

# ARA-DAC Weekly Analysis Result: 2162 (GFA)

## Technical Report

**GPS Week: 2162 (GFA)**

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

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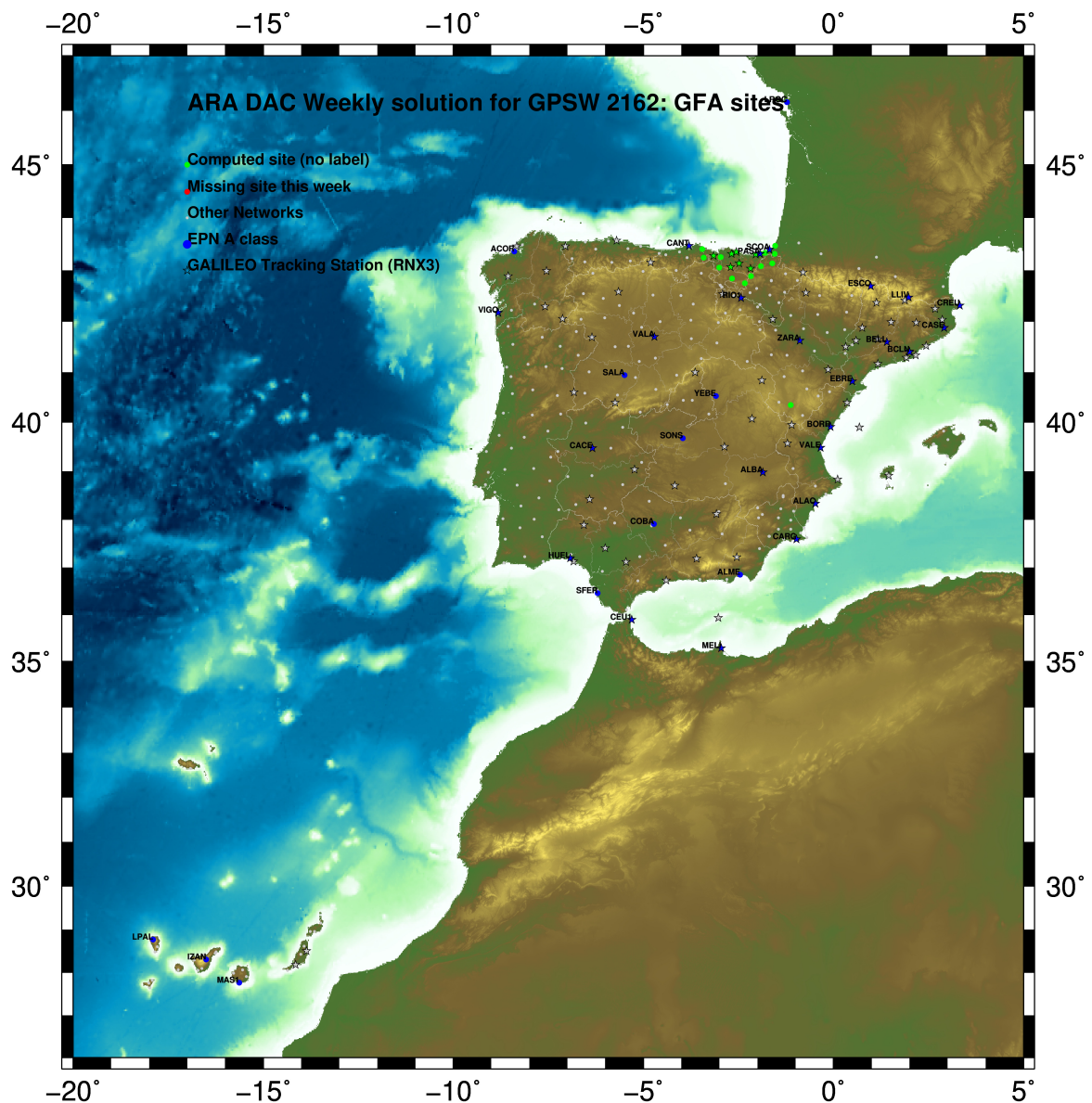
Report generated on 2021/07/04 at 14:04:24



# 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



2021 Jul 04 14:04:16

Fig.1: Computed Sites for GPS Week2162 (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 2162 WEEK FINAL COMBINATION: PRECISE ORBITS					04-JUL-21 10:37
LOCAL GEODETIC DATUM: IGB14					EPOCH: 2021-06-16 12:00:00
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.54046	-678367.40285	4357066.30942	W
39	ALDA 19383M001	4687280.13683	-190876.52676	4308106.98241	A
50	ALSA 19419M001	4677250.80947	-176770.36468	4319079.90134	A
53	AMUR 19388M001	4661499.42484	-244591.21866	4332269.90980	A
100	BLAZ 10074M002	4634456.02183	-124344.93667	4365785.48099	A
101	BIDA 00000M000	4644177.79553	-145778.28460	4354832.50773	A
113	BRZR 19387M001	4662220.96493	-220769.86152	4333309.46519	A
104	CACE 13447M001	4899866.48309	-544566.99856	4033770.22962	W
116	CANT 13438M001	4625924.28904	-307096.19764	4365771.57993	W
154	CHER 00000M000	4645879.99352	-125721.86988	4353624.10977	A
162	CREU 13432M001	4715420.10003	273178.09739	4271946.86336	W
204	EBRE 13410M001	4833519.96276	41537.42902	4147461.73832	W
180	ELGE 19353S001	4657557.36921	-202241.43225	4338991.91189	A
182	EMAZ 17001M001	4645924.17973	-276949.82989	4347759.60111	A
209	GERN 19389M001	4642811.29345	-217222.88780	4353278.90584	A
235	IGEL 19352S001	4645951.40885	-165574.46478	4352550.44801	A
240	ISPS 19484M001	4640596.45245	-206963.73949	4356391.93810	A
245	KAST 19499M001	4646949.05629	-240747.23528	4348015.02156	A
252	LARE 19440M001	4632831.92869	-279026.10630	4360314.45446	A
256	LAZK 19354S001	4666098.30836	-178186.15225	4330463.69106	A
261	LEIT 19428M001	4663520.91370	-155858.67974	4334519.91147	A
334	ORON 19427M001	4659695.75212	-130864.69520	4338948.90565	A
345	PAS2 19351S001	4644909.03283	-156645.03030	4353623.10232	A
493	PASA 19351S001	4644909.03232	-156645.03008	4353623.10289	W
553	RID1 13448M002	4708446.80476	-199490.24583	4284089.76307	W
558	SALA 13469M001	4803054.46037	-462131.03303	4158379.10319	W
566	SCDA 10088M002	4639940.47091	-136224.90194	4359552.44193	W
418	SOPU 19386M001	4643997.88332	-255913.86915	4350063.16875	A
443	TERU 13487M001	4867391.28472	-95523.30729	4108341.70145	A
493	VITO 19385M001	4679397.67909	-218436.46727	4314898.39647	A
752	YEBE 13420M001	4848724.53968	-261631.88932	4123094.35217	W
755	ZARA 13462M001	4773803.14115	-73505.94505	4215454.11930	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 2162					04-JUL-21 10:37
LOCAL GEODETIC DATUM: ETRF2000					EPOCH: 2021-06-16 12:00:00
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.86326	-678367.97996	4357065.86536	W
39	ALDA 19383M001	4687280.51692	-190877.11316	4308106.53724	A
50	ALSA 19419M001	4677251.19213	-176770.93992	4319079.45716	A
53	AMUR 19388M001	4661499.80001	-244591.80233	4332269.46602	A
100	BLAZ 10074M002	4634456.41448	-124345.51699	4365785.04094	A
101	BIDA 00000M000	4644178.18470	-145778.86607	4354832.06662	A
113	BRZR 19387M001	4662221.34316	-220770.44522	4333309.02166	A
104	CACE 13447M001	4899866.79867	-544567.60915	4033769.76262	W
116	CANT 13438M001	4625924.65889	-307096.77752	4365771.13820	W
154	CHER 00000M000	4645880.38510	-125722.45148	4353623.66878	A
162	CREU 13432M001	4715420.53527	273177.50951	4271946.42181	W
204	EBRE 13410M001	4833520.35993	41536.82723	4147461.28429	W
180	ELGE 19353S001	4657557.75017	-202242.01538	4338991.46897	A
182	EMAZ 17001M001	4645924.55201	-276950.41193	4347759.15817	A
209	GERN 19389M001	4642811.67359	-217223.46932	4353278.46392	A
235	IGEL 19352S001	4645951.79538	-165575.04651	4352550.00650	A
240	ISPS 19484M001	4640596.83410	-206964.32074	4356391.49649	A
245	KAST 19499M001	4646949.43311	-240747.81733	4348014.57900	A
252	LARE 19440M001	4632832.30164	-279026.68688	4360314.01254	A
256	LAZK 19354S001	4666098.69169	-178186.73625	4330463.24776	A
261	LEIT 19428M001	4663521.30011	-155859.26339	4334519.46867	A
334	ORON 19427M001	4659696.14198	-130865.27835	4338948.46348	A
345	PAS2 19351S001	4644909.42056	-156645.61188	4353622.66101	A
493	PASA 19351S001	4644909.42095	-156645.61166	4353622.66158	W
553	RID1 13448M002	4708447.18200	-199490.83459	4284089.31608	W
558	SALA 13469M001	4803054.79550	-462131.63287	4158378.64513	W
566	SCDA 10088M002	4639940.86162	-136225.48291	4359552.00128	W
418	SOPU 19386M001	4643998.25840	-255914.45091	4350062.72623	A
443	TERU 13487M001	4867391.66190	-95523.91327	4108341.24293	A
493	VITO 19385M001	4679398.05624	-218437.05287	4314897.95158	A
752	YEBE 13420M001	4848724.89723	-261632.49372	4123093.89302	W
755	ZARA 13462M001	4773803.52902	-73506.54065	4215453.66864	W

### 5.3 ETRF2014 (ETRS89) Coordinates

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

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ETRF2014 FINAL COORD. wk 2162                                04-JUL-21 10:37
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LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2021-06-16 12:00:00
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
4  ACDR 13434M001         4594489.82234      -678368.01784    4357065.91643    W
39 ALDA 19383M001         4687280.47369      -190877.15234    4308106.58819    A
50 ALSA 19419M001         4677251.14895      -176770.97919    4319079.50814    A
53 AMUR 19388M001         4661499.75721      -244591.84144    4332269.51701    A
100 BIAZ 10074M002         4634456.37157      -124345.55662    4365785.09207    A
101 BIDA 00000M000         4644178.14176      -145778.90559    4354832.11771    A
113 BRZR 19387M001         4662221.30027      -220770.48440    4333309.07266    A
104 CACE 13447M001         4899866.75417      -544567.64623    4033769.81290    W
116 CANT 13438M001         4625924.61663      -307096.81656    4365771.18928    W
154 CHER 00000M000         4645880.34208      -125722.49106    4353623.71988    A
162 CREU 13432M001         4715420.49010      273177.46888     4271946.47299    W
204 EBRE 13410M001         4833520.31436        41536.78787     4147461.33499    W
180 ELGE 19353S001         4657557.70727      -202242.05464    4338991.52000    A
182 EMAZ 17001M001         4645924.50947      -276950.45099    4347759.20919    A
209 GERN 19389M001         4642811.63089      -217223.50860    4353278.51498    A
235 IGEL 19352S001         4645951.75249      -165575.08595    4352550.05758    A
240 ISPS 19484M001         4640596.79139      -206964.36006    4356391.54756    A
245 KAST 19499M001         4646949.39044      -240747.85651    4348014.63004    A
252 LARE 19440M001         4632832.25923      -279026.72598    4360314.06361    A
256 LAZK 19354S001         4666098.64862      -178186.77557    4330463.29878    A
261 LEIT 19428M001         4663521.25701      -155859.30280    4334519.51970    A
334 ORDN 19427M001         4659696.09883      -130865.31785    4338948.51453    A
345 PAS2 19351S001         4644909.37764      -156645.65136    4353622.71210    A
493 PASA 19351S001         4644909.37803      -156645.65114    4353622.71267    W
553 RIO1 13448M002         4708447.13857      -199490.87366    4284089.36696    W
558 SALA 13469M001         4803054.75185      -462131.67064    4158378.69566    W
566 SOA4 10088M002         4639940.81869      -136225.52247    4359552.05239    W
418 SOPU 19386M001         4643998.21580      -255914.49005    4350062.77727    A
443 TERU 13487M001         4867391.61644      -95523.95202     4108341.29345    A
493 VITO 19385M001         4679398.01318      -218437.09199    4314898.00254    A
752 YEBE 13420M001         4848724.85250      -261632.53199    4123093.94351    W
755 ZARA 13462M001         4773803.48449      -73506.57988     4215453.71942    W

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## 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 2162 WEEK FINAL COMBINATION: PRECISE ORBITS 04-JUL-21 10:37

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.77	1.01	4.59
ALDA 19383M001	7	XXXXXX	2.09	1.44	4.70
ALSA 19419M001	7	XXXXXX	1.83	0.66	3.33
AMUR 19388M001	7	XXXXXX	0.93	1.48	7.29
BLAZ 10074M002	7	XXXXXX	1.50	1.29	2.65
BIDA 00000M000	7	XXXXXX	1.14	1.34	5.55
BRZR 19387M001	7	XXXXXX	1.86	1.09	3.68
CACE 13447M001	7	XXXXXX	1.24	0.86	4.53
CANT 13438M001	7	XXXXXX	0.70	0.96	3.85
CHER 00000M000	7	XXXXXX	1.69	2.43	3.56
CREU 13432M001	6	XX XXX	1.20	0.40	2.20
EBRE 13410M001	7	XXXXXX	0.64	0.95	4.78
ELGE 19353S001	7	XXXXXX	1.52	1.07	7.19
EMAZ 17001M001	7	XXXXXX	2.05	1.80	3.41
GERN 19389M001	7	XXXXXX	0.75	1.38	3.61
IGEL 19352S001	7	XXXXXX	1.36	1.22	4.93
ISPS 19484M001	7	XXXXXX	0.85	1.83	5.09
KAST 19499M001	7	XXXXXX	1.77	1.05	8.29
LARE 19440M001	7	XXXXXX	1.29	1.48	3.49
LAZK 19354S001	7	XXXXXX	0.61	0.73	11.21
LEIT 19428M001	7	XXXXXX	2.45	1.27	6.16
ORON 19427M001	7	XXXXXX	2.91	0.75	6.31
PAS2 19351S001	7	XXXXXX	1.21	1.52	3.93
PASA 19351S001	7	XXXXXX	1.19	1.33	3.79
RI01 13448M002	7	XXXXXX	1.04	1.25	2.26
SALA 13469M001	7	XXXXXX	1.10	0.78	2.06
SCDA 10088M002	7	XXXXXX	1.98	1.58	4.40
SOPU 19386M001	7	XXXXXX	1.01	0.85	5.95
TERU 13487M001	7	XXXXXX	0.91	0.46	2.58
VITD 19385M001	3	XXX	0.51	0.77	4.67
YEBE 13420M001	7	XXXXXX	0.63	0.61	3.16
ZARA 13462M001	6	XXXXXX	0.40	1.00	2.56

Comparison of individual solutions:

ACOR 13434M001	N	0.77	-0.07	1.23	-0.80	-0.28	0.18	-0.45	1.03
ACOR 13434M001	E	1.01	0.43	1.46	0.35	-0.27	-1.79	0.17	0.55
ACOR 13434M001	U	4.59	-3.16	-5.81	-6.58	5.50	-0.78	-2.75	0.90
ALDA 19383M001	N	2.09	-2.48	2.10	2.35	0.89	-2.42	-1.13	1.48
ALDA 19383M001	E	1.44	-1.51	-1.34	-1.46	2.25	-0.72	-0.84	-0.02
ALDA 19383M001	U	4.70	0.23	-0.51	3.85	7.33	-5.01	1.09	-6.11
ALSA 19419M001	N	1.83	-1.16	1.41	-0.03	0.00	-1.25	-2.33	3.13
ALSA 19419M001	E	0.66	0.02	0.45	-0.83	-0.82	-0.91	0.32	-0.32
ALSA 19419M001	U	3.33	-0.13	0.36	6.12	-4.74	0.19	-0.49	-2.47
AMUR 19388M001	N	0.93	-0.68	1.54	-0.51	-0.56	0.74	0.37	-1.03
AMUR 19388M001	E	1.48	0.65	-1.51	0.49	1.59	-0.47	0.69	-2.65
AMUR 19388M001	U	7.29	-10.71	7.74	8.59	-7.17	0.06	3.99	1.82
BLAZ 10074M002	N	1.50	-2.03	-1.72	-1.21	1.94	-0.09	-0.89	-0.60
BLAZ 10074M002	E	1.29	-0.86	-1.30	-0.87	-1.17	1.06	-0.53	-2.01
BLAZ 10074M002	U	2.65	-2.76	-3.60	-0.64	-2.40	-0.11	-1.55	3.57
BIDA 00000M000	N	1.14	-1.41	-0.53	0.20	-0.59	0.45	-0.47	-2.17
BIDA 00000M000	E	1.34	-0.77	-0.45	-0.77	0.76	-0.53	-1.18	-2.68
BIDA 00000M000	U	5.55	-1.73	-6.67	2.34	-4.50	9.59	-4.42	0.20
BRZR 19387M001	N	1.86	1.68	0.28	2.40	-2.91	-0.77	1.36	-1.03
BRZR 19387M001	E	1.09	0.26	0.94	0.76	-0.50	0.27	-0.09	-2.28
BRZR 19387M001	U	3.68	-3.88	5.16	4.93	-3.34	1.77	0.59	-0.62
CACE 13447M001	N	1.24	0.63	0.90	0.41	-2.67	-0.16	0.80	-0.05
CACE 13447M001	E	0.86	0.61	0.83	-0.52	-0.78	-0.41	0.75	-1.34
CACE 13447M001	U	4.53	-1.56	8.70	1.43	1.52	-4.85	1.56	-3.86
CANT 13438M001	N	0.70	-0.38	0.75	-0.19	0.63	-1.28	0.22	0.37
CANT 13438M001	E	0.96	0.49	-0.50	-0.09	-2.06	0.60	0.26	0.61
CANT 13438M001	U	3.85	2.76	-1.30	5.34	-3.44	6.07	-1.24	0.87
CHER 00000M000	N	1.69	-1.09	-1.12	0.42	-0.63	-2.25	-2.46	1.72
CHER 00000M000	E	2.43	-0.91	-0.79	0.26	0.99	-0.02	-3.14	-4.79
CHER 00000M000	U	3.56	-2.21	-5.59	3.37	-2.39	4.30	-1.15	-1.70
CREU 13432M001	N	1.20	0.44	-1.72	-1.30		0.23	0.73	1.31
CREU 13432M001	E	0.40	0.11	-0.49	-0.32		0.40	-0.15	0.53
CREU 13432M001	U	2.20	-2.43	0.95	-1.00		-3.38	-1.17	1.90
EBRE 13410M001	N	0.64	-1.07	0.65	-0.72	0.48	0.07	-0.21	0.28
EBRE 13410M001	E	0.95	-0.78	-0.48	0.81	1.21	-1.41	0.49	0.45
EBRE 13410M001	U	4.78	3.27	-5.90	-8.09	-1.65	0.46	4.02	2.68
ELGE 19353S001	N	1.52	1.61	1.12	0.95	-2.52	-1.34	0.92	0.34
ELGE 19353S001	E	1.07	0.18	0.85	-1.60	-0.97	1.53	-0.31	-0.43
ELGE 19353S001	U	7.19	1.13	7.19	12.23	-5.80	-0.65	-1.98	-8.35
EMAZ 17001M001	N	2.05	0.17	0.60	0.73	2.51	-2.66	-2.82	1.69
EMAZ 17001M001	E	1.80	1.41	2.67	-0.51	-2.09	-0.13	0.05	-2.39
EMAZ 17001M001	U	3.41	0.44	0.68	-0.97	6.80	4.05	1.06	-2.05
GERN 19389M001	N	0.75	-0.47	0.86	0.85	0.34	0.53	-1.12	-0.02
GERN 19389M001	E	1.38	0.28	1.26	-1.73	-1.05	1.16	1.22	-1.68
GERN 19389M001	U	3.61	-2.55	5.63	5.22	-2.37	-1.67	-0.89	1.85
IGEL 19352S001	N	1.36	-0.43	-1.15	0.14	0.46	-0.35	-0.50	-2.99
IGEL 19352S001	E	1.22	-0.69	-0.57	0.40	-1.36	-0.37	-0.74	-2.32
IGEL 19352S001	U	4.93	-2.10	-8.39	0.71	-1.68	5.01	5.14	-4.03
ISPS 19484M001	N	0.85	1.19	-0.48	0.09	-0.09	-1.02	-0.08	1.28
ISPS 19484M001	E	1.83	0.40	2.75	-0.65	-2.46	0.92	0.49	-2.21
ISPS 19484M001	U	5.09	-0.95	2.33	4.69	-9.58	5.65	1.64	0.91
KAST 19499M001	N	1.77	-0.36	-0.89	1.06	-3.35	2.00	0.66	1.02
KAST 19499M001	E	1.05	0.29	-0.35	-0.26	0.91	0.32	1.28	-1.94
KAST 19499M001	U	8.29	-4.74	4.05	-1.17	-11.22	6.32	13.67	4.39
LARE 19440M001	N	1.29	-0.02	0.99	0.63	1.12	-2.09	-1.48	0.93
LARE 19440M001	E	1.48	1.93	1.08	-0.34	0.12	-0.07	-0.59	-2.78
LARE 19440M001	U	3.49	-1.25	5.05	-2.47	-1.11	2.46	0.99	5.61
LAZK 19354S001	N	0.61	-0.24	0.35	-1.13	0.19	-0.33	-0.10	0.79
LAZK 19354S001	E	0.73	-0.46	0.36	0.26	-1.44	0.19	-0.82	-0.25

LAZK	19354S001	U	11.21	7.35	8.05	11.90	-12.17	-18.07	-2.36	3.62
LEIT	19428M001	N	2.45	-1.90	1.04	-1.05	4.65	-0.12	-2.74	-0.94
LEIT	19428M001	E	1.27	-1.71	-0.49	-1.11	-0.45	-1.09	0.39	1.92
LEIT	19428M001	U	6.16	-1.80	-9.41	5.63	-4.82	-1.25	0.55	8.89
ORDN	19427M001	N	2.91	0.91	0.50	0.58	1.40	1.51	0.42	-6.70
ORDN	19427M001	E	0.75	0.09	-0.36	0.20	-1.07	0.44	-1.35	-0.20
ORDN	19427M001	U	6.31	-0.55	0.67	4.77	-13.67	5.01	1.10	1.54
PAS2	19351S001	N	1.21	-0.67	-0.30	-0.39	0.31	-0.08	-1.31	-2.51
PAS2	19351S001	E	1.52	-0.04	0.15	-0.86	0.58	-1.77	-1.29	-2.81
PAS2	19351S001	U	3.93	-1.98	-3.73	-2.85	4.52	1.95	-0.33	-6.49
PASA	19351S001	N	1.19	-1.51	-0.79	0.13	0.78	-0.13	-1.72	-1.43
PASA	19351S001	E	1.33	-0.44	-0.46	0.19	0.11	-1.43	-1.22	-2.57
PASA	19351S001	U	3.79	-1.57	-4.68	0.39	4.27	2.72	-1.06	-5.92
RID1	13448M002	N	1.04	-0.94	-0.05	-0.92	-0.11	1.16	0.22	1.84
RID1	13448M002	E	1.25	-1.01	1.38	-1.88	0.51	-0.23	-1.09	-1.22
RID1	13448M002	U	2.26	0.58	2.08	1.72	-3.07	-0.66	-1.83	-3.11
SALA	13469M001	N	1.10	1.35	-1.96	0.02	-0.32	-0.64	0.04	1.03
SALA	13469M001	E	0.78	-0.40	1.00	0.08	-0.76	1.00	-0.87	-0.41
SALA	13469M001	U	2.06	-0.77	-0.45	0.19	3.28	1.37	-3.29	-1.03
SCDA	10088M002	N	1.98	-1.48	-1.53	0.68	2.07	-3.64	0.45	-0.91
SCDA	10088M002	E	1.58	-0.82	0.16	0.61	-1.97	-3.14	-0.20	-0.39
SCDA	10088M002	U	4.40	-0.89	-5.46	2.00	-2.31	7.29	-3.88	-2.82
SOPU	19386M001	N	1.01	0.02	0.30	-0.56	1.70	-0.81	-1.18	0.87
SOPU	19386M001	E	0.85	0.03	-0.10	-0.19	-0.84	1.51	0.63	-0.94
SOPU	19386M001	U	5.95	-7.32	4.64	-2.44	1.80	7.09	8.77	1.00
TERU	13487M001	N	0.91	-0.30	0.20	0.28	1.17	0.31	-0.44	-1.75
TERU	13487M001	E	0.46	-0.05	0.24	0.40	0.40	0.05	0.16	-0.94
TERU	13487M001	U	2.58	-0.21	-5.10	-3.03	0.84	1.14	0.13	1.67
VITO	19385M001	N	0.51	0.17	-0.64	0.27				
VITO	19385M001	E	0.77	0.38	-1.01	0.10				
VITO	19385M001	U	4.67	-3.61	3.13	4.56				
YEBE	13420M001	N	0.63	-0.50	-0.47	-0.91	0.09	0.02	0.82	0.63
YEBE	13420M001	E	0.61	-0.24	-0.06	-0.46	1.16	-0.15	0.13	-0.77
YEBE	13420M001	U	3.16	3.44	0.79	-1.58	0.77	0.06	-2.01	-6.36
ZARA	13462M001	N	0.40		-0.41	-0.20	0.61	-0.10	-0.12	0.46
ZARA	13462M001	E	1.00		1.21	0.21	-1.43	-0.96	0.07	-0.75
ZARA	13462M001	U	2.56		2.39	0.58	0.09	-2.77	-3.24	2.94

## 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	-0.93	1.58	-4.86
12	ALAC 13433M001	I W	-0.14	0.65	-0.06
15	ALBA 13452M001	I W	0.22	-0.96	-4.26
21	ALME 13437M001	I W	-0.43	0.06	4.09
47	BCLN 13412M001	I W	-0.24	-2.10	1.97
52	BELL 13431M001	I W	1.12	-1.22	0.96
71	BORR 13480M001	I W	-0.73	-0.32	-2.03
76	BRST 10004M004	I W	-1.51	0.51	-0.68
104	CACE 13447M001	I W	1.29	0.86	2.06
116	CANT 13438M001	I W	-0.98	1.56	-1.77
117	CARG 19412M001	I W	0.98	1.06	-1.98
122	CASE 13494M001	I W	-1.57	-1.12	-1.81
128	CEU1 13449M002	I W	0.82	-1.53	-1.42
143	COBA 13453M001	I W	0.77	1.05	-0.25
162	CREU 13432M001	I W	-0.61	1.21	3.57
204	EBRE 13410M001	I W	0.14	0.89	1.64
222	ESCO 13435M001	I W	0.44	2.13	-1.62
299	HUEL 13451M001	I W	2.08	-2.11	-2.88
316	IZAN 13109M002	I W	0.21	-0.66	2.38
385	LLIV 13436M001	I W	0.55	0.27	0.72
390	LPAL 81701M001	I W	-2.57	0.71	-0.18
392	LROC 10023M001	I W	0.93	0.89	0.14
421	MAS1 13103M002	I W	0.71	1.79	1.47
432	MELI 19379M001	I W	2.76	-0.68	-3.58
493	PASA 19351S001	I W	-1.11	-1.04	-2.69
553	RID1 13448M002	I W	-1.12	-0.53	-4.70
558	SALA 13469M001	I W	0.33	1.46	-2.37
566	SCOA 10088M002	I W	-4.37	-2.41	-3.98
574	SFER 13402M004	I W	0.91	0.04	2.69
599	SONS 13446M001	I W	-0.40	2.01	7.27
700	VALA 13463M002	I W	0.89	1.13	-0.40
704	VALE 13439M001	I W	0.33	-0.49	-2.18
715	VIGO 13450M001	I W	3.02	-1.51	1.68
752	YEBE 13420M001	I W	-1.62	-1.98	8.21
755	ZARA 13462M001	I W	-0.55	-0.73	1.80
764	ZIMM 14001M004	I W	0.40	-0.46	3.03
	RMS / COMPONENT		1.41	1.28	3.07
	MEAN		0.00	0.00	0.00
	MIN		-4.37	-2.41	-4.86
	MAX		3.02	2.13	8.21

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 108  
RMS OF TRANSFORMATION : 2.09 MM

BARYCENTER COORDINATES:

LATITUDE : 40 0 32.53  
LONGITUDE : - 3 31 28.72  
HEIGHT : -36.203 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.35 MM  
TRANSLATION IN E : 0.00 +- 0.35 MM  
TRANSLATION IN U : -0.00 +- 0.35 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          18754195
NUMBER OF UNKNOWN               242920
NUMBER OF DEGREES OF FREEDOM    18511275
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  2.489867493404087
```

Helmert Transformation Parameters With Respect to Combined Solution:

Sol	Rms (m)	Translation (m)			Rotation (")			Scale (ppm)
		X	Y	Z	X	Y	Z	
1	0.00219	-0.0046	-0.0007	0.0050	-0.0000	-0.0002	-0.0000	0.00006
2	0.00269	0.0149	0.0163	-0.0190	-0.0002	0.0008	0.0005	0.00008
3	0.00232	-0.0040	-0.0152	0.0075	0.0005	-0.0003	-0.0002	-0.00037
4	0.00283	-0.0175	-0.0431	0.0207	0.0008	-0.0009	-0.0012	-0.00023
5	0.00267	0.0022	-0.0039	-0.0043	0.0001	0.0002	-0.0001	0.00017
6	0.00260	-0.0013	-0.0191	0.0072	0.0003	-0.0002	-0.0005	-0.00071
7	0.00255	-0.0291	-0.0374	0.0340	0.0006	-0.0014	-0.0011	-0.00027

Statistics of individual solutions:

File	RMS (m)	DOF	Chi**2/DOF	#Observations authentic / pseudo	#Parameters explicit / implicit / singular
1	0.00154	2743364	2.38	2779615	3 972 35282 0
2	0.00158	2668054	2.50	2703551	3 954 34546 0
3	0.00157	2701805	2.46	2737906	3 981 35123 0
4	0.00166	2548593	2.76	2585010	3 909 35511 0
5	0.00157	2492500	2.48	2526413	3 888 33028 0
6	0.00158	2655683	2.48	2691840	3 972 35188 0
7	0.00152	2695642	2.31	2729860	3 966 33255 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 21:164:00000 21:170:86370 LEICA GR50 -----
ALDA A 1 P 21:164:00000 21:170:86370 LEICA GR10 -----
ALSA A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
AMUR A 1 P 21:164:00000 21:170:86370 LEICA GR10 -----
BIAZ A 1 P 21:164:00000 21:170:86370 SPECTRA SP90M -----
BIDA A 1 P 21:164:00000 21:170:86370 LEICA GR10 -----
BRZR A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
CACE A 1 P 21:164:00000 21:170:86370 TRIMBLE NETR9 -----
CANT A 1 P 21:164:00000 21:170:86370 LEICA GR10 -----
CHER A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
CREU A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
EBRE A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
ELGE A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
EMAZ A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
GERN A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
IGEL A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
ISPS A 1 P 21:164:00000 21:170:86370 TRIMBLE NETR9 -----
KAST A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
LARE A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
LAZK A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
LEIT A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
ORON A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
PAS2 A 1 P 21:164:00030 21:170:82770 STONEX SC2200 -----
PASA A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
RIO1 A 1 P 21:164:00000 21:170:86370 LEICA GR25 -----
SALA A 1 P 21:164:00000 21:170:86370 LEICA GRX1200+GNSS -----
SCOA A 1 P 21:164:00000 21:170:86370 LEICA GR25 -----
SOPU A 1 P 21:164:00000 21:170:86370 LEICA GR30 -----
TERU A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
VITO A 1 P 21:164:00000 21:166:86370 LEICA GR10 -----
YEBE A 1 P 21:164:00000 21:170:86370 LEICA GR50 -----
ZARA A 1 P 21:165:00000 21:170:86370 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 21:164:00000 21:170:86370 LEIAS04 LEIS -----
ALDA A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
ALSA A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
AMUR A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
```

```

BIAZ A 1 P 21:164:00000 21:170:86370 LEIAR25 LEIT -----
BIDA A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
BRZR A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
CACE A 1 P 21:164:00000 21:170:86370 TRM29659.00 NONE -----
CANT A 1 P 21:164:00000 21:170:86370 LEIAR25_R4 LEIT 25066
CHER A 1 P 21:164:00000 21:170:86370 LEIAR10 NONE -----
CREU A 1 P 21:164:00000 21:170:86370 LEIAR25_R4 NONE 26357
EBRE A 1 P 21:164:00000 21:170:86370 LEIAR25_R4 NONE 26359
ELGE A 1 P 21:164:00000 21:170:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
GERN A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
IGEL A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
ISPS A 1 P 21:164:00000 21:170:86370 TRM59900.00 SCIS -----
KAST A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
LARE A 1 P 21:164:00000 21:170:86370 LEIAR20 LEIM -----
LAZK A 1 P 21:164:00000 21:170:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 21:164:00000 21:170:86370 LEIAR10 NONE -----
ORDN A 1 P 21:164:00000 21:170:86370 LEIAR10 NONE -----
PAS2 A 1 P 21:164:00030 21:170:82770 LEIAR20 LEIM 73034
PASA A 1 P 21:164:00000 21:170:86370 LEIAR20 LEIM 73034
RIO1 A 1 P 21:164:00000 21:170:86370 LEIAR25_R4 LEIT 25138
SALA A 1 P 21:164:00000 21:170:86370 LEIAR25 NONE -----
SCOA A 1 P 21:164:00000 21:170:86370 TRM55971.00 NONE -----
SOPU A 1 P 21:164:00000 21:170:86370 LEIAS10 NONE -----
TERU A 1 P 21:164:00000 21:170:86370 LEIAR20 LEIM 49044
VITO A 1 P 21:164:00000 21:166:86370 LEIAS10 NONE -----
YEBE A 1 P 21:164:00000 21:170:86370 LEIAR20 LEIM 49016
ZARA A 1 P 21:165:00000 21:170:86370 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 21:164:00000 21:170:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 21:164:00000 21:170:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 21:164:00000 21:170:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 21:164:00000 21:170:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 21:164:00000 21:170:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 21:164:00000 21:170:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 21:164:00000 21:170:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 21:164:00000 21:170:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 21:164:00000 21:170:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 21:164:00000 21:170:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 21:164:00030 21:170:82770 UNE 0.0000 0.0000 0.0000
PASA A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
RIO1 A 1 P 21:164:00000 21:170:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 21:164:00000 21:170:86370 UNE 0.0600 0.0000 0.0000
SCOA A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 21:164:00000 21:170:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 21:164:00000 21:170:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 21:164:00000 21:166:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 21:164:00000 21:170:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 21:165:00000 21:170:86370 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)

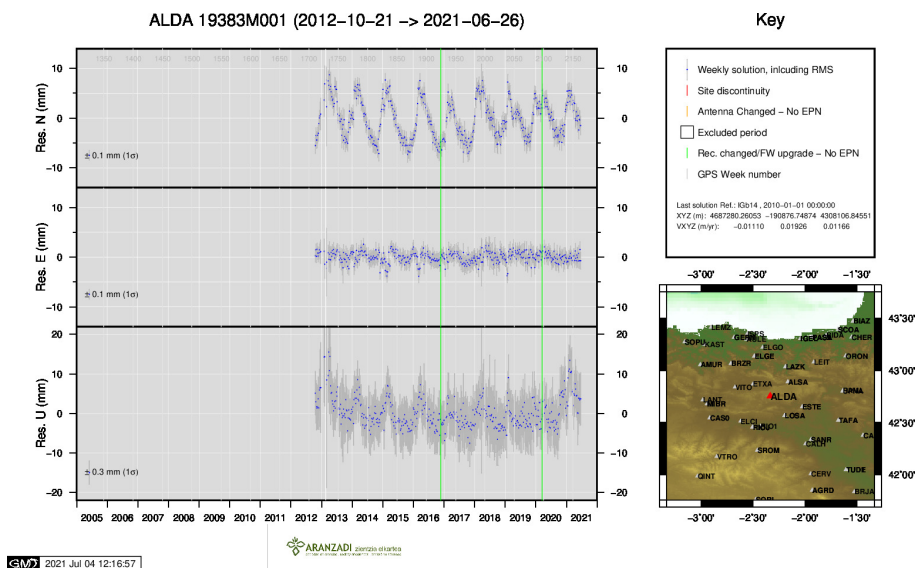
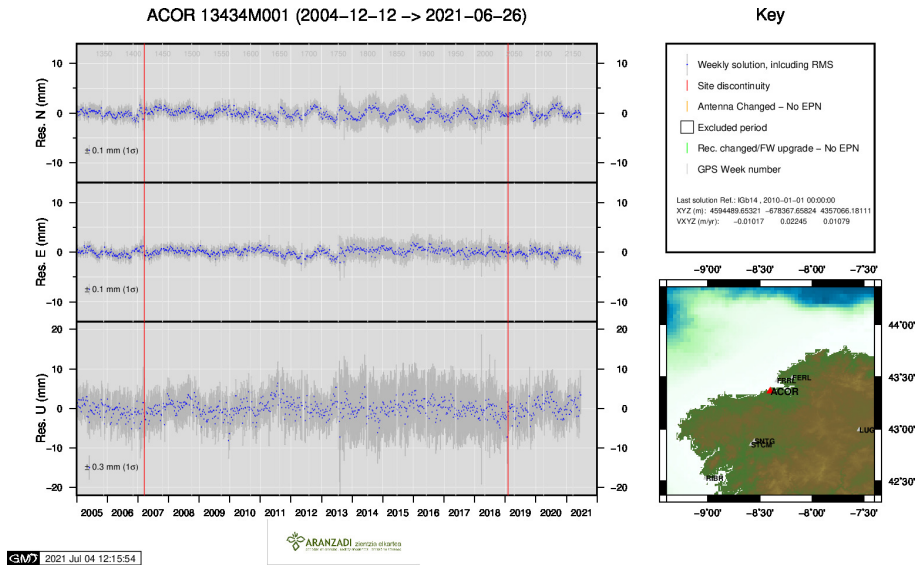
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](http://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

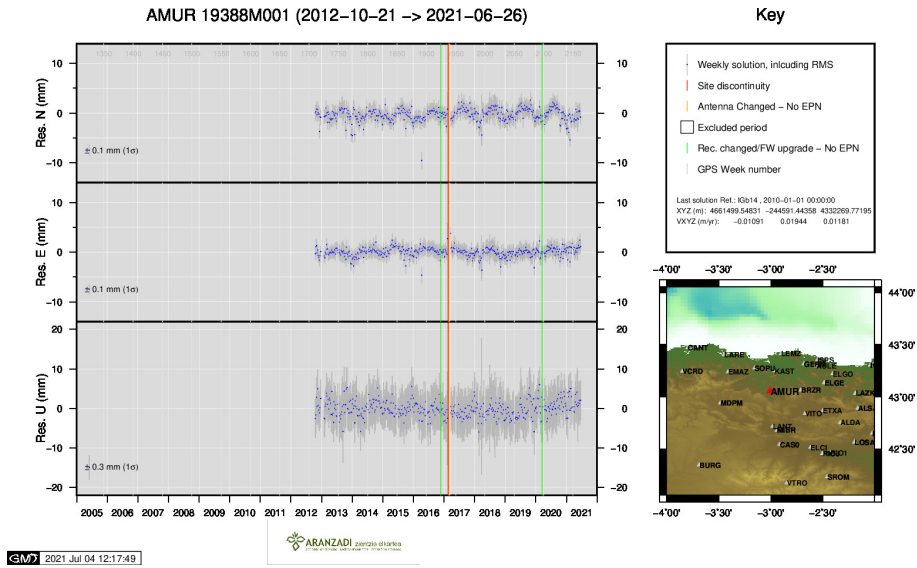
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)



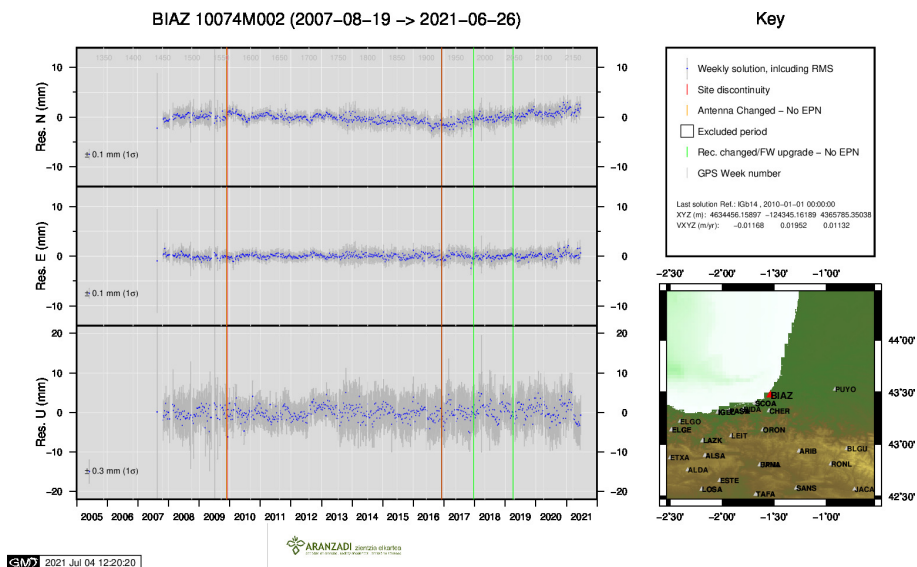
## 9 Cumulative Time Series

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

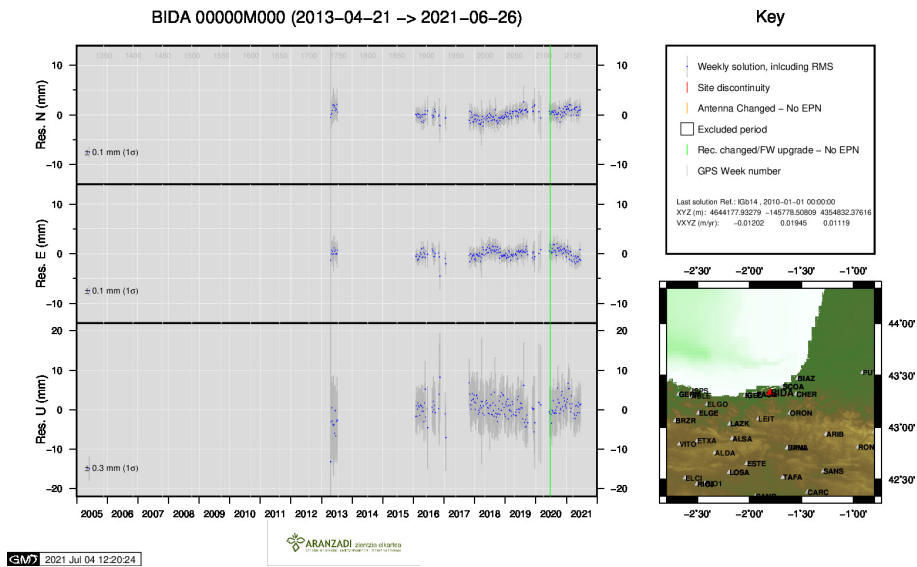




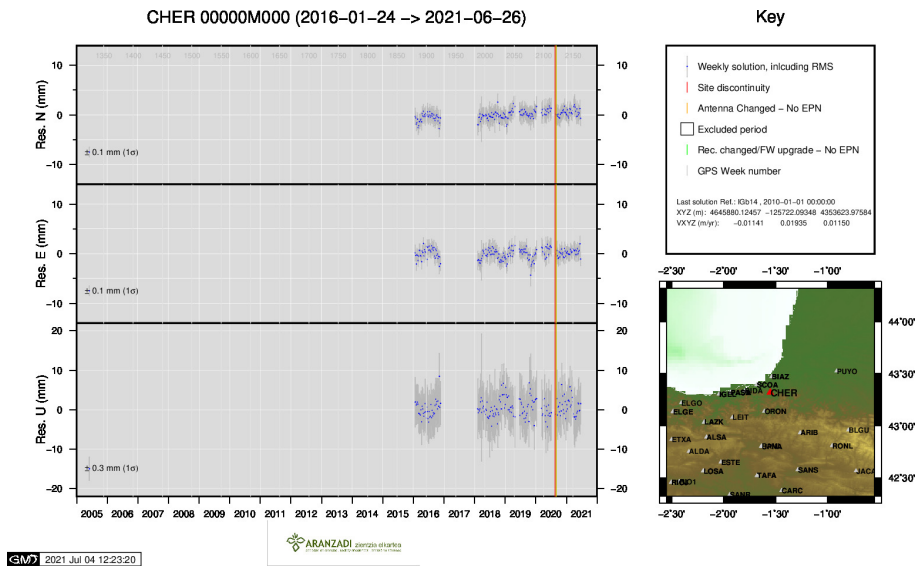
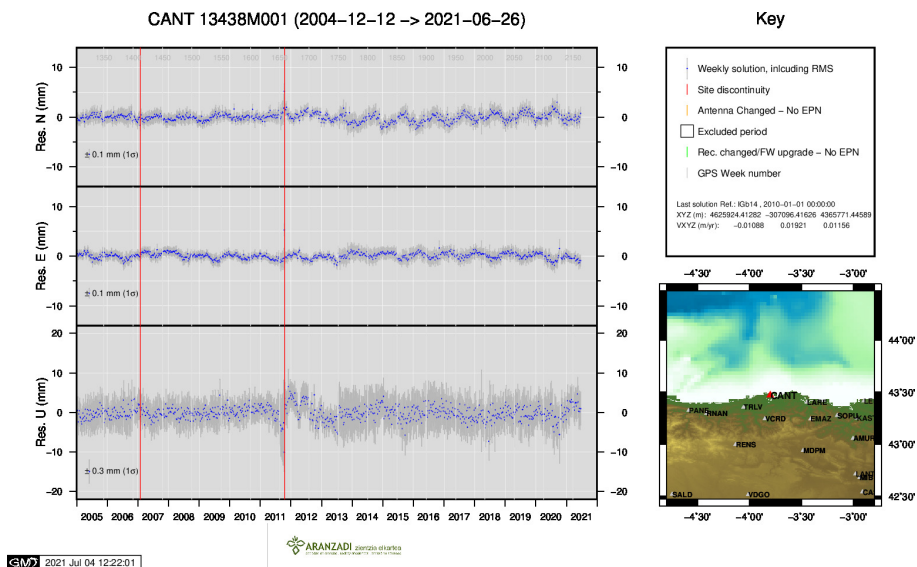
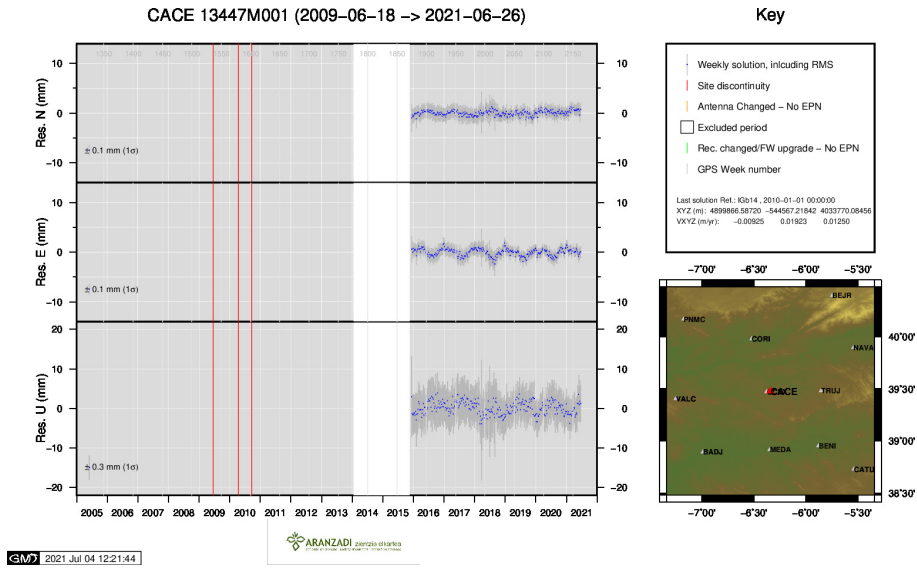
3 ) AMUR

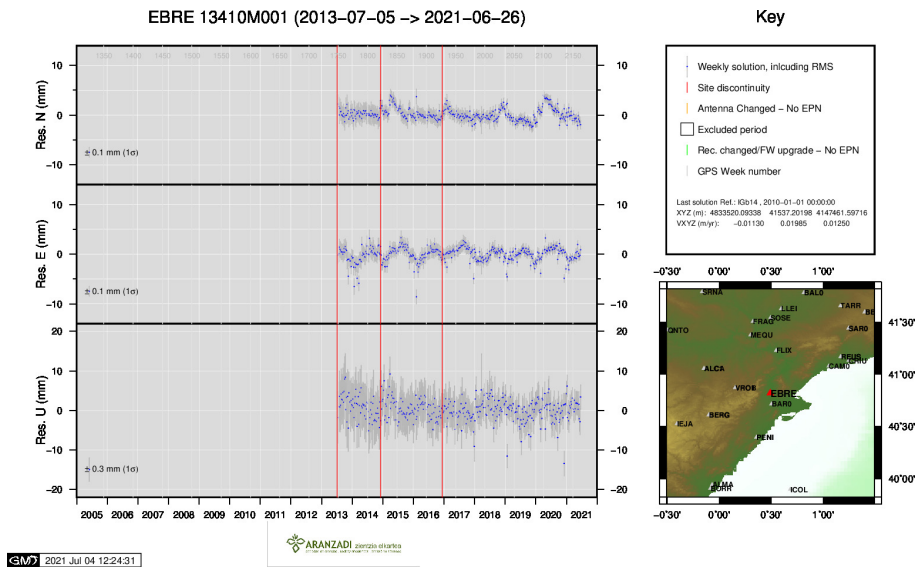


4 ) BIAZ

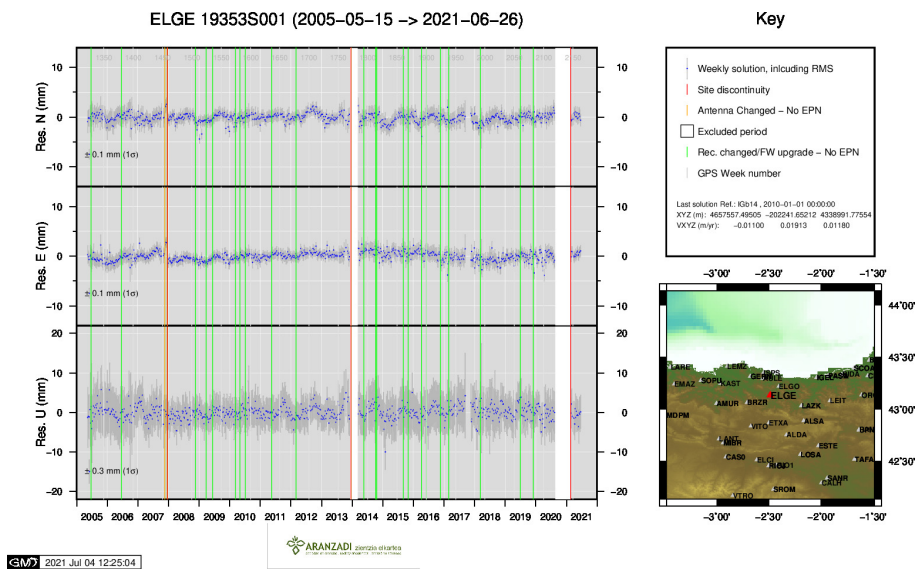


5 ) BIDA

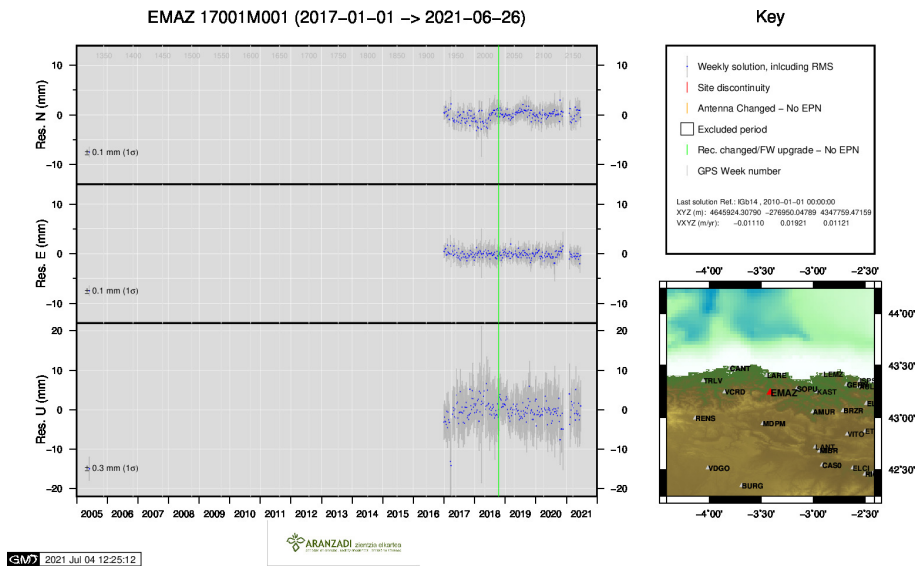




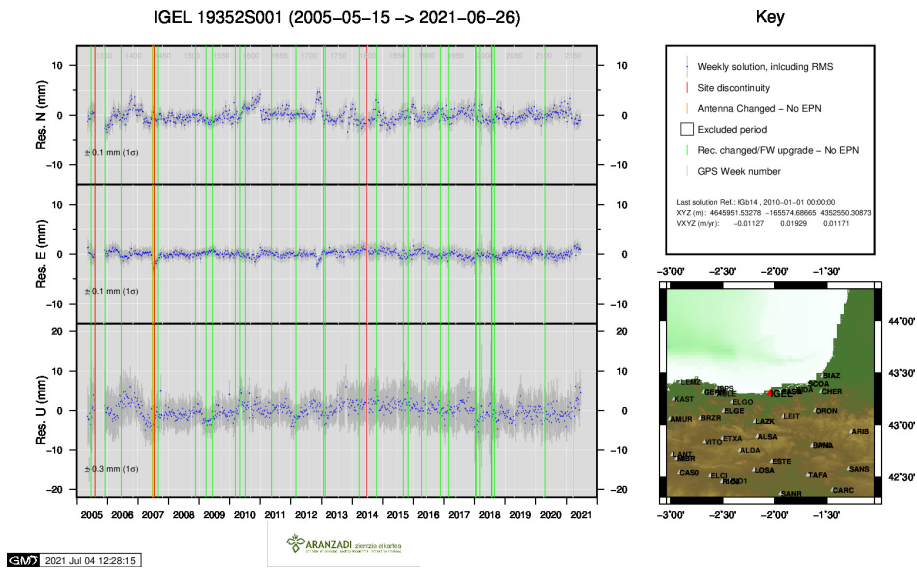
9 ) EBRE



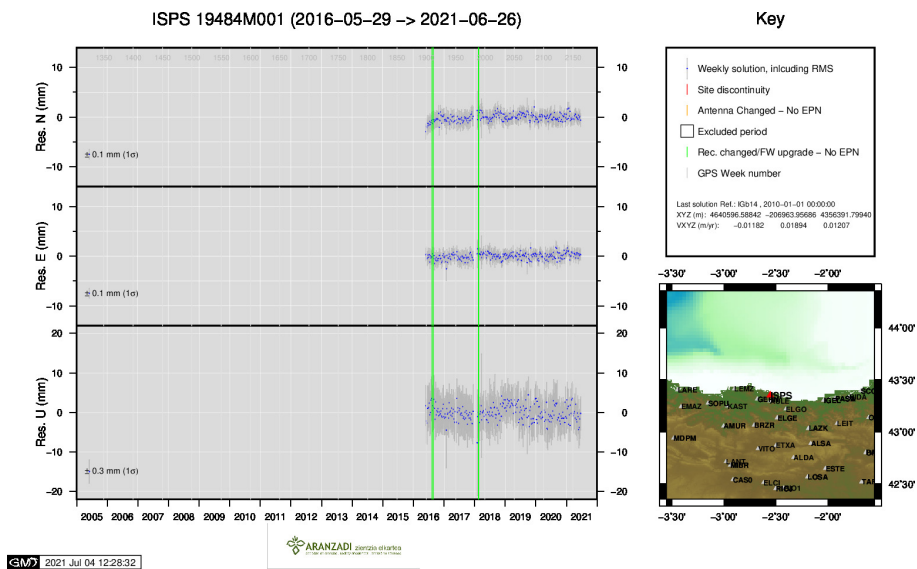
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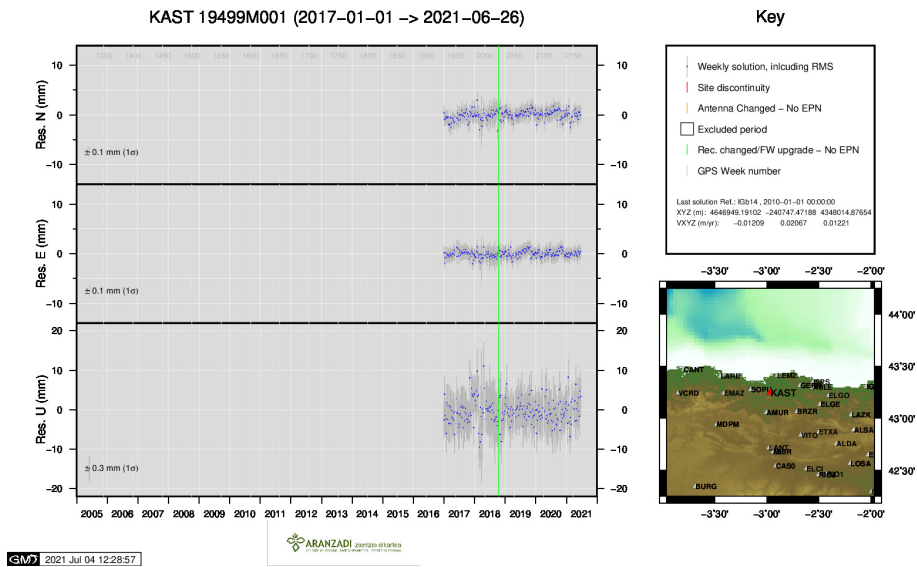
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12 ) IGEL

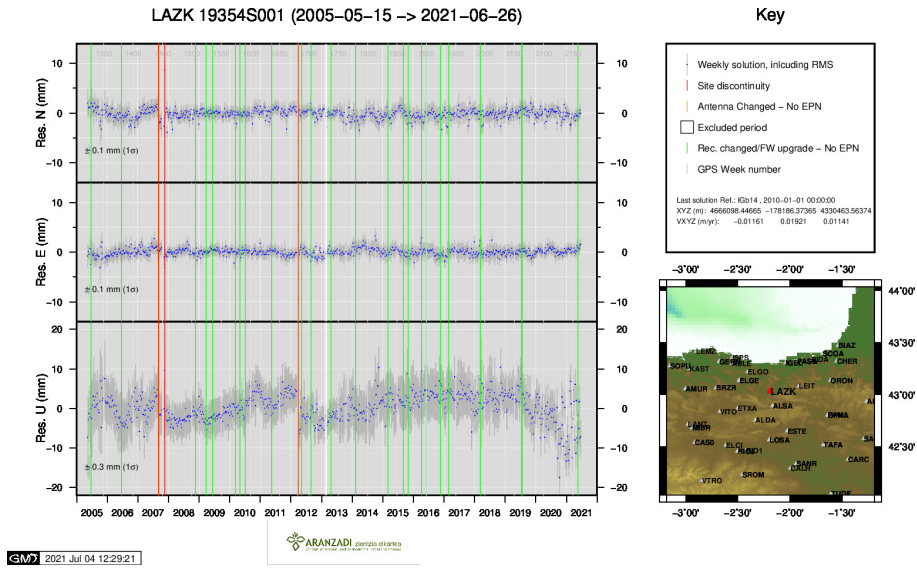


13 ) ISPS

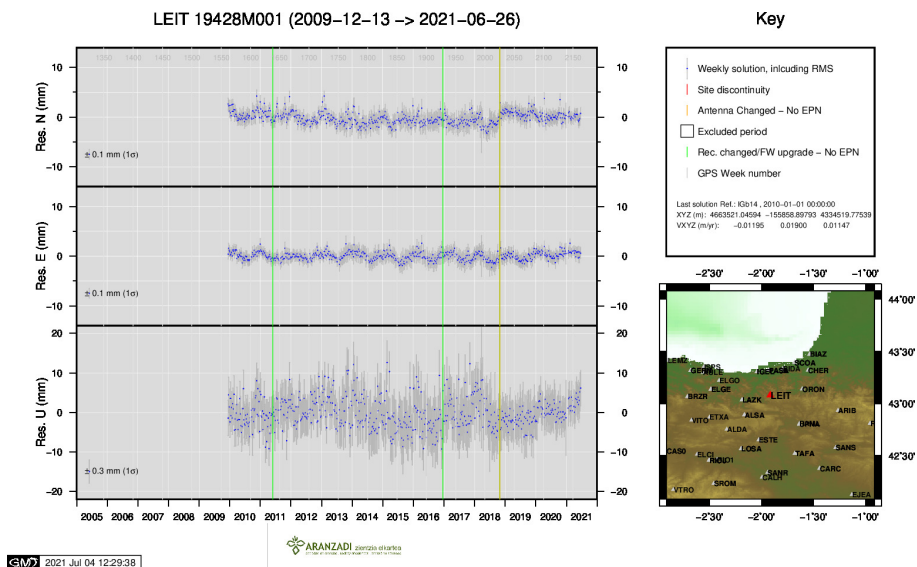


14 ) KAST

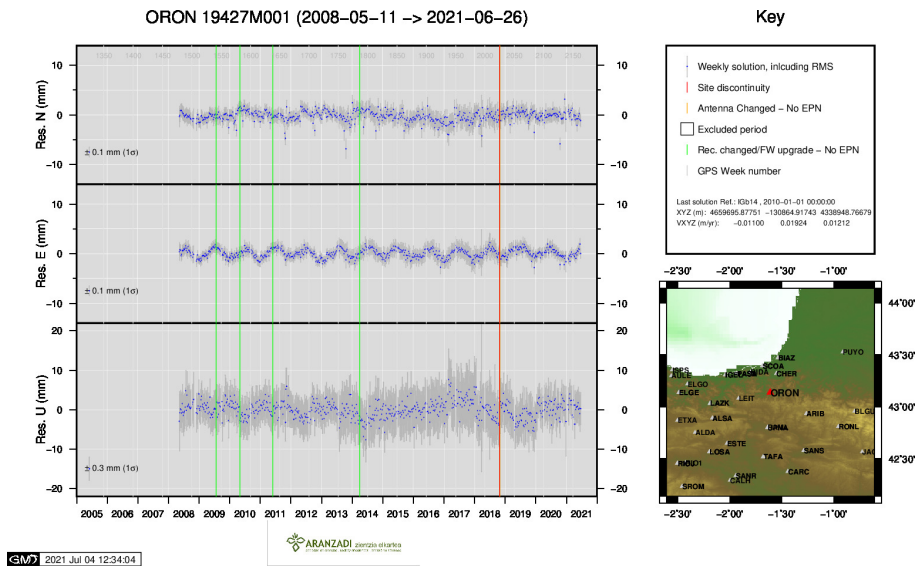




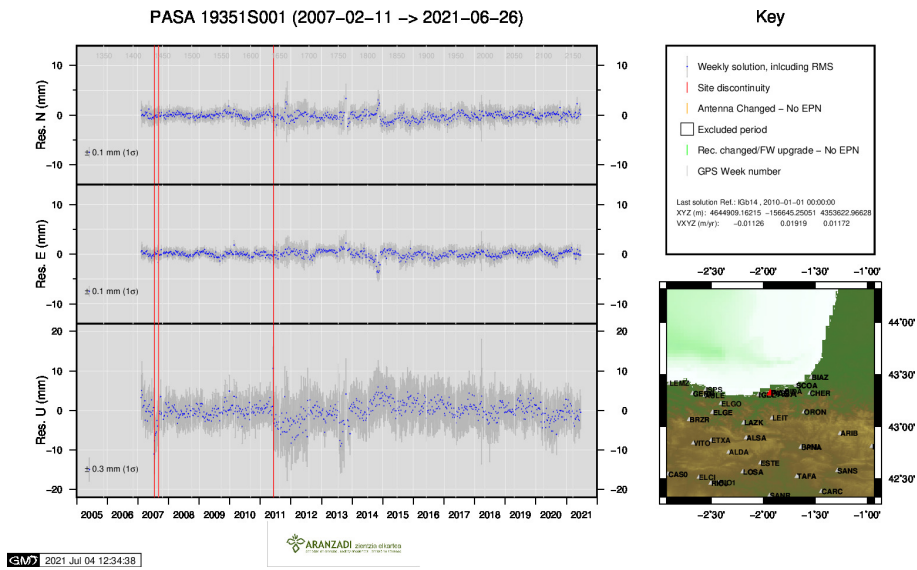
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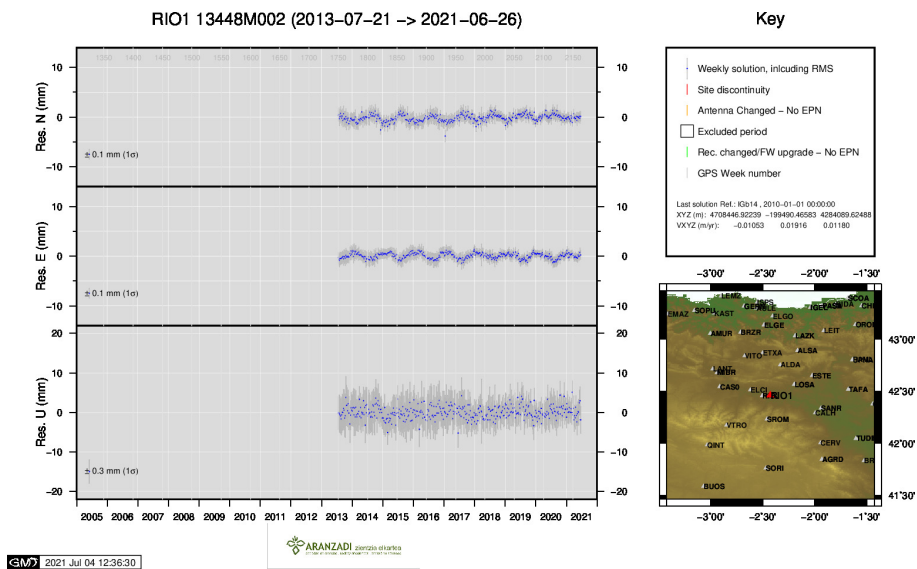
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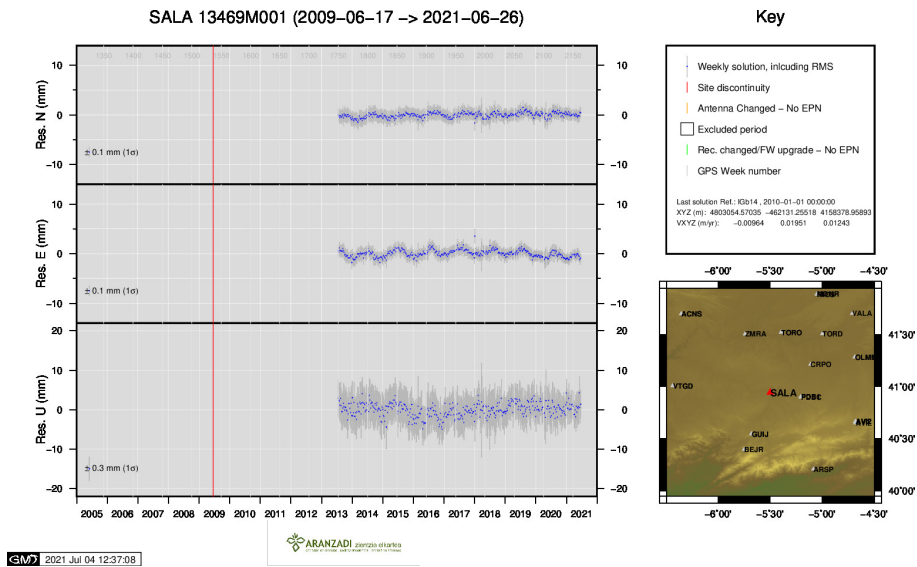
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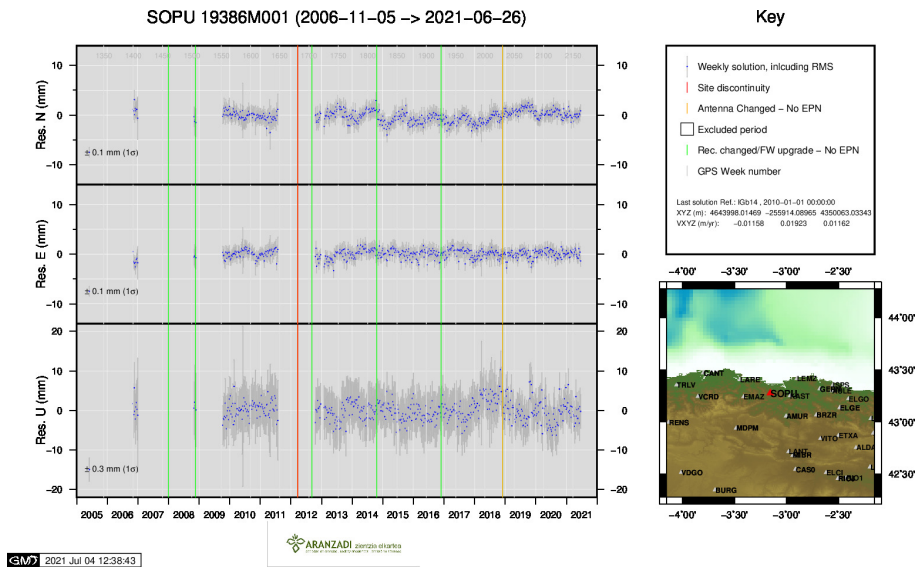
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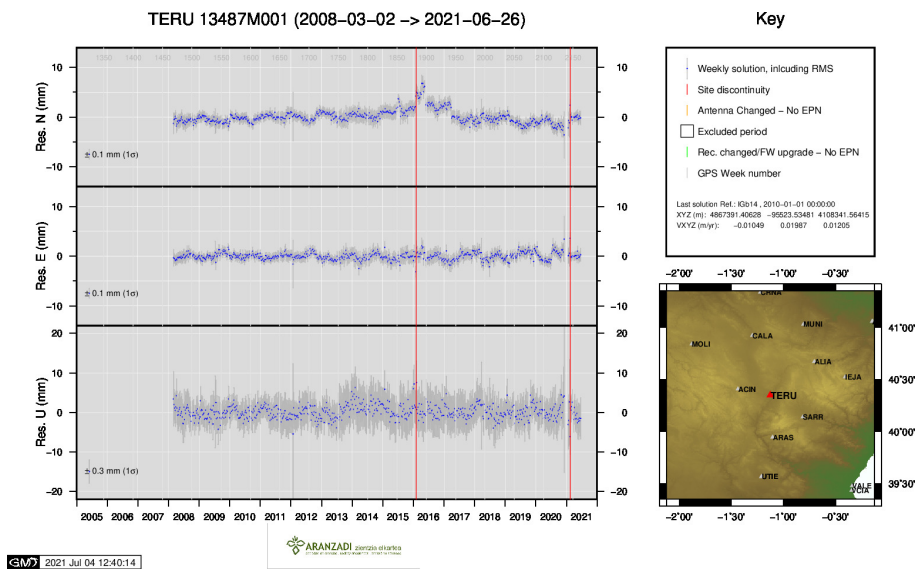
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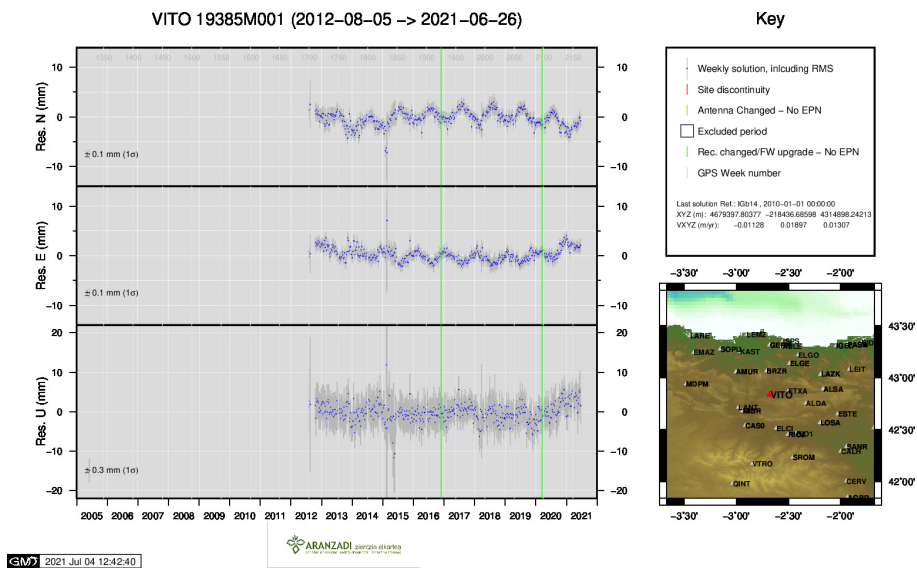
20 ) SALA



21 ) SOPU

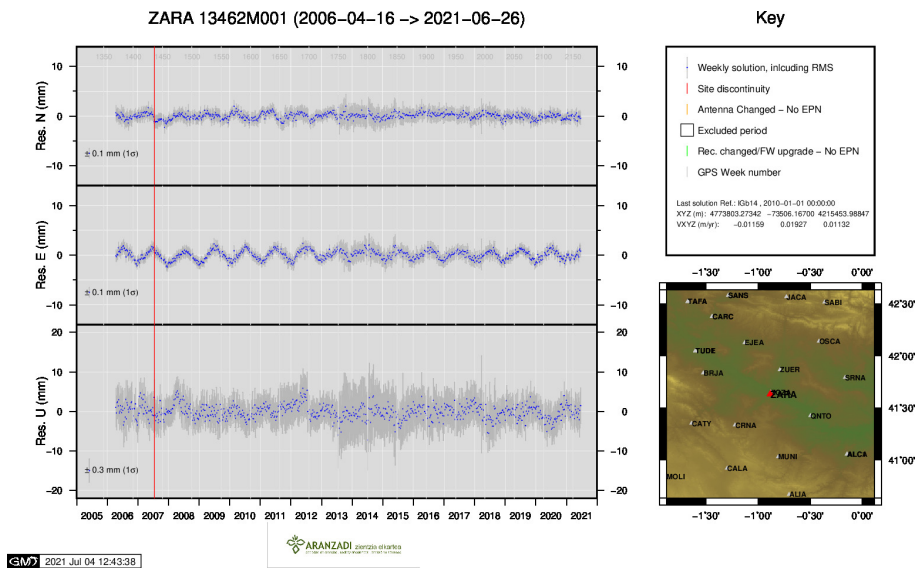


22 ) TERU



23 ) VITO





24 ) ZARA