001	I W	-0.72	-0.11	-0.13
31	PDEL 31906M004	I W	-0.62	-0.46	-2.37
33	RIO1 13448M002	I W	-0.99	0.32	-0.56
34	SALA 13469M001	I W	0.27	0.49	-1.98
35	SCOA 10088M002	I W	-3.36	-0.54	2.61
38	SONS 13446M001	I W	-0.22	0.59	-4.34
40	VALA 13463M002	I W	-0.82	-0.12	0.17
41	VALE 13439M001	I W	-0.13	0.95	-1.07
42	VIGO 13450M001	I W	0.06	0.66	3.64
43	YEBE 13420M001	I W	0.78	-0.34	3.35
44	ZARA 13462M001	I W	0.12	0.47	0.12
45	ZIMM 14001M004	I W	1.31	0.43	6.81
	RMS / COMPONENT		1.19	0.94	2.92
	MEAN		-0.00	0.00	-0.00
	MIN		-3.36	-2.15	-5.71
	MAX		2.81	1.79	6.81

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 114  
RMS OF TRANSFORMATION : 1.90 MM

BARYCENTER COORDINATES:

LATITUDE : 39 53 17.56  
LONGITUDE : - 4 51 17.75  
HEIGHT : -44.890 KM

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.31 MM  
TRANSLATION IN E : 0.00 +- 0.31 MM  
TRANSLATION IN U : -0.00 +- 0.31 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 the daily solutions are shown.

```
* STATISTICAL PARAMETER----- VALUE(S)-----
NUMBER OF OBSERVATIONS          17420998
NUMBER OF UNKNOWN               197451
NUMBER OF DEGREES OF FREEDOM    17223537
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  1.958676889065605

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")
      X          Y          Z          X          Y          Z      Scale (ppm)
-----
 1  0.00182    -0.0049 -0.0235 -0.0041  0.0006 0.0000 -0.0006  0.00073
 2  0.00195    -0.0029  0.0014  0.0033  0.0000 -0.0001  0.0001  0.00002
 3  0.00191    -0.0056 -0.0006  0.0048 -0.0000 -0.0002 -0.0001  0.00024
 4  0.00213    -0.0195 -0.0131  0.0201  0.0001 -0.0009 -0.0004  0.00020
 5  0.00187    -0.0085 -0.0060  0.0127  0.0001 -0.0005 -0.0002 -0.00039
 6  0.00231    -0.0063 -0.0153  0.0131  0.0003 -0.0005 -0.0004 -0.00061
 7  0.00213     0.0156 -0.0015 -0.0115  0.0002  0.0006  0.0001 -0.00061
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00137    2494358    1.87          2523345      3          981    28009    0
 2  0.00137    2478646    1.88          2507758      3          984    28131    0
 3  0.00138    2463765    1.91          2493015      3          972    28281    0
 4  0.00142    2472637    2.02          2501407      3          987    27786    0
 5  0.00145    2480537    2.10          2510274      3          987    28753    0
 6  0.00140    2405711    1.95          2434585      3          954    27923    0
 7  0.00139    2422060    1.93          2450604      3          966    27581    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 19:139:00000 19:145:86370 LEICA GR10 -----
ALDA  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
ALSA  A  1 P 19:139:00000 19:145:86370 LEICA GR50 -----
AMUR  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
BIAZ  A  1 P 19:139:24210 19:145:86370 TRI SP90M -----
BIDA  A  1 P 19:142:27780 19:145:86370 LEICA GR10 -----
BRZR  A  1 P 19:139:00000 19:145:86370 LEICA GR30 -----
CACE  A  1 P 19:139:00000 19:145:86370 TRIMBLE NETR9 -----
CANT  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
CREU  A  1 P 19:139:00000 19:145:86370 LEICA GR50 -----
EBRE  A  1 P 19:139:00000 19:145:86370 LEICA GR50 -----
ELGE  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
EMAZ  A  1 P 19:139:00000 19:145:86370 LEICA GR30 -----
GERN  A  1 P 19:139:00000 19:145:86370 LEICA GR30 -----
IGEL  A  1 P 19:139:00000 19:145:86370 LEICA GR30 -----
ISPS  A  1 P 19:139:00000 19:145:86370 TRIMBLE NETR9 -----
KAST  A  1 P 19:139:00000 19:145:86370 LEICA GR30 -----
LARE  A  1 P 19:139:00000 19:145:86370 LEICA GRX1200GGPRO -----
LAZK  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
LEIT  A  1 P 19:139:00000 19:145:86370 LEICA GR50 -----
ORON  A  1 P 19:139:00000 19:145:86370 LEICA GR50 -----
PASA  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
RIO1  A  1 P 19:139:00000 19:145:86370 LEICA GR25 -----
SALA  A  1 P 19:139:00000 19:145:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 19:139:00000 19:145:86370 LEICA GR25 -----
SOPU  A  1 P 19:139:00000 19:145:86370 LEICA GR30 -----
TERU  A  1 P 19:139:00000 19:145:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 19:139:00000 19:145:86370 LEICA GR10 -----
YEBE  A  1 P 19:139:00000 19:145:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 19:139:00000 19:145:86370 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 19:139:00000 19:145:86370 LEIAT504    LEIS -----
ALDA  A  1 P 19:139:00000 19:145:86370 LEIAS10     NONE -----
ALSA  A  1 P 19:139:00000 19:145:86370 LEIAS10     NONE -----
AMUR  A  1 P 19:139:00000 19:145:86370 LEIAS10     NONE -----
BIAZ  A  1 P 19:139:24210 19:145:86370 LEIAR25     LEIT -----
BIDA  A  1 P 19:142:27780 19:145:86370 LEIAS10     NONE -----
```

```

BRZR A 1 P 19:139:00000 19:145:86370 LEIAS10 NONE -----
CACE A 1 P 19:139:00000 19:145:86370 TRM29659.00 NONE -----
CANT A 1 P 19:139:00000 19:145:86370 LEIAR25_R4 LEIT 25066
CREU A 1 P 19:139:00000 19:145:86370 LEIAR25_R4 NONE 26357
EBRE A 1 P 19:139:00000 19:145:86370 LEIAR25_R4 NONE 26359
ELGE A 1 P 19:139:00000 19:145:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 19:139:00000 19:145:86370 LEIAS10 NONE -----
GERN A 1 P 19:139:00000 19:145:86370 LEIAS10 NONE -----
IGEL A 1 P 19:139:00000 19:145:86370 LEIAR20 LEIM -----
ISPS A 1 P 19:139:00000 19:145:86370 TRM59900.00 SCIS -----
KAST A 1 P 19:139:00000 19:145:86370 LEIAS10 NONE -----
LARE A 1 P 19:139:00000 19:145:86370 LEIAT504 NONE -----
LAZK A 1 P 19:139:00000 19:145:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 19:139:00000 19:145:86370 LEIAR10 NONE -----
ORDN A 1 P 19:139:00000 19:145:86370 LEIAR10 NONE -----
PASA A 1 P 19:139:00000 19:145:86370 LEIAR20 LEIM 73034
RID1 A 1 P 19:139:00000 19:145:86370 LEIAR25_R4 LEIT 25138
SALA A 1 P 19:139:00000 19:145:86370 LEIAR25 NONE -----
SCDA A 1 P 19:139:00000 19:145:86370 TRM55971.00 NONE -----
SOPU A 1 P 19:139:00000 19:145:86370 LEIAS10 NONE -----
TERU A 1 P 19:139:00000 19:145:86370 LEIAT504GG LEIS -----
VITO A 1 P 19:139:00000 19:145:86370 LEIAS10 NONE -----
YEBE A 1 P 19:139:00000 19:145:86370 TRM29659.00 NONE -----
ZARA A 1 P 19:139:00000 19:145:86370 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 19:139:00000 19:145:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 19:139:24210 19:145:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 19:142:27780 19:145:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 19:139:00000 19:145:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 19:139:00000 19:145:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 19:139:00000 19:145:86370 UNE 3.0490 0.0000 0.0000
CREU A 1 P 19:139:00000 19:145:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 19:139:00000 19:145:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 19:139:00000 19:145:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 19:139:00000 19:145:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 19:139:00000 19:145:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 19:139:00000 19:145:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
RID1 A 1 P 19:139:00000 19:145:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 19:139:00000 19:145:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 19:139:00000 19:145:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 19:139:00000 19:145:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 19:139:00000 19:145:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 19:139:00000 19:145:86370 UNE 3.2590 0.0000 0.0000

```

## 8 References

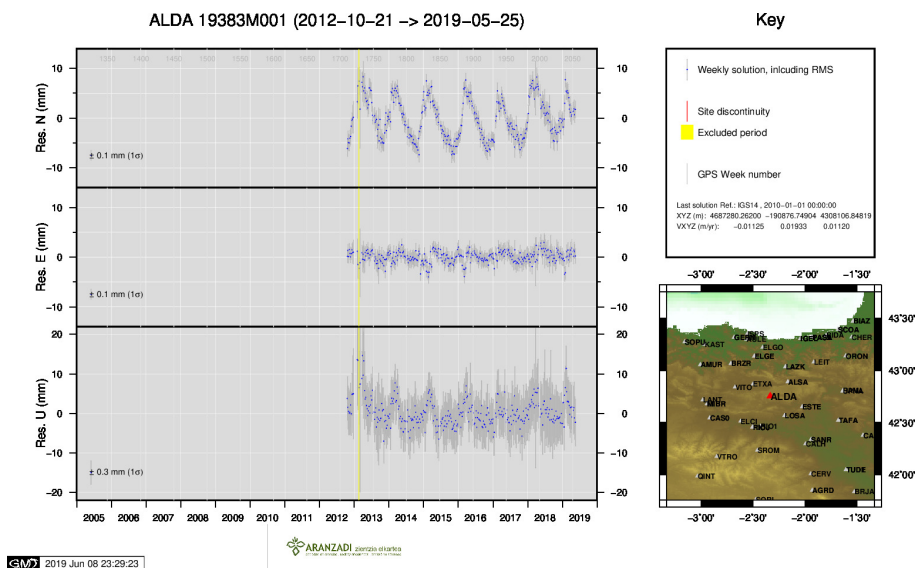
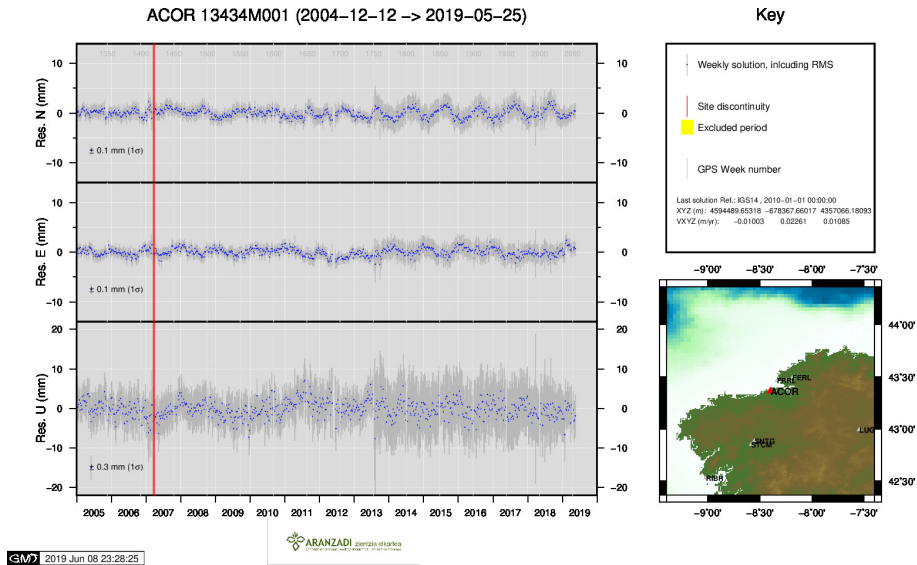
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](https://etrs89.ensg.ign.fr/memo-V8.pdf)

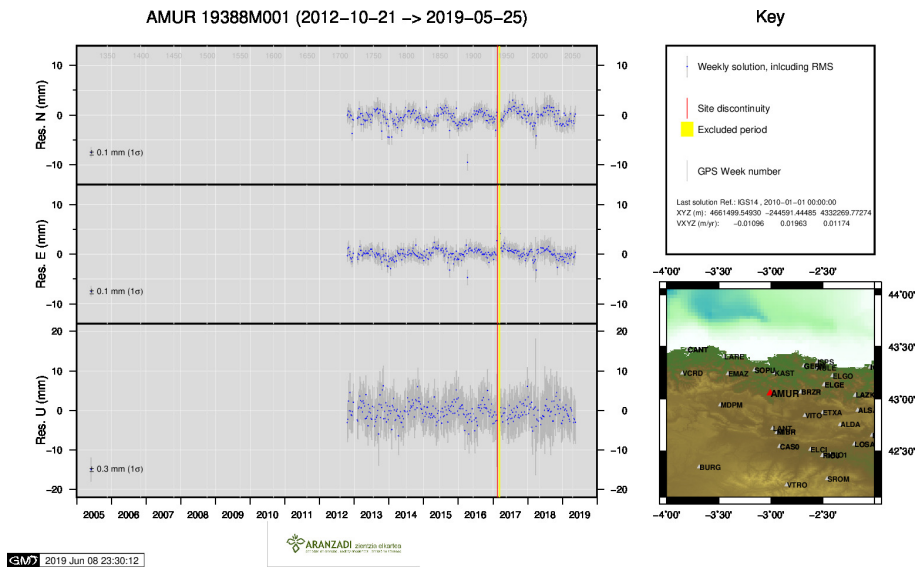
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](https://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

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

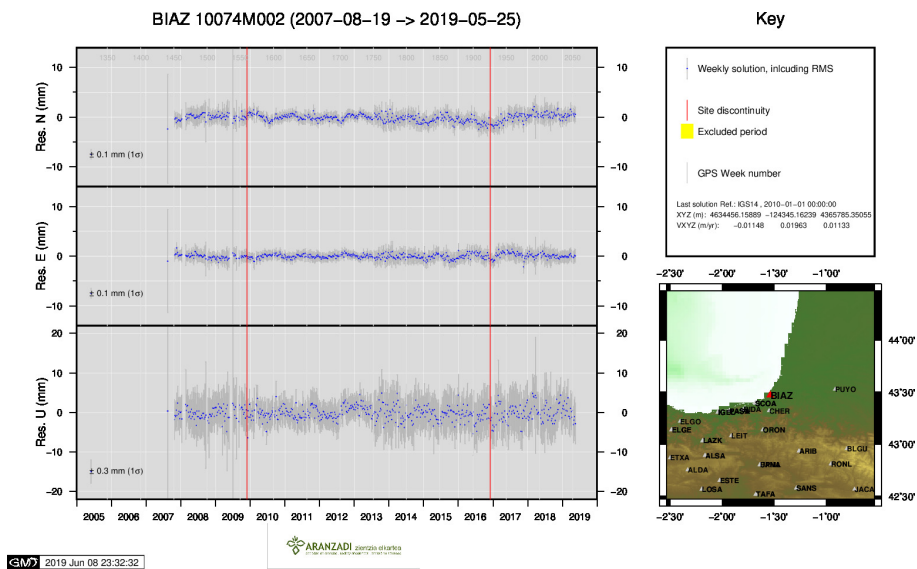
## 9 Cumulative Time Series

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

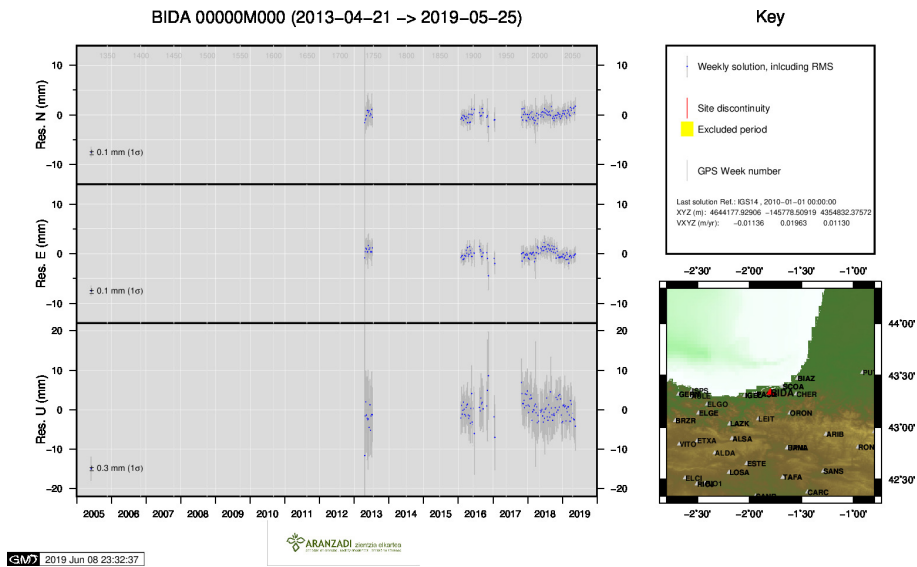




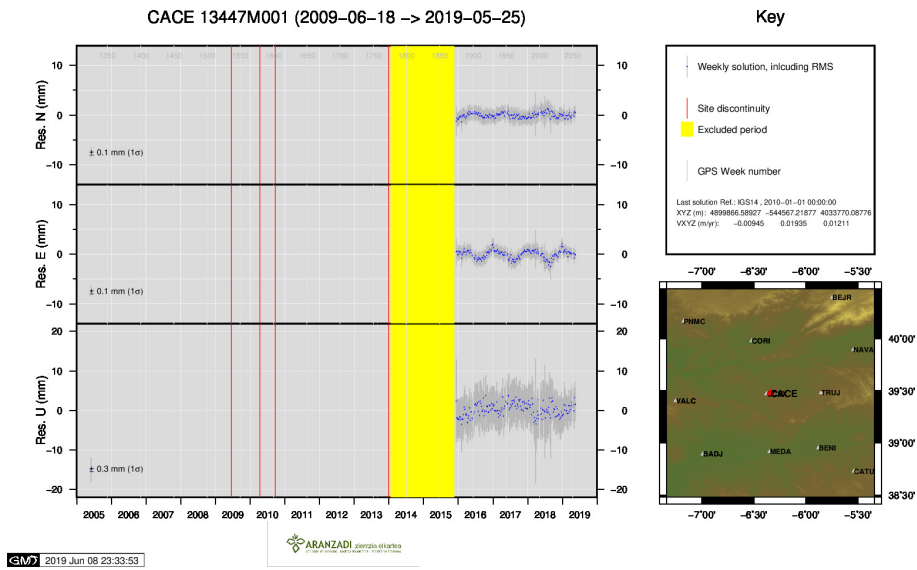
3 ) AMUR



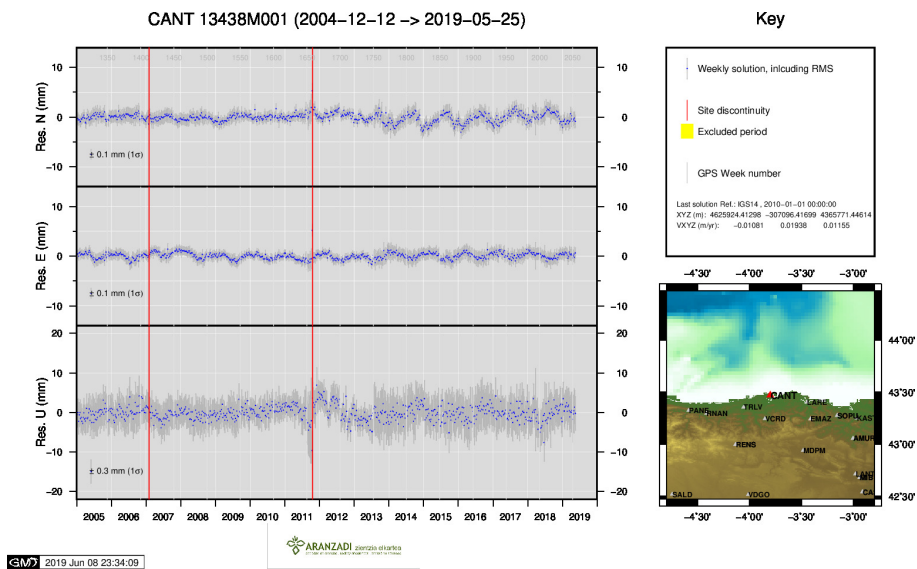
4 ) BLAZ



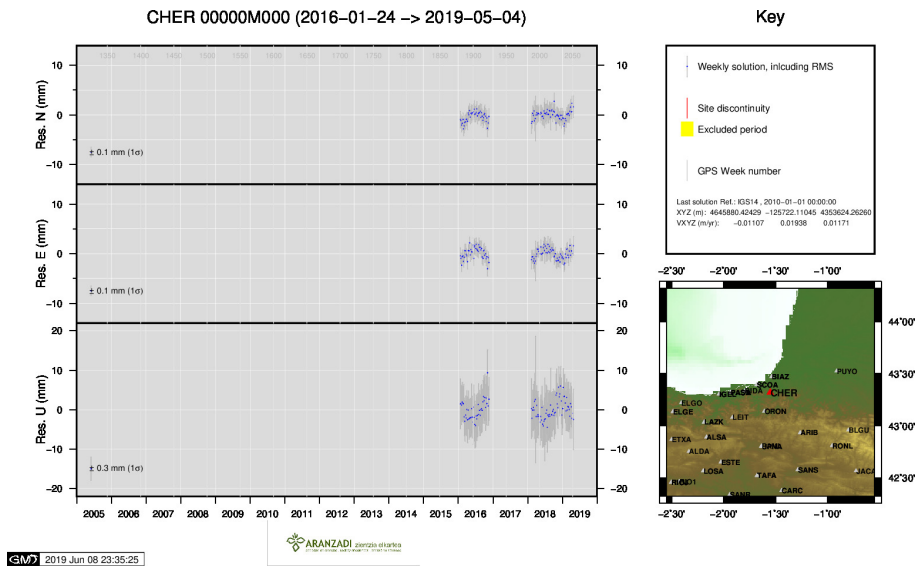
5 ) BIDA



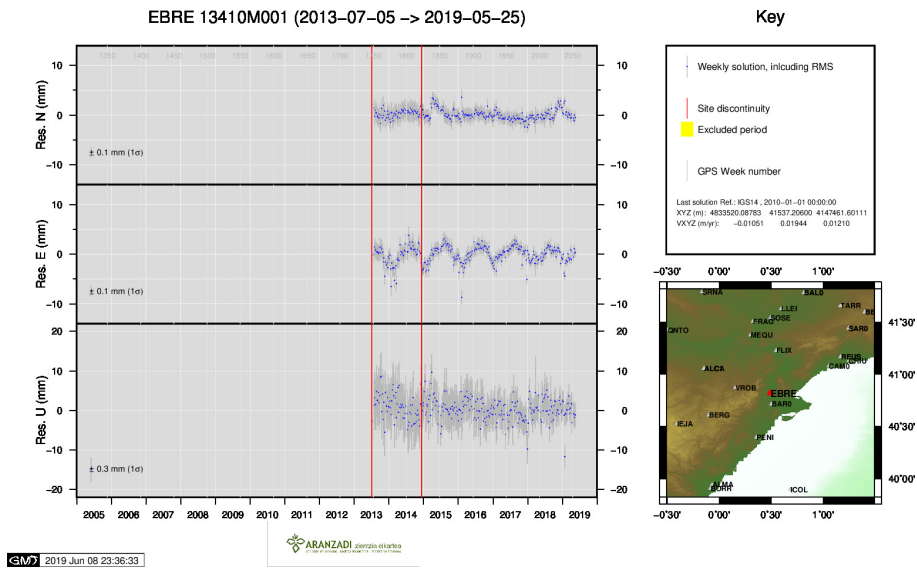
6 ) CACE



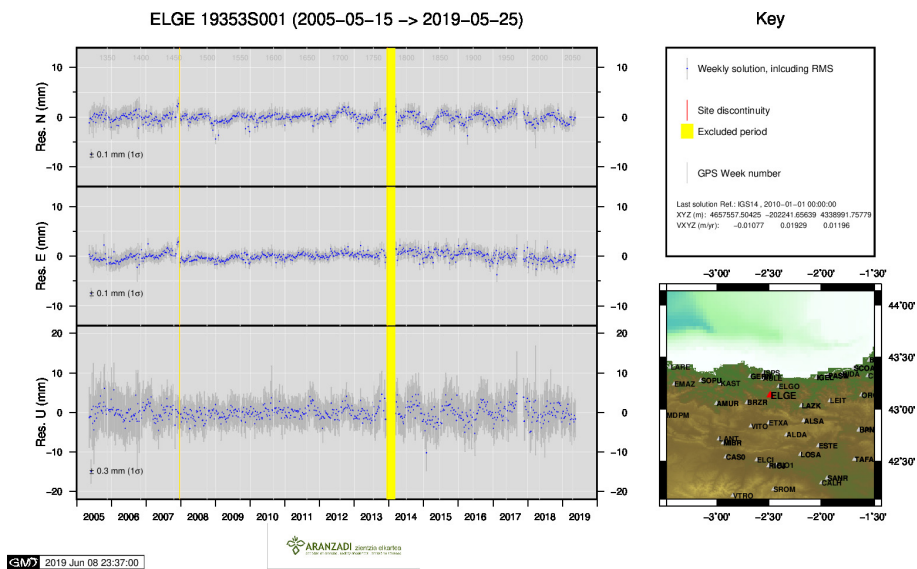
7 ) CANT



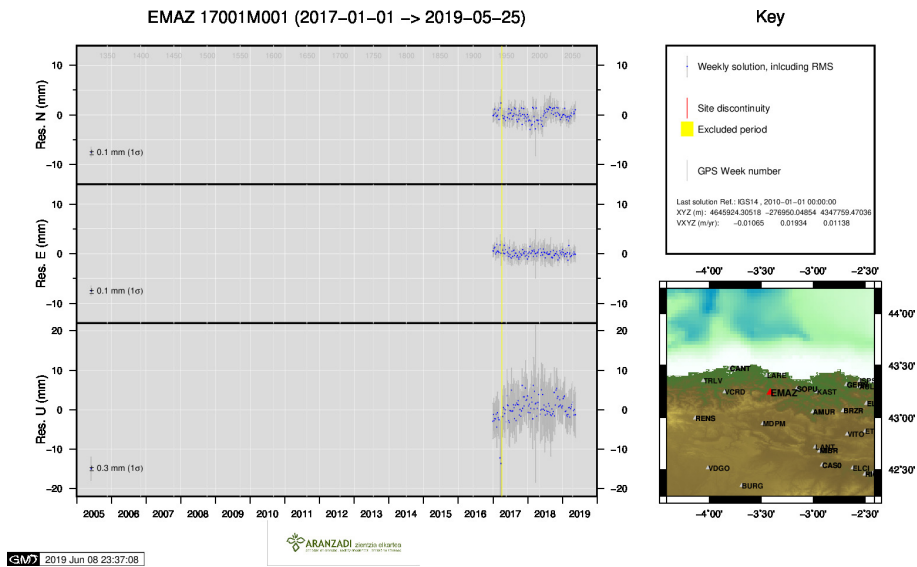
8 ) CHER



9 ) EBRE

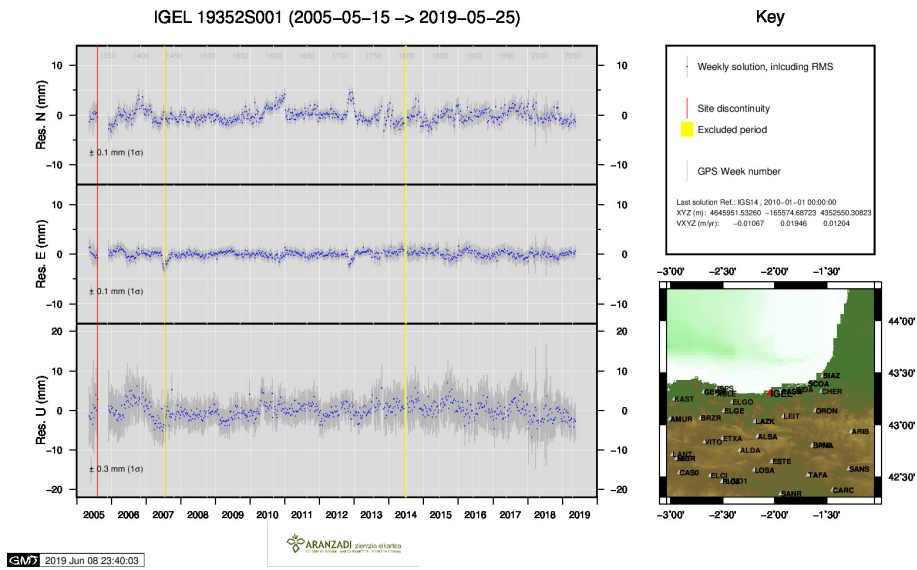


10 ) ELGE

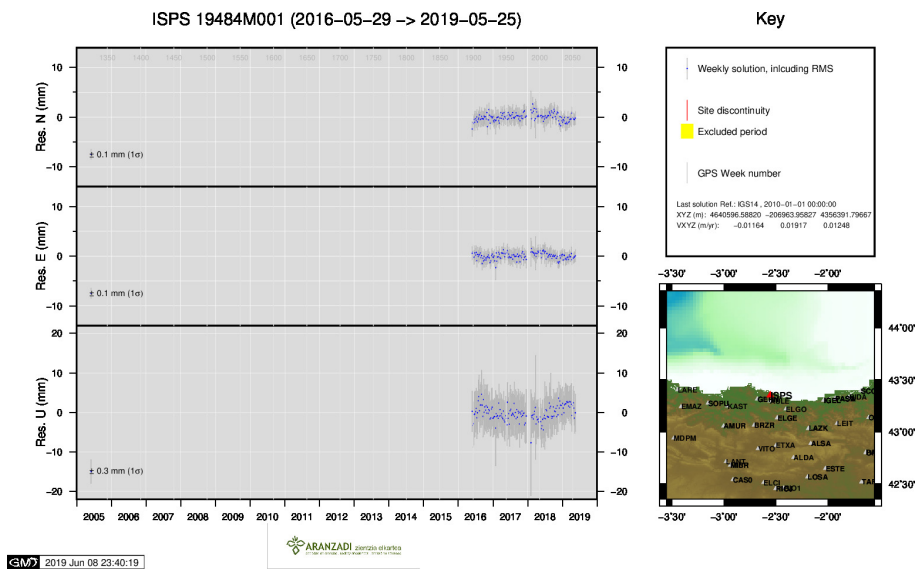


11 ) EMAZ

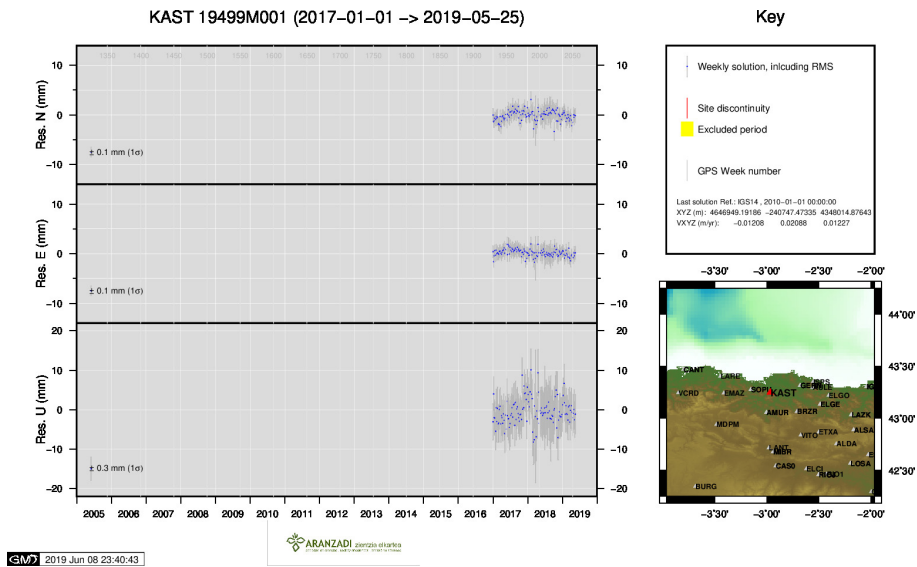




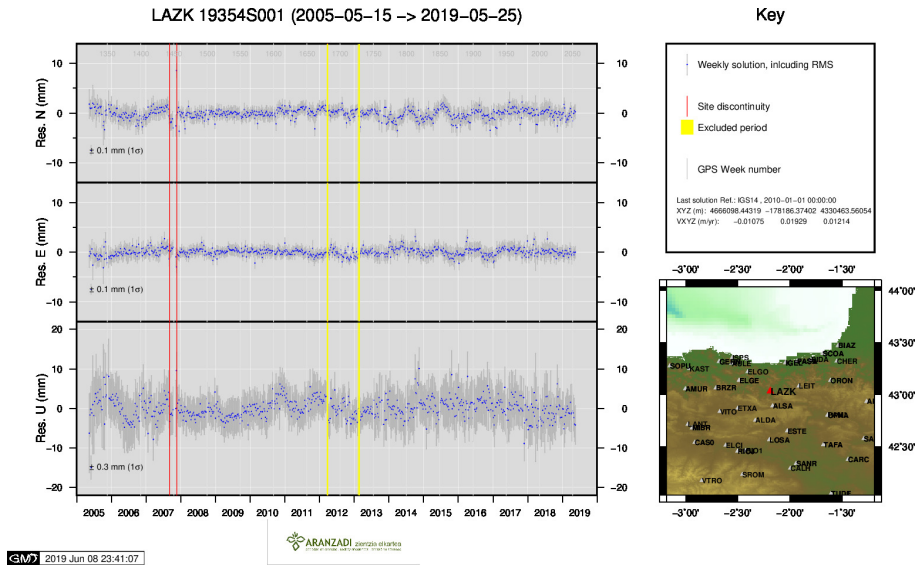
12 ) IGEL



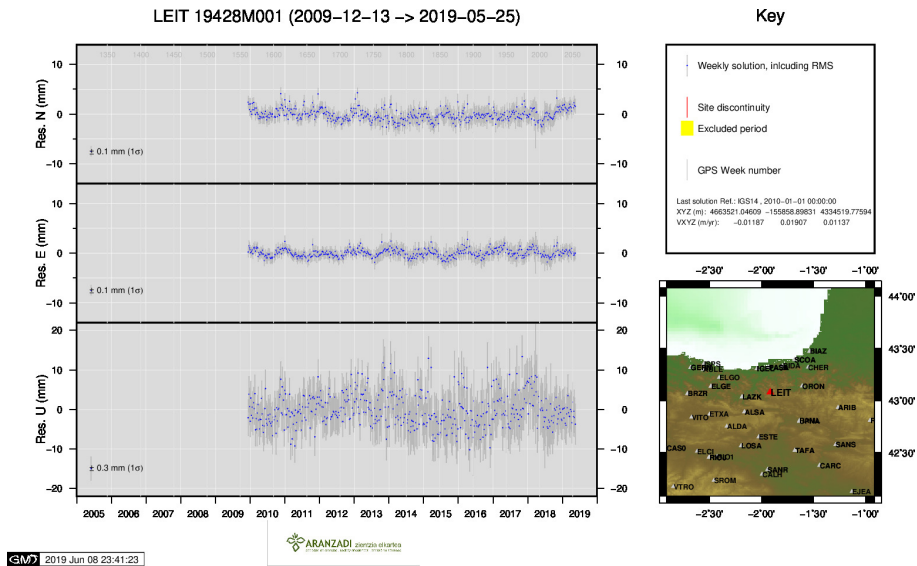
13 ) ISPS



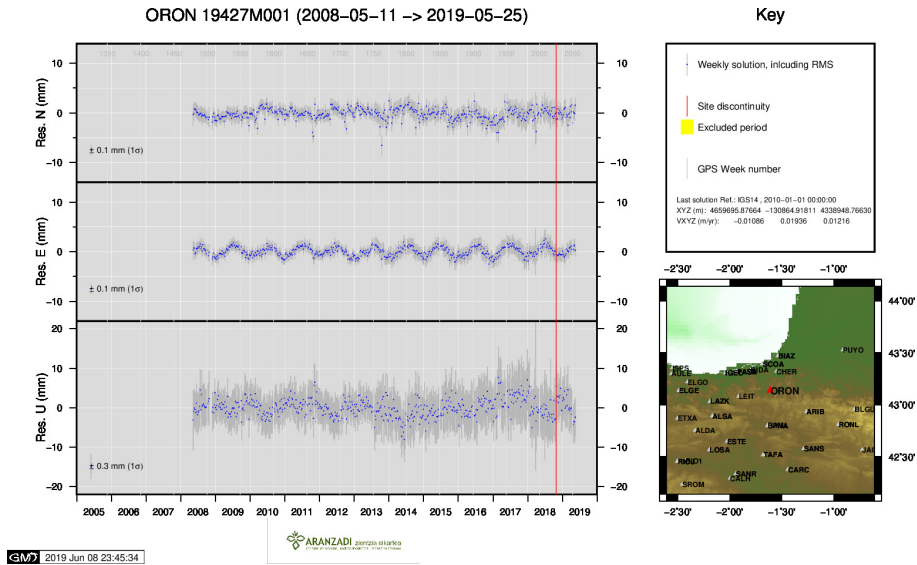
14 ) KAST



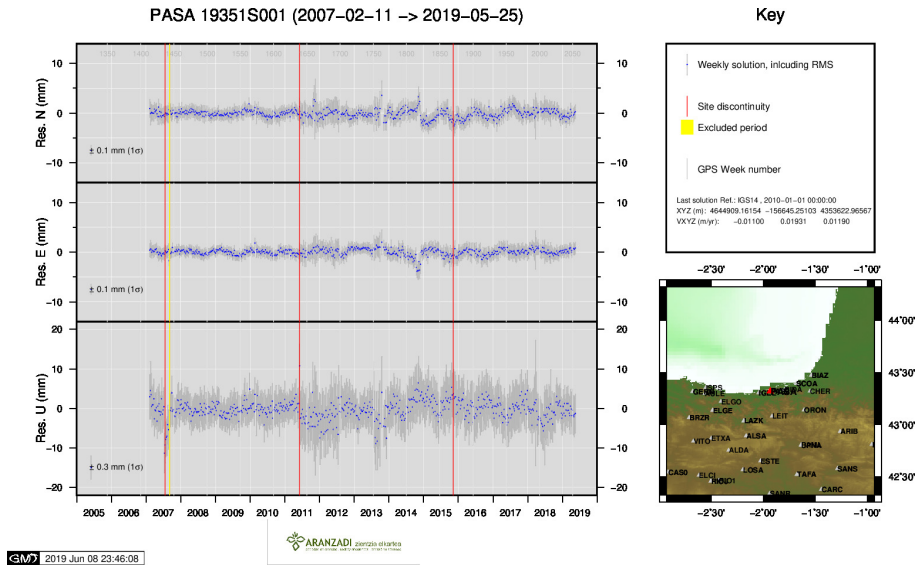
15 ) LAZK



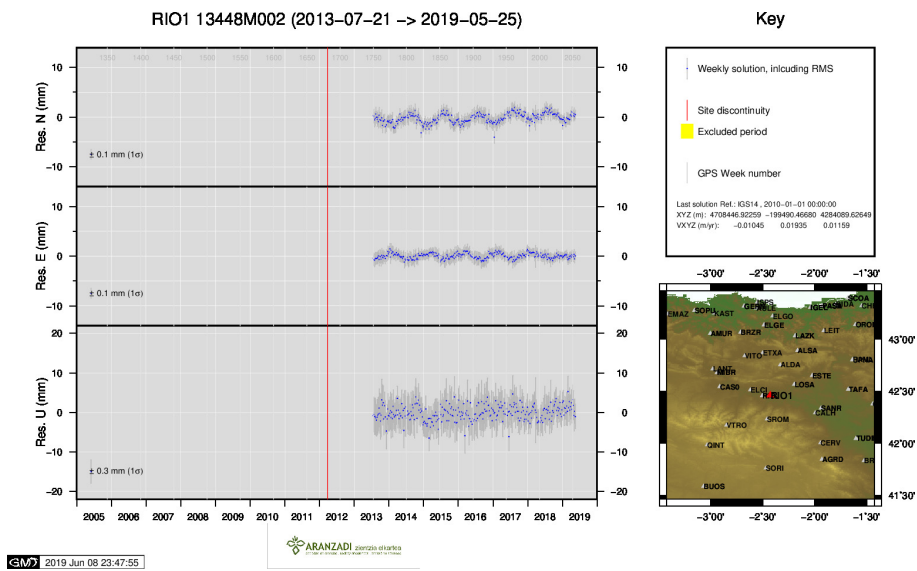
16 ) LEIT



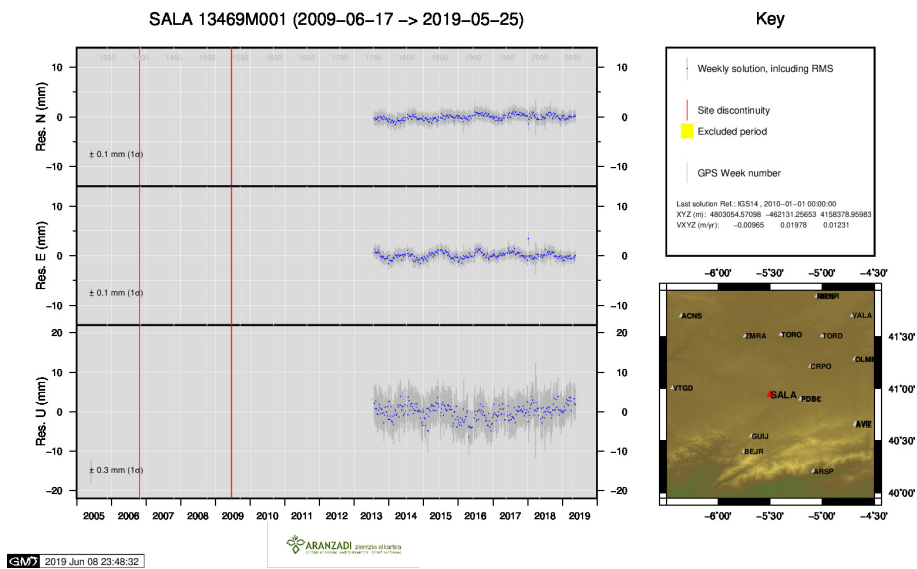
17 ) ORON



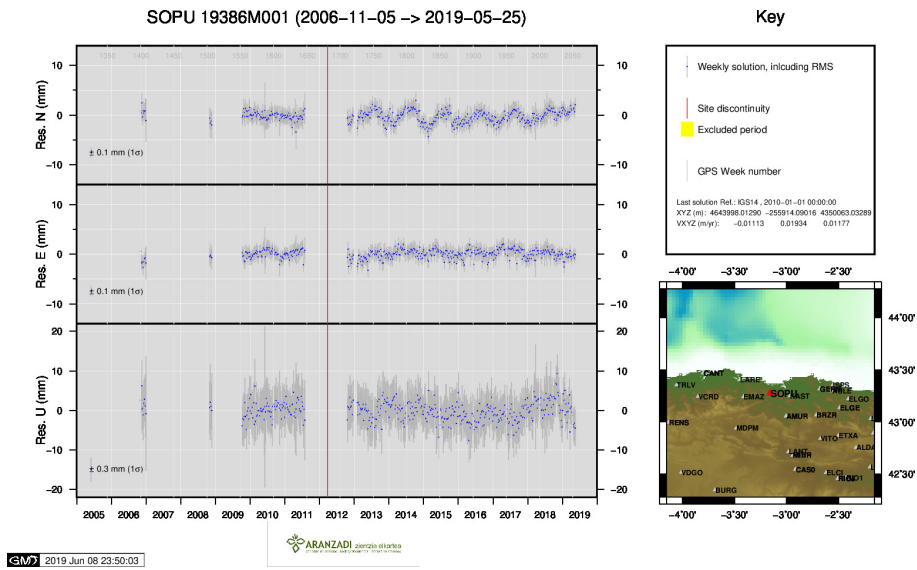
18 ) PASA



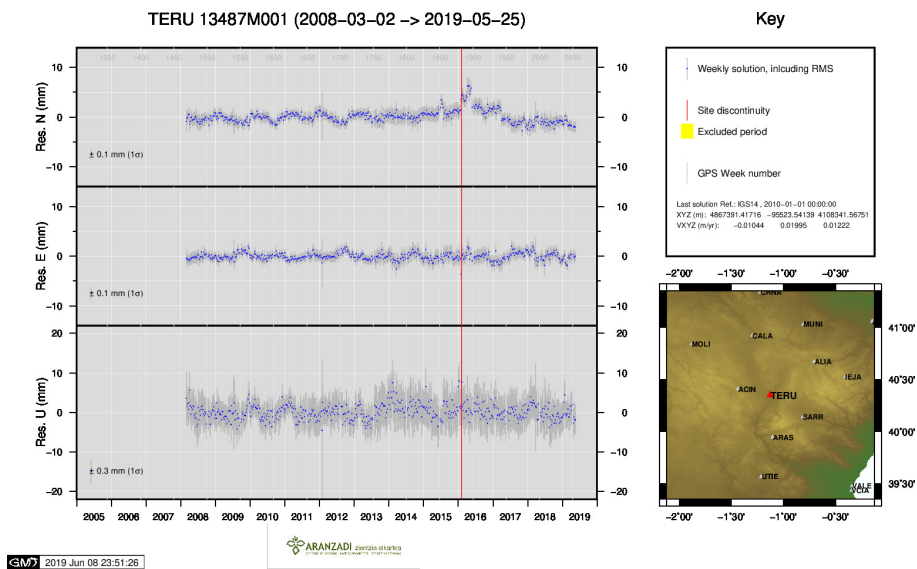
19 ) RIO1



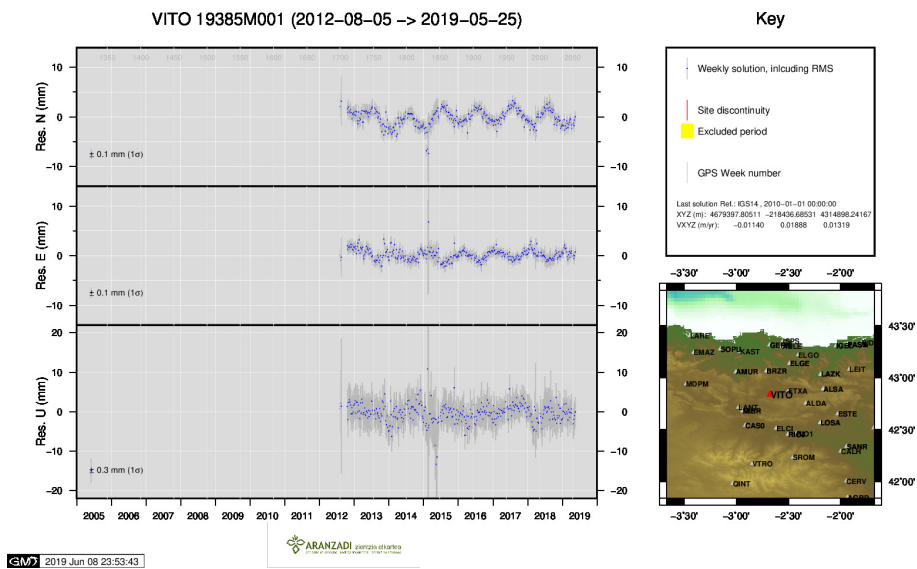
20 ) SALA



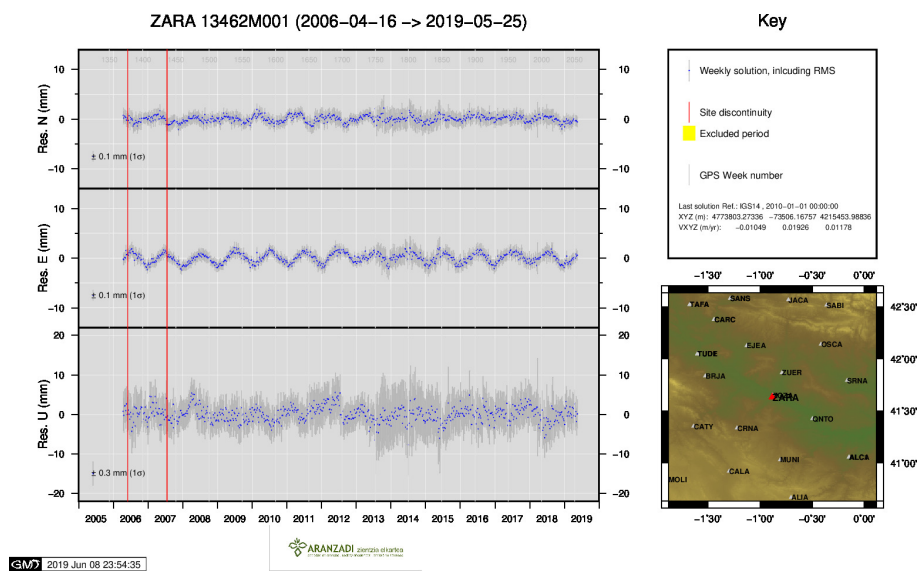
21 ) SOPU



22 ) TERU



23 ) VITO



24 ) ZARA