

# ARA-DAC Weekly Analysis Result: 2167 (GFA)

## Technical Report

**GPS Week: 2167 (GFA)**

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

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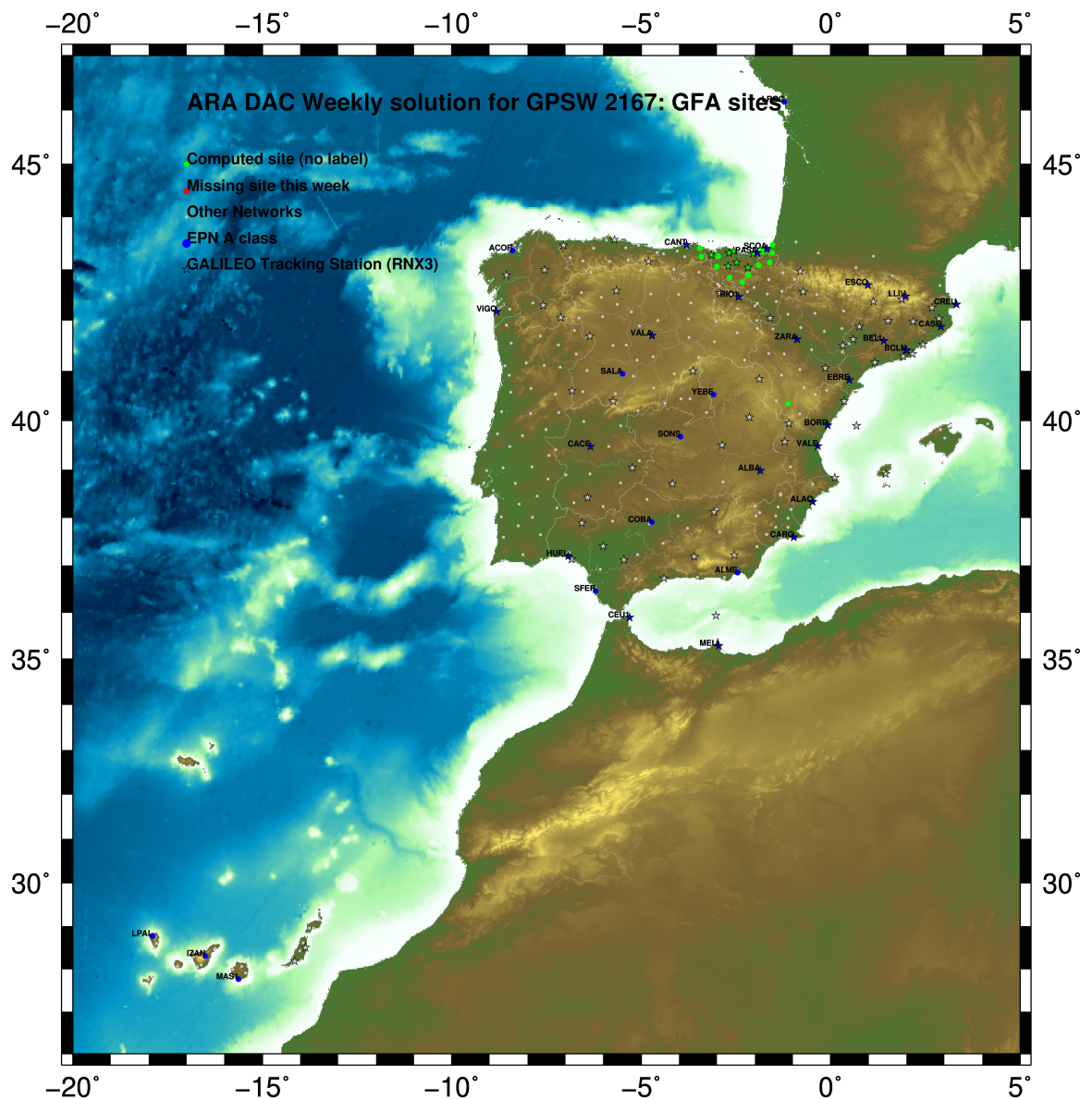
Report generated on 2021/08/08 at 17:16:33



# 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 Aug 08 17:16:24

Fig.1: Computed Sites for GPS Week2167 (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 2167 WEEK FINAL COMBINATION: PRECISE ORBITS 08-AUG-21 13:56

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LOCAL GEODETIC DATUM: IGB14 EPOCH: 2021-07-21 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.53553	-678367.39980	4357066.30695	W
39	ALDA 19383M001	4687280.14088	-190876.52783	4308106.98666	A
50	ALSA 19419M001	4677250.81071	-176770.35339	4319079.90521	A
53	AMUR 19388M001	4661499.42456	-244591.21777	4332269.91141	A
100	BIAZ 10074M002	4634456.02284	-124344.93599	4365785.48213	A
101	BIDA 00000M000	4644177.79537	-145778.28472	4354832.50915	A
113	BRZR 19387M001	4662220.96409	-220769.85922	4333309.46721	A
104	CACE 13447M001	4899866.48128	-544566.99746	4033770.23098	W
116	CANT 13438M001	4625924.28819	-307096.19567	4365771.58182	W
154	CHER 00000M000	4645879.99529	-125721.86963	4353624.11026	A
162	CREU 13432M001	4715420.10024	273178.09927	4271946.86472	W
204	EBRE 13410M001	4833519.96274	41537.43205	4147461.73989	W
180	ELGE 19353S001	4657557.36748	-202241.43066	4338991.91339	A
182	EMAZ 17001M001	4645924.17951	-276949.82626	4347759.60261	A
209	GERN 19389M001	4642811.29075	-217222.88557	4353278.90525	A
257	HOND 15012M002	4640529.28690	-145676.94443	4358761.77933	A
235	IHEL 19352S001	4645951.40634	-165574.46318	4352550.44816	A
240	ISPS 19484M001	4640596.45313	-208963.73698	4356391.93937	A
245	KAST 19499M001	4646949.05421	-240747.23249	4348015.02119	A
252	LARE 19440M001	4632831.93037	-279026.10443	4360314.45713	A
256	LAZK 19354S001	4666098.31539	-178186.15085	4330463.69870	A
261	LEIT 19428M001	4663520.91065	-155858.67888	4334519.91174	A
334	ORDN 19427M001	4659696.75337	-130864.69414	4338948.90980	A
345	PAS2 19351S001	4644909.03112	-156645.02938	4353623.10209	A
493	PASA 19351S001	4644909.03157	-156645.02940	4353623.10281	W
553	RID1 13448M002	4708446.80384	-199490.24534	4284089.76505	W
558	SALA 13469M001	4803054.46268	-462131.03054	4158379.10635	W
566	SCDA 10088M002	4639940.47001	-136224.90140	4359552.44342	W
418	SOPU 19386M001	4643997.88060	-255913.86767	4350063.16869	A
443	TERU 13487M001	4867391.28683	-95523.30504	4108341.70414	A
493	VITO 19385M001	4679397.67867	-218436.46547	4314898.39864	A
752	YEBE 13420M001	4848724.53969	-261631.88755	4123094.35379	W
755	ZARA 13462M001	4773803.14006	-73505.94281	4215454.11982	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 2167 08-AUG-21 13:56

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LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2021-07-21 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.85913	-678367.97876	4357065.86168	W
39	ALDA 19383M001	4687280.52194	-190877.11611	4308106.54028	A
50	ALSA 19419M001	4677251.19435	-176770.94051	4319079.45982	A
53	AMUR 19388M001	4661499.80069	-244591.80332	4332269.46642	A
100	BIAZ 10074M002	4634456.41650	-124345.51818	4365785.04088	A
101	BIDA 00000M000	4644178.18554	-145778.86805	4354832.06684	A
113	BRZR 19387M001	4662221.34328	-220770.44479	4333309.02247	A
104	CACE 13447M001	4899866.79764	-544567.61000	4033769.76271	W
116	CANT 13438M001	4625924.65898	-307096.77741	4365771.13889	W
154	CHER 00000M000	4645880.38788	-125722.45309	4353623.66807	A
162	CREU 13432M001	4715420.53661	273177.50951	4271946.42197	W
204	EBRE 13410M001	4833520.36093	41536.82833	4147461.28463	W
180	ELGE 19353S001	4657557.74941	-202242.01565	4338991.46927	A
182	EMAZ 17001M001	4645924.55274	-276950.41017	4347759.15846	A
209	GERN 19389M001	4642811.67186	-217223.46896	4353278.46212	A
257	HOND 15012M002	4640529.67737	-145676.52736	4358781.33731	A
235	IHEL 19352S001	4645951.79386	-165575.04677	4352550.00545	A
240	ISPS 19484M001	4640596.83576	-206964.32009	4356391.49656	A
245	KAST 19499M001	4646949.43199	-240747.81640	4348014.57743	A
252	LARE 19440M001	4632832.30427	-279026.68687	4360314.01401	A
256	LAZK 19354S001	4666098.69970	-178186.73672	4330463.25420	A
261	LEIT 19428M001	4663521.29805	-155859.26441	4334519.46773	A
334	ORDN 19427M001	4659696.14423	-130865.27916	4338948.46642	A
345	PAS2 19351S001	4644909.41984	-156645.61283	4353622.65958	A
493	PASA 19351S001	4644909.42029	-156645.61285	4353622.66030	W
553	RID1 13448M002	4708447.18204	-199490.83598	4284089.31684	W
558	SALA 13469M001	4803054.79865	-462131.63229	4158378.64704	W
566	SCDA 10088M002	4639940.86172	-136225.48423	4359552.00157	W
418	SOPU 19386M001	4643998.25663	-255914.45129	4350062.72497	A
443	TERU 13487M001	4867391.66497	-95523.91295	4108341.24437	A
493	VITO 19385M001	4679398.05679	-218437.05294	4314897.95254	A
752	YEBE 13420M001	4848724.89815	-261632.49388	4123093.89339	W
755	ZARA 13462M001	4773803.52892	-73506.54032	4215453.66793	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 2167		08-AUG-21 13:56			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2021-07-21 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.81824	-678368.01661	4357065.91280	W
39	ALDA 19383M001	4687280.47873	-190877.15526	4308106.59127	A
50	ALSA 19419M001	4677251.15120	-176770.97975	4319079.51085	A
53	AMUR 19388M001	4661499.75791	-244591.84239	4332269.51746	A
100	BIAZ 10074M002	4634456.37361	-124345.55777	4365785.09206	A
101	BIDA 00000M000	4644178.14262	-145778.90754	4354832.11798	A
113	BRZR 19387M001	4662221.30042	-220770.48394	4333309.07352	A
104	CACE 13447M001	4899866.75316	-544567.64704	4033769.81303	W
116	CANT 13438M001	4625924.61675	-307096.81642	4365771.19002	W
154	CHER 00000M000	4645880.34487	-125722.49264	4353623.71922	A
162	CREU 13432M001	4715420.49146	273177.46891	4271946.47320	W
204	EBRE 13410M001	4833520.31537	41536.78900	4147461.33537	W
180	ELGE 19353S001	4657557.70654	-202242.05489	4338991.52034	A
182	EMAZ 17001M001	4645924.51022	-276950.44920	4347759.20953	A
209	GERN 19389M001	4642811.62919	-217223.50820	4353278.51324	A
257	HOND 15012M002	4640529.63449	-145676.56686	4358781.38847	A
235	IGEL 19352S001	4645951.75099	-165575.08618	4352550.05658	A
240	ISPS 19484M001	4640596.79307	-206964.35938	4356391.54768	A
245	KAST 19499M001	4646949.38935	-240747.85555	4348014.62851	A
252	LARE 19440M001	4632832.26188	-279026.72594	4360314.06512	A
256	LAZK 19354S001	4666098.65666	-178186.77601	4330463.30526	A
261	LEIT 19428M001	4663521.25497	-155859.30378	4334519.51881	A
334	ORON 19427M001	4659696.10110	-130865.31863	4338948.51753	A
345	PAS2 19351S001	4644909.37695	-156645.65227	4353622.71071	A
493	PASA 19351S001	4644909.37740	-156645.65229	4353622.71143	W
553	RI01 13448M002	4708447.13863	-199490.87502	4284089.36777	W
558	SALA 13469M001	4803054.75502	-462131.67003	4158378.69762	W
566	SOA 10088M002	4639940.81882	-136225.52377	4359552.05273	W
418	SOPU 19386M001	4643998.21406	-255914.49040	4350062.77606	A
443	TERU 13487M001	4867391.61953	-95523.95168	4108341.29494	A
493	VITO 19385M001	4679398.01374	-218437.09203	4314898.00354	A
752	YEBE 13420M001	4848724.85344	-261632.53212	4123093.94392	W
755	ZARA 13462M001	4773803.48441	-73506.57951	4215453.71876	W

## 6 Quality Control

### 6.1 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repeatabilities refer to the IGB14 solution and are given with respect to the Local frame (North-East-Up).

ARA LAC 2167 WEEK FINAL COMBINATION: PRECISE ORBITS 08-AUG-21 13:56

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.85	0.62	2.88
ALDA 19383M001	7	XXXXXX	2.78	1.80	5.53
ALSA 19419M001	7	XXXXXX	2.13	1.02	2.73
AMUR 19388M001	7	XXXXXX	1.34	1.27	4.65
BIAZ 10074M002	7	XXXXXX	0.93	1.24	2.47
BIDA 00000M000	7	XXXXXX	1.22	1.32	4.10
BRZR 19387M001	7	XXXXXX	0.60	0.87	3.03
CACE 13447M001	7	XXXXXX	0.86	0.70	3.97
CANT 13438M001	7	XXXXXX	0.68	0.61	3.06
CHER 00000M000	7	XXXXXX	0.75	2.88	3.46
CREU 13432M001	7	XXXXXX	1.86	0.63	3.46
EBRE 13410M001	7	XXXXXX	0.69	0.79	4.09
ELGE 19353S001	7	XXXXXX	1.04	0.76	2.58
EMAZ 17001M001	7	XXXXXX	1.06	0.50	3.32
GERN 19389M001	7	XXXXXX	0.98	0.83	3.79
HOND 15012M002	4	XXXX	0.65	0.91	3.77
IGEL 19352S001	7	XXXXXX	1.80	0.84	5.90
ISPS 19484M001	7	XXXXXX	1.03	2.10	2.01
KAST 19499M001	7	XXXXXX	0.86	1.65	5.71
LARE 19440M001	7	XXXXXX	0.96	0.90	4.39
LAZK 19354S001	6	XXXX X	0.86	1.05	2.79
LEIT 19428M001	7	XXXXXX	2.09	1.01	4.68
ORON 19427M001	7	XXXXXX	1.25	0.91	2.99
PAS2 19351S001	7	XXXXXX	1.25	1.09	4.38
PASA 19351S001	6	XXXI XX	1.17	0.61	3.71
RI01 13448M002	7	XXXXXX	0.71	0.64	6.52
SALA 13469M001	3	XX X	0.62	0.87	1.35
SCDA 10088M002	7	XXXXXX	1.33	1.79	5.31
SOPU 19386M001	7	XXXXXX	1.31	0.57	5.48
TERU 13487M001	7	XXXXXX	1.26	0.74	4.42
VITO 19385M001	7	XXXXXX	1.66	1.76	3.11
YEBE 13420M001	7	XXXXXX	0.72	0.64	3.10
ZARA 13462M001	7	XXXXXX	0.69	1.13	2.09

Comparison of individual solutions:

ACOR 13434M001	N	0.85	0.62	1.70	0.53	0.12	0.52	-0.08	0.69
ACOR 13434M001	E	0.62	-0.59	0.38	0.80	-0.03	0.41	-0.24	-0.95
ACOR 13434M001	U	2.88	4.75	-2.76	1.95	0.21	3.09	0.29	-2.47
ALDA 19383M001	N	2.78	5.05	2.26	-1.13	-1.09	-3.24	-1.63	0.32
ALDA 19383M001	E	1.80	-3.29	0.34	1.06	2.07	1.05	1.13	-0.83
ALDA 19383M001	U	5.53	-10.46	0.51	-0.71	7.67	2.16	1.50	-2.74
ALSA 19419M001	N	2.13	1.90	1.45	1.52	-0.17	-4.06	-0.50	1.53
ALSA 19419M001	E	1.02	2.27	-0.49	-0.15	-0.04	0.08	0.74	-0.47
ALSA 19419M001	U	2.73	3.92	0.58	-2.53	0.03	1.24	-1.52	-4.32
AMUR 19388M001	N	1.34	-0.16	0.28	-1.69	-0.22	-1.00	2.39	1.03
AMUR 19388M001	E	1.27	1.17	-1.63	-1.25	1.14	1.07	1.28	-0.06
AMUR 19388M001	U	4.65	-1.21	-8.66	-4.92	2.91	2.50	-2.25	3.05
BIAZ 10074M002	N	0.93	-0.58	-0.14	-0.21	-1.65	-0.60	1.26	0.32
BIAZ 10074M002	E	1.24	-0.39	-1.43	1.40	-0.68	1.49	1.25	0.89
BIAZ 10074M002	U	2.47	-1.76	-0.94	0.20	0.61	5.29	1.79	0.96
BIDA 00000M000	N	1.22	1.35	-0.64	-2.21	-0.56	0.00	1.03	-0.66
BIDA 00000M000	E	1.32	0.91	-0.74	-0.73	-0.93	0.89	2.16	1.51
BIDA 00000M000	U	4.10	0.62	-4.64	-5.98	4.71	2.83	1.51	-3.26
BRZR 19387M001	N	0.60	-0.69	-0.01	-0.16	0.78	-0.22	0.46	0.87
BRZR 19387M001	E	0.87	1.65	-0.48	-0.01	0.55	0.52	0.61	0.79
BRZR 19387M001	U	3.03	0.76	-2.41	-1.16	3.42	3.79	-1.52	4.34
CACE 13447M001	N	0.86	0.04	-0.21	1.09	1.25	-1.03	-0.77	-0.11
CACE 13447M001	E	0.70	0.46	-0.33	-0.15	0.78	0.28	-0.93	-1.01
CACE 13447M001	U	3.97	-2.06	-1.96	-0.69	-0.15	0.46	-5.21	7.66
CANT 13438M001	N	0.68	-0.39	0.40	1.12	0.83	0.12	0.16	0.70
CANT 13438M001	E	0.61	-0.18	-0.48	-0.41	0.43	1.20	0.10	0.37
CANT 13438M001	U	3.06	-1.68	-4.55	2.79	-1.69	-2.68	2.25	3.15
CHER 00000M000	N	0.75	-0.03	-0.19	-1.70	-0.61	-0.22	0.03	-0.05
CHER 00000M000	E	2.88	-0.02	-0.18	6.52	-0.42	0.28	1.94	1.82
CHER 00000M000	U	3.46	0.11	-2.78	-5.44	3.39	1.92	1.78	-4.03
CREU 13432M001	N	1.86	-3.06	2.13	0.23	-0.44	1.19	-2.00	-1.09
CREU 13432M001	E	0.63	0.86	0.43	0.66	0.30	0.20	-0.80	0.46
CREU 13432M001	U	3.46	0.55	-0.47	0.44	1.88	6.88	-4.41	0.88
EBRE 13410M001	N	0.69	0.40	-0.69	-0.72	0.37	-1.12	0.02	-0.59
EBRE 13410M001	E	0.79	0.76	-0.70	1.02	0.70	-0.28	-0.73	0.70
EBRE 13410M001	U	4.09	3.33	8.06	-3.78	1.43	0.16	0.04	-2.84
ELGE 19353S001	N	1.04	-0.05	1.85	-1.05	0.03	-1.07	0.70	0.55
ELGE 19353S001	E	0.76	-0.15	0.29	0.07	0.58	1.12	1.04	0.86
ELGE 19353S001	U	2.58	-2.97	-0.17	1.66	2.31	3.00	0.05	3.72
EMAZ 17001M001	N	1.06	1.31	0.52	1.39	1.07	-1.25	-0.35	0.10
EMAZ 17001M001	E	0.50	0.70	-0.45	0.08	0.00	0.87	0.15	-0.14
EMAZ 17001M001	U	3.32	-0.02	-7.44	-0.38	1.38	1.61	2.26	1.00
GERN 19389M001	N	0.98	-1.57	-0.23	0.37	0.14	0.31	1.67	0.52
GERN 19389M001	E	0.83	0.17	1.73	0.03	0.22	0.48	0.93	0.15
GERN 19389M001	U	3.79	-3.33	-1.74	1.49	2.70	2.76	-1.60	7.24
HOND 15012M002	N	0.65				-0.56	0.14	0.86	-0.45
HOND 15012M002	E	0.91				0.55	0.94	-0.83	0.77
HOND 15012M002	U	3.77				1.60	4.40	2.36	-3.88
IGEL 19352S001	N	1.80	-0.81	-1.18	-1.36	-1.87	2.28	2.42	-1.00
IGEL 19352S001	E	0.84	0.24	0.20	-0.86	0.12	1.71	0.62	-0.21
IGEL 19352S001	U	5.90	-3.62	-5.01	-3.70	1.96	10.22	2.93	-6.35
ISPS 19484M001	N	1.03	-1.84	-0.31	0.61	-0.15	1.22	0.95	0.34
ISPS 19484M001	E	2.10	-1.65	1.03	-0.76	0.03	-0.52	1.01	4.57
ISPS 19484M001	U	2.01	1.01	1.10	-0.70	1.85	-0.62	1.31	4.01
KAST 19499M001	N	0.86	-0.66	1.41	-0.05	0.32	1.25	-0.50	0.24
KAST 19499M001	E	1.65	-1.03	-1.94	0.07	1.88	2.19	1.52	-0.92
KAST 19499M001	U	5.71	-3.02	-8.59	-3.85	-0.83	9.35	0.05	3.19
LARE 19440M001	N	0.96	0.55	1.56	0.76	-0.35	-0.95	0.18	1.09

LARE 19440M001	E	0.90	0.62	-0.21	-0.98	-0.46	0.51	1.73	-0.01
LARE 19440M001	U	4.39	-3.45	-7.75	2.61	1.09	-2.11	4.36	3.45
LAZK 19354S001	N	0.86	1.01	-0.46	1.22	-0.41	-0.55		0.71
LAZK 19354S001	E	1.05	1.43	1.42	0.17	-1.01	0.11		-0.62
LAZK 19354S001	U	2.79	1.33	1.48	-4.49	2.21	-2.58		-1.81
LEIT 19428M001	N	2.09	4.20	-0.02	-1.74	-1.92	-1.18	0.52	-0.46
LEIT 19428M001	E	1.01	0.62	-0.29	-0.30	-0.20	1.33	1.72	-0.87
LEIT 19428M001	U	4.68	-8.56	-4.38	3.85	3.81	2.21	-1.40	1.60
ORDN 19427M001	N	1.25	2.11	0.46	0.42	-0.81	0.59	-1.86	0.33
ORDN 19427M001	E	0.91	0.72	-0.52	-0.00	0.29	1.77	0.56	-0.78
ORDN 19427M001	U	2.99	-5.80	-1.35	-1.48	3.29	0.48	2.22	0.14
PAS2 19351S001	N	1.25	0.07	-1.19	0.45	-1.77	-0.51	2.08	-0.22
PAS2 19351S001	E	1.09	0.15	0.09	-1.11	0.40	2.17	-0.83	0.48
PAS2 19351S001	U	4.38	-1.06	-4.99	-2.95	4.92	4.60	0.96	-5.86
PASA 19351S001	N	1.17	-0.11	-0.77	-0.26	-1.77		1.64	-0.63
PASA 19351S001	E	0.61	0.66	0.39	-0.48	0.08		-0.64	0.79
PASA 19351S001	U	3.71	-1.94	-5.92	-0.27	3.53		0.72	-4.14
RID1 13448M002	N	0.71	0.02	-0.77	-0.07	0.70	-0.16	1.36	0.12
RID1 13448M002	E	0.64	0.12	-0.12	1.08	0.13	0.02	-0.61	0.95
RID1 13448M002	U	6.52	-0.04	11.57	-2.39	-4.71	1.67	1.90	-9.32
SALA 13469M001	N	0.62	0.05	0.78				0.40	
SALA 13469M001	E	0.87	-0.30	1.15				-0.32	
SALA 13469M001	U	1.35	1.73	-0.79				0.24	
SCDA 10088M002	N	1.33	0.77	-0.55	-1.15	1.64	0.89	-1.13	-1.92
SCDA 10088M002	E	1.79	2.92	0.96	1.59	-0.58	-1.54	-0.90	1.95
SCDA 10088M002	U	5.31	1.70	-1.70	-9.45	0.12	5.09	4.34	-5.44
SOPU 19386M001	N	1.31	-0.49	1.41	-0.35	-0.75	-0.82	2.50	0.74
SOPU 19386M001	E	0.57	-0.27	-0.14	1.05	0.29	-0.22	0.44	0.65
SOPU 19386M001	U	5.48	-4.99	-8.58	-0.06	1.79	6.23	-3.66	5.17
TERU 13487M001	N	1.26	0.23	0.23	0.06	1.08	1.12	-0.01	-2.65
TERU 13487M001	E	0.74	0.16	-0.79	0.82	-1.09	0.40	0.75	-0.04
TERU 13487M001	U	4.42	-2.34	-3.57	-4.44	3.25	-5.27	6.31	0.93
VITO 19385M001	N	1.66	3.48	-1.81	-0.13	-0.75	-0.62	0.50	-0.03
VITO 19385M001	E	1.76	3.87	-0.62	-1.66	0.19	-0.64	-0.05	0.28
VITO 19385M001	U	3.11	-1.49	-2.15	-5.22	1.67	-1.32	4.21	1.33
YEBE 13420M001	N	0.72	0.23	-0.57	0.99	0.15	-0.26	-1.09	0.71
YEBE 13420M001	E	0.64	-0.23	-1.34	0.18	0.72	0.12	-0.21	0.11
YEBE 13420M001	U	3.10	-3.92	1.12	4.41	-2.64	-1.37	-0.43	3.57
ZARA 13462M001	N	0.69	1.25	-0.02	-0.47	0.18	0.02	0.61	-0.79
ZARA 13462M001	E	1.13	1.27	0.74	1.53	-0.28	0.23	0.50	-1.68
ZARA 13462M001	U	2.09	-2.79	-2.29	2.21	1.39	1.72	-1.61	0.81



## 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	-0.84	0.93	0.46
12	ALAC 13433M001	I W	-0.34	-1.55	3.07
15	ALBA 13452M001	I W	1.09	-2.21	-6.42
21	ALME 13437M001	I W	-0.28	1.98	1.89
47	BCLN 13412M001	I W	-0.44	-2.13	2.23
52	BELL 13431M001	I W	0.61	-1.97	1.81
71	BORR 13480M001	I W	0.06	-1.60	-2.24
76	BRST 10004M004	I W	-2.44	0.55	1.77
104	CACE 13447M001	I W	0.62	1.68	2.68
116	CANT 13438M001	I W	-1.47	1.42	-2.39
117	CARG 19412M001	I W	0.19	-0.07	-1.99
122	CASE 13494M001	I W	-1.43	0.15	2.31
128	CEU1 13449M002	I W	-0.07	0.26	-1.46
143	COBA 13453M001	I W	1.04	1.60	-2.85
162	CREU 13432M001	I W	0.09	1.11	2.37
204	EBRE 13410M001	I W	0.43	-0.31	0.63
222	ESCO 13435M001	I W	-0.20	2.02	-2.33
299	HUEL 13451M001	I W	2.54	-3.40	-1.77
316	IZAN 13109M002	I W	0.66	0.33	1.47
385	LLIV 13436M001	I W	-0.37	1.33	0.19
390	LPAL 81701M001	I W	-1.93	0.33	-1.42
392	LROC 10023M001	I W	0.99	0.75	-0.94
421	MAS1 13103M002	I W	1.58	1.01	0.66
432	MELI 19379M001	I W	3.07	0.64	-1.59
493	PASA 19351S001	I W	-0.52	0.15	-1.60
553	RID1 13448M002	I W	-1.67	0.80	-5.37
558	SALA 13469M001	I W	0.88	0.64	-6.12
566	SCOA 10088M002	I W	-4.50	-1.15	-4.51
574	SFER 13402M004	I W	1.80	1.62	-1.30
599	SONS 13446M001	I W	-1.52	1.80	2.28
700	VALA 13463M002	I W	0.90	-0.35	-0.34
704	VALE 13439M001	I W	0.49	-2.18	-0.47
715	VIGO 13450M001	I W	2.22	-1.96	4.46
752	YEBE 13420M001	I W	-1.34	-1.95	7.21
755	ZARA 13462M001	I W	-0.12	-1.13	2.23
764	ZIMM 14001M004	I W	0.23	0.86	7.37
	RMS / COMPONENT		1.47	1.46	3.18
	MEAN		0.00	0.00	-0.00
	MIN		-4.50	-3.40	-6.42
	MAX		3.07	2.02	7.37

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 108  
RMS OF TRANSFORMATION : 2.19 MM

BARYCENTER COORDINATES:

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

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.37 MM  
TRANSLATION IN E : 0.01 +- 0.37 MM  
TRANSLATION IN U : -0.00 +- 0.37 MM

### 6.3 Adjustment Statistics

In this section, the summary of the global adjustment and not subnetworks are shown. Also, the Helmert parameters of the combined solution with respect to the daily solutions are shown.

```
* STATISTICAL PARAMETER-----VALUE(S)-----
NUMBER OF OBSERVATIONS          18829708
NUMBER OF UNKNOWN               230667
NUMBER OF DEGREES OF FREEDOM    18598841
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.161175474867285

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")
      X          Y          Z          X          Y          Z      Scale (ppm)
-----
  1  0.00225     0.0007 -0.0036  0.0003  0.0001  0.0000 -0.0001 -0.00010
  2  0.00240     0.0014  0.0055  0.0002 -0.0000  0.0000  0.0002 -0.00009
  3  0.00210     0.0066  0.0163 -0.0118 -0.0002  0.0004  0.0005  0.00036
  4  0.00224     0.0065 -0.0131 -0.0106  0.0003  0.0004 -0.0003  0.00009
  5  0.00215     0.0217  0.0030 -0.0231  0.0001  0.0010  0.0002 -0.00017
  6  0.00204     0.0107 -0.0009 -0.0140  0.0001  0.0006  0.0001  0.00025
  7  0.00251    -0.0089  0.0194  0.0116 -0.0004 -0.0005  0.0005  0.00003
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00146     2518958      2.12          2550390      3          909      30526      0
  2  0.00145     2616958      2.10          2649664      3          975      31734      0
  3  0.00150     2682981      2.26          2718343      3          975      34390      0
  4  0.00147     2572395      2.17          2603756      3          915      30449      0
  5  0.00145     2694876      2.10          2730653      3          981      34799      0
  6  0.00148     2753990      2.18          2788710      3          993      33730      0
  7  0.00146     2752974      2.13          2788192      3          993      34228      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 21:199:00000 21:205:86370 LEICA GR50      -----
ALDA  A  1 P 21:199:00000 21:205:86370 LEICA GR10      -----
ALSA  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
AMUR  A  1 P 21:199:00000 21:205:86370 LEICA GR10      -----
BIAZ  A  1 P 21:199:00000 21:205:86370 SPECTRA SP90M   -----
BIDA  A  1 P 21:199:00000 21:205:86370 LEICA GR10      -----
BRZR  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
CACE  A  1 P 21:199:00000 21:205:86370 TRIMBLE NETR9   -----
CANT  A  1 P 21:199:00000 21:205:86370 LEICA GR10      -----
CHER  A  1 P 21:199:00000 21:205:52590 LEICA GR30      -----
CREU  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
EBRE  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
ELGE  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
EMAZ  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
GERN  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
HOND  A  1 P 21:202:00000 21:205:86370 LEICA GR50      -----
IGEL  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
ISPS  A  1 P 21:199:00000 21:205:86370 TRIMBLE NETR9   -----
KAST  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
LARE  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
LAZK  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
LEIT  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
ORON  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
PAS2  A  1 P 21:199:00030 21:205:86370 STONEX SC2200   -----
PASA  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
RIO1  A  1 P 21:199:00000 21:205:86370 LEICA GR25      -----
SALA  A  1 P 21:199:00000 21:203:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 21:199:00000 21:205:86370 LEICA GR25      -----
SOPU  A  1 P 21:199:00000 21:205:86370 LEICA GR30      -----
TERU  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
VITO  A  1 P 21:199:00000 21:205:86370 LEICA GR10      -----
YEBE  A  1 P 21:199:00000 21:205:86370 LEICA GR50      -----
ZARA  A  1 P 21:199:00000 21:205:86370 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 21:199:00000 21:205:86370 LEIAT504      LEIS -----
ALDA  A  1 P 21:199:00000 21:205:86370 LEIAS10      NONE -----
ALSA  A  1 P 21:199:00000 21:205:86370 LEIAR10      NONE -----
```

AMUR	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
BIAZ	A	1	P	21:199:00000	21:205:86370	LEIAR25	LEIT	----
BIDA	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
BRZR	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
CACE	A	1	P	21:199:00000	21:205:86370	TRM29659.00	NONE	----
CANT	A	1	P	21:199:00000	21:205:86370	LEIAR25.R4	LEIT	25066
CHEA	A	1	P	21:199:00000	21:205:52590	LEIAR10	NONE	----
CREU	A	1	P	21:199:00000	21:205:86370	LEIAR25.R4	NONE	26357
EBRE	A	1	P	21:199:00000	21:205:86370	LEIAR25.R4	NONE	26359
ELGE	A	1	P	21:199:00000	21:205:86370	LEIAR25.R4	LEIT	----
EMAZ	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
GERN	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
HOND	A	1	P	21:202:00000	21:205:86370	LEIAR20	LEIM	41012
IGEL	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
ISPS	A	1	P	21:199:00000	21:205:86370	TRM59900.00	SCIS	----
KAST	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
LARE	A	1	P	21:199:00000	21:205:86370	LEIAR20	LEIM	----
LAZK	A	1	P	21:199:00000	21:205:86370	LEIAR25.R4	LEIT	----
LEIT	A	1	P	21:199:00000	21:205:86370	LEIAR10	NONE	----
ORDN	A	1	P	21:199:00000	21:205:86370	LEIAR10	NONE	----
PAS2	A	1	P	21:199:00030	21:205:86370	LEIAR20	LEIM	73034
PASA	A	1	P	21:199:00000	21:205:86370	LEIAR20	LEIM	73034
RI01	A	1	P	21:199:00000	21:205:86370	LEIAR25.R4	LEIT	25138
SALA	A	1	P	21:199:00000	21:203:86370	LEIAR25	NONE	----
SCDA	A	1	P	21:199:00000	21:205:86370	TRM55971.00	NONE	----
SOPU	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
TERU	A	1	P	21:199:00000	21:205:86370	LEIAR20	LEIM	49044
VITO	A	1	P	21:199:00000	21:205:86370	LEIAS10	NONE	----
YEBE	A	1	P	21:199:00000	21:205:86370	LEIAR20	LEIM	49016
ZARA	A	1	P	21:199:00000	21:205:86370	TRM29659.00	NONE	----

### 7.3 Eccentricities

*S	PT	SOLN	T	DATA_START_	DATA_END_	AXE	ARP->BENCHMARK(M)	UP_	NORTH_	EAST_
ACOR	A	1	P	21:199:00000	21:205:86370	UNE	3.0460	0.0000	0.0000	0.0000
ALDA	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
ALSA	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
AMUR	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
BIAZ	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
BIDA	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
BRZR	A	1	P	21:199:00000	21:205:86370	UNE	0.0771	0.0000	0.0000	0.0000
CACE	A	1	P	21:199:00000	21:205:86370	UNE	0.0600	0.0000	0.0000	0.0000
CANT	A	1	P	21:199:00000	21:205:86370	UNE	3.0490	0.0000	0.0000	0.0000
CHEA	A	1	P	21:199:00000	21:205:52590	UNE	0.0000	0.0000	0.0000	0.0000
CREU	A	1	P	21:199:00000	21:205:86370	UNE	0.0770	0.0000	0.0000	0.0000
EBRE	A	1	P	21:199:00000	21:205:86370	UNE	0.0770	0.0000	0.0000	0.0000
ELGE	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
EMAZ	A	1	P	21:199:00000	21:205:86370	UNE	0.0350	0.0000	0.0000	0.0000
GERN	A	1	P	21:199:00000	21:205:86370	UNE	0.0771	0.0000	0.0000	0.0000
HOND	A	1	P	21:202:00000	21:205:86370	UNE	0.0771	0.0000	0.0000	0.0000
IGEL	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
ISPS	A	1	P	21:199:00000	21:205:86370	UNE	0.0350	0.0000	0.0000	0.0000
KAST	A	1	P	21:199:00000	21:205:86370	UNE	0.0350	0.0000	0.0000	0.0000
LARE	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
LAZK	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
LEIT	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
ORDN	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
PAS2	A	1	P	21:199:00030	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
PASA	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
RI01	A	1	P	21:199:00000	21:205:86370	UNE	0.0606	0.0000	0.0000	0.0000
SALA	A	1	P	21:199:00000	21:203:86370	UNE	0.0600	0.0000	0.0000	0.0000
SCDA	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
SOPU	A	1	P	21:199:00000	21:205:86370	UNE	0.0771	0.0000	0.0000	0.0000
TERU	A	1	P	21:199:00000	21:205:86370	UNE	0.0600	0.0000	0.0000	0.0000
VITO	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
YEBE	A	1	P	21:199:00000	21:205:86370	UNE	0.0000	0.0000	0.0000	0.0000
ZARA	A	1	P	21:199:00000	21:205:86370	UNE	3.2590	0.0000	0.0000	0.0000

## 8 References

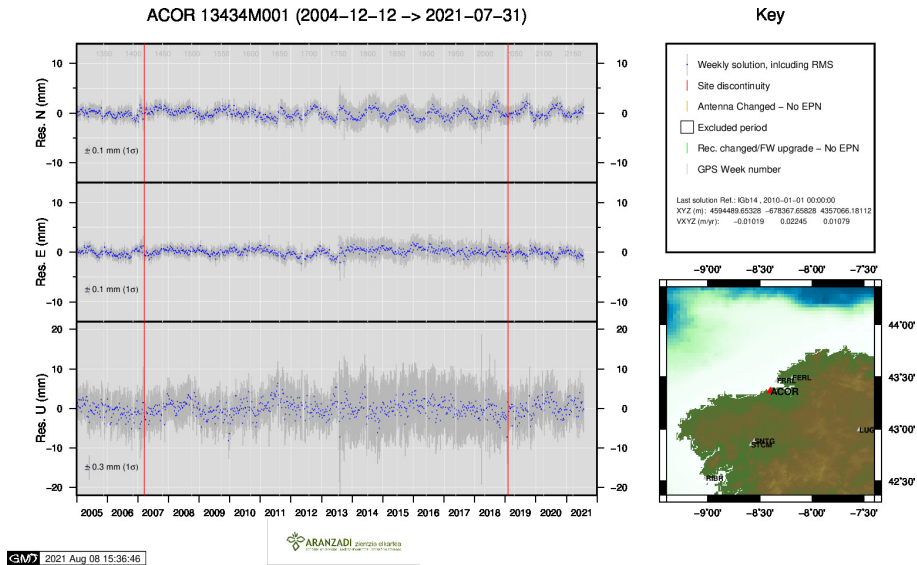
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](http://etrs89.ensg.ign.fr/memo-V8.pdf)

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)

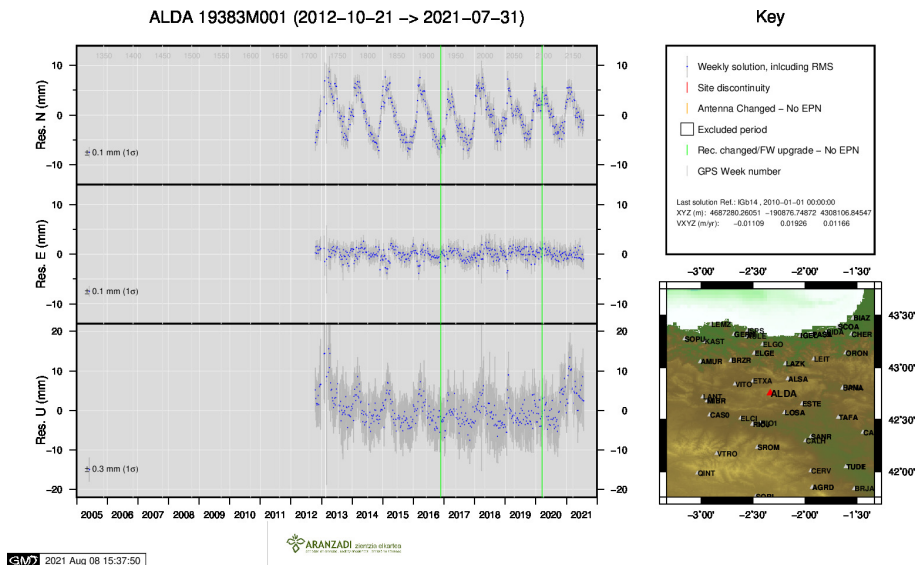
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

## 9 Cumulative Time Series

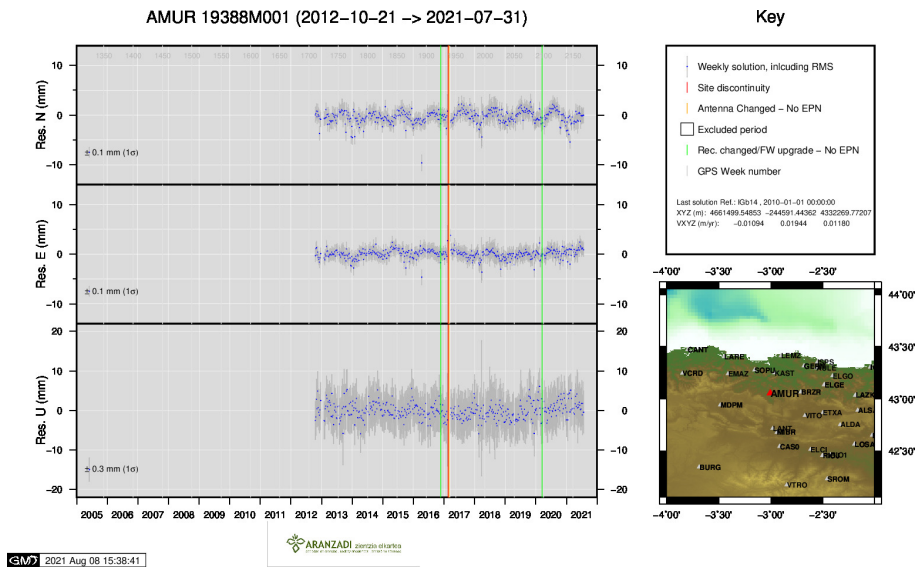
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



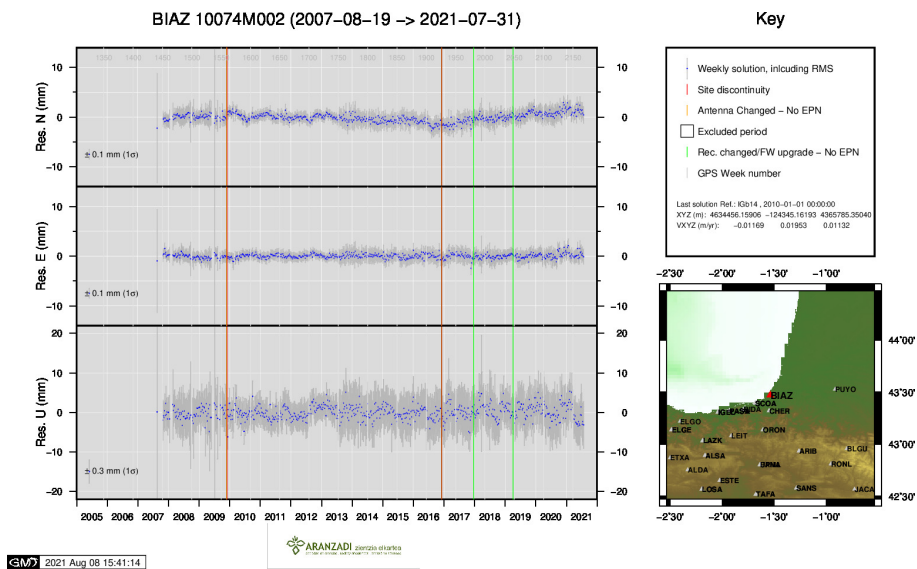
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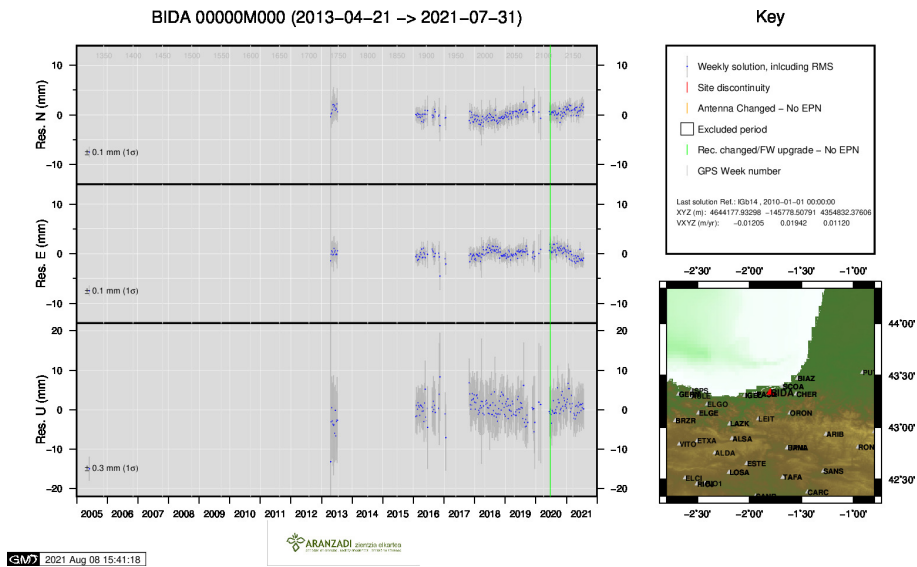
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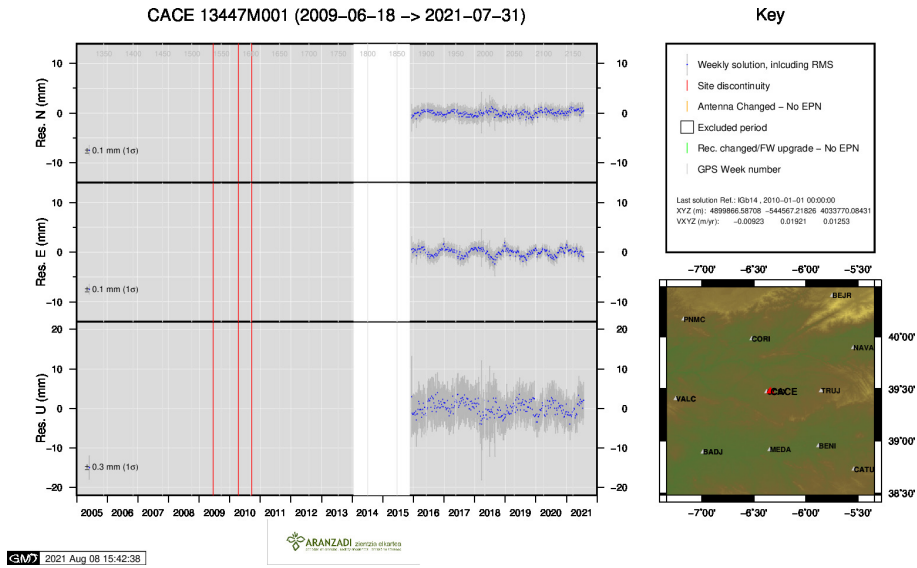
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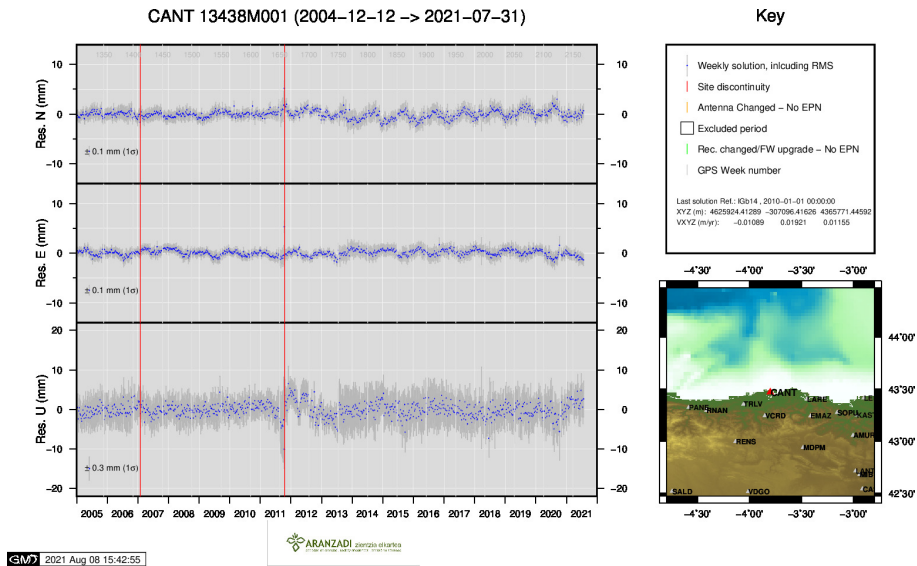
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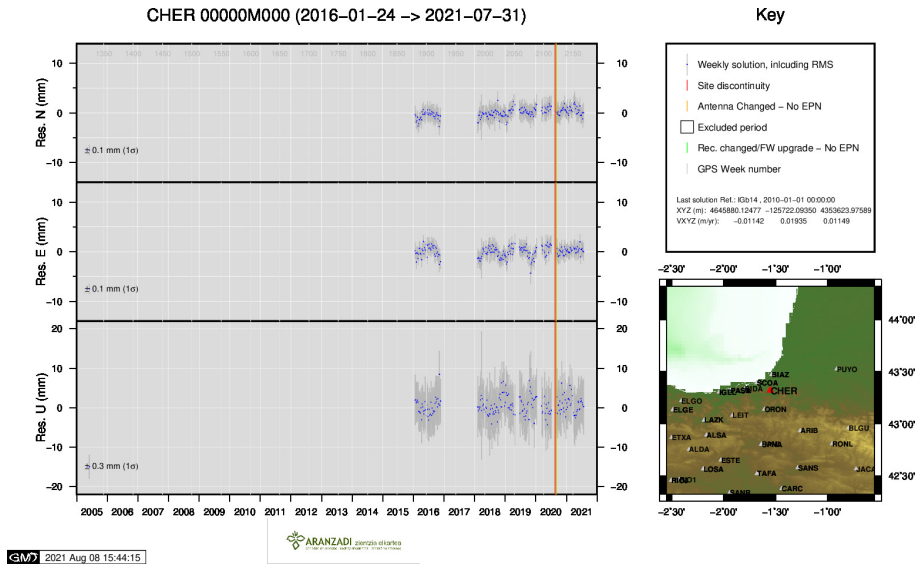
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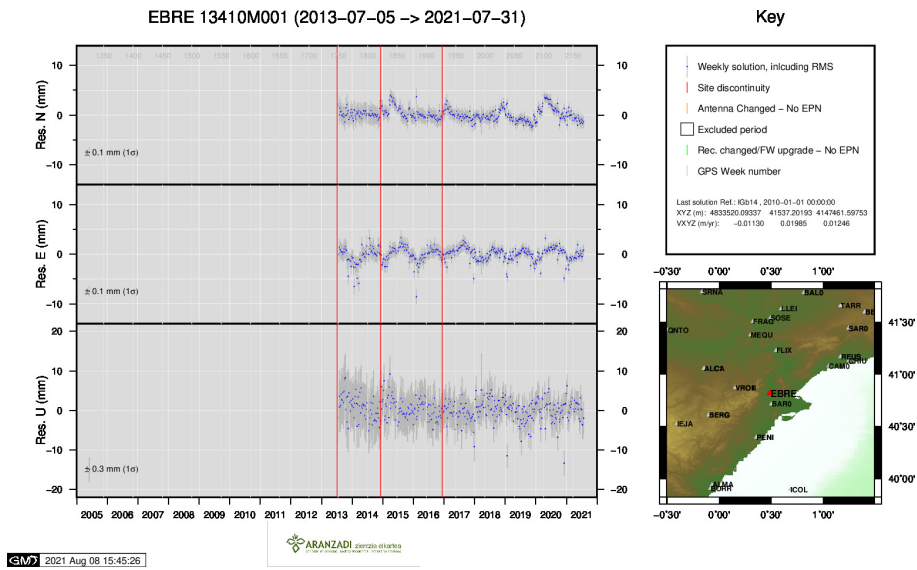
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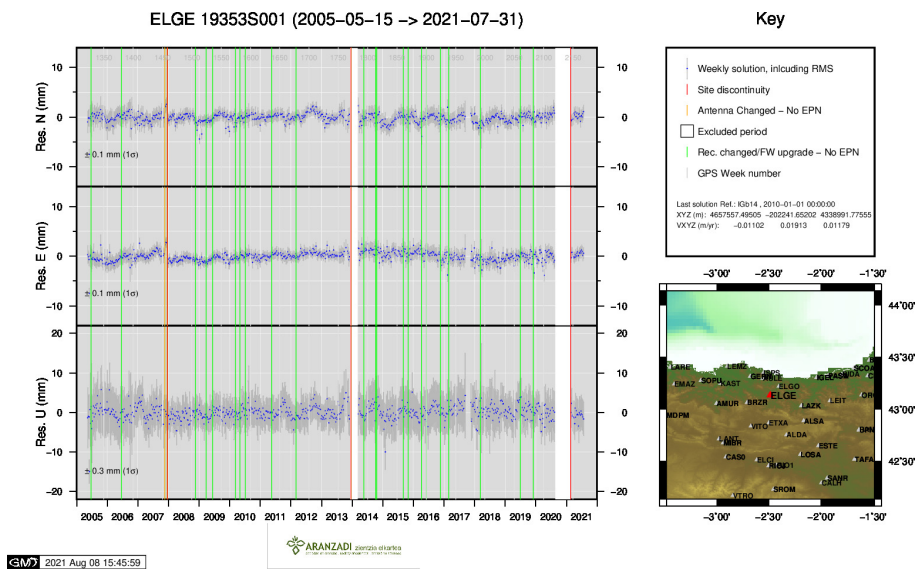
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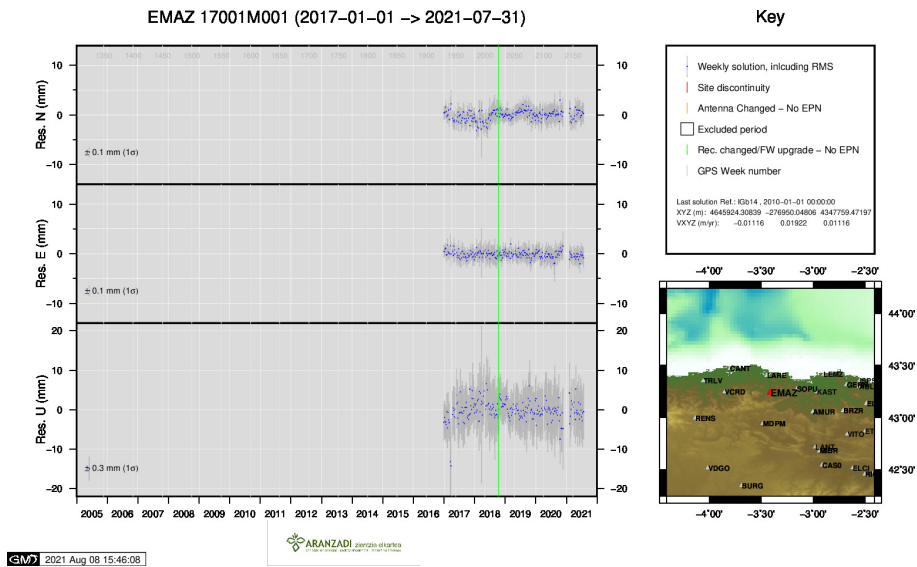
8 ) CHER



9 ) EBRE

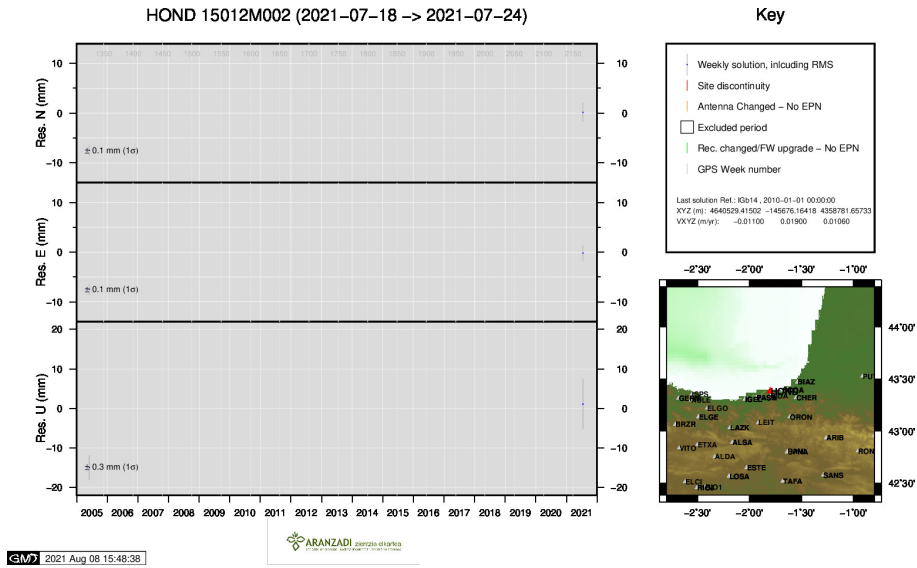


10 ) ELGE

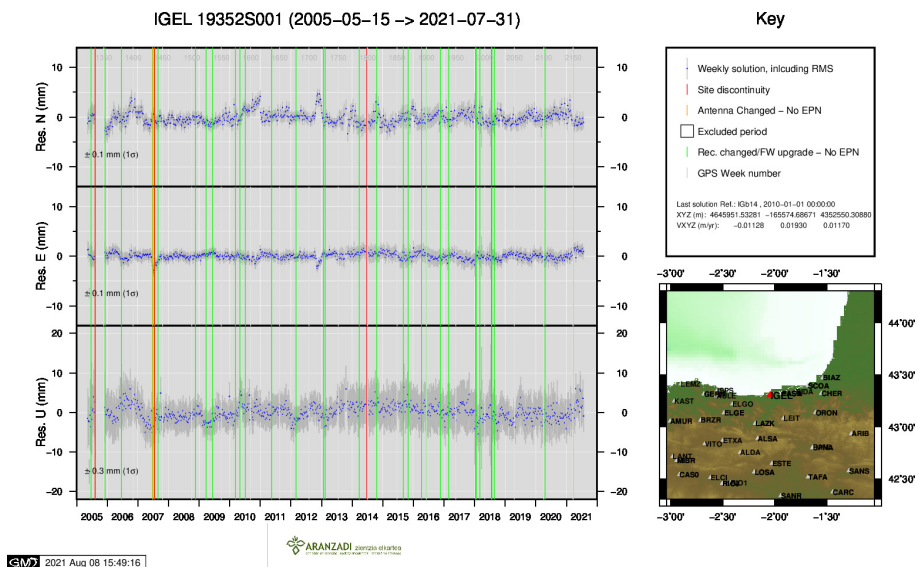


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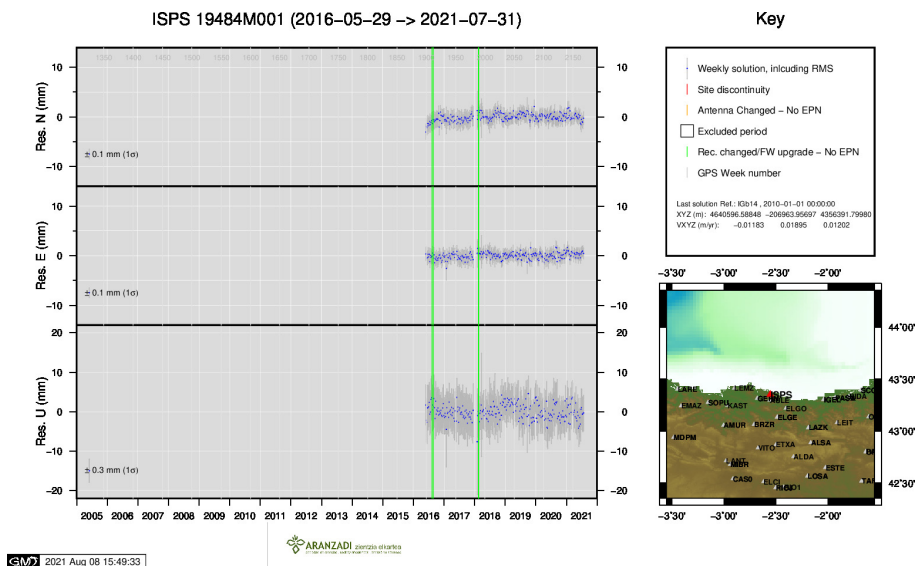




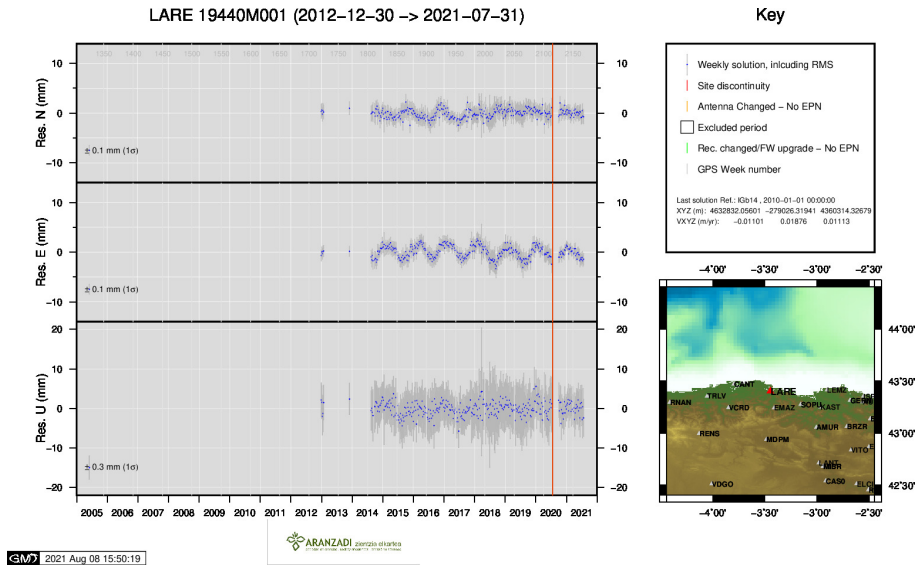
12 ) HOND



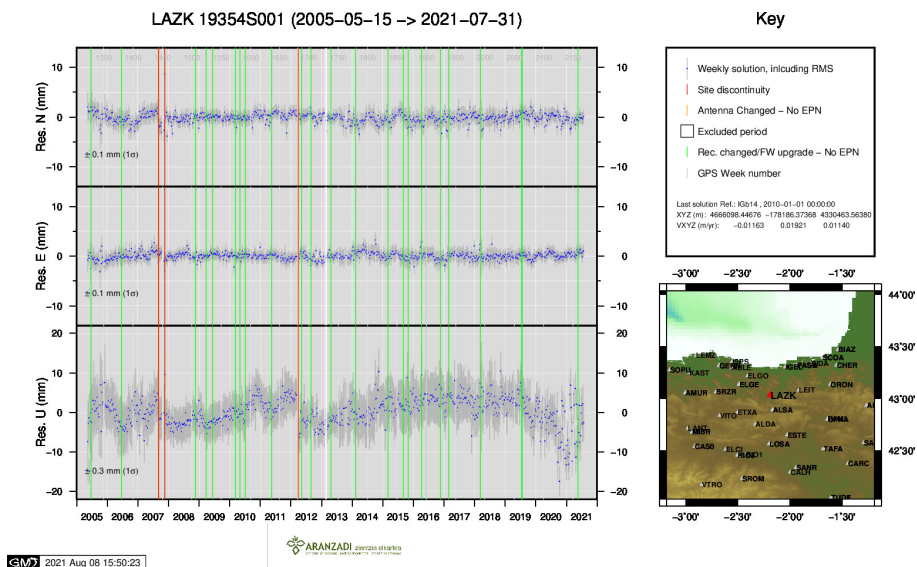
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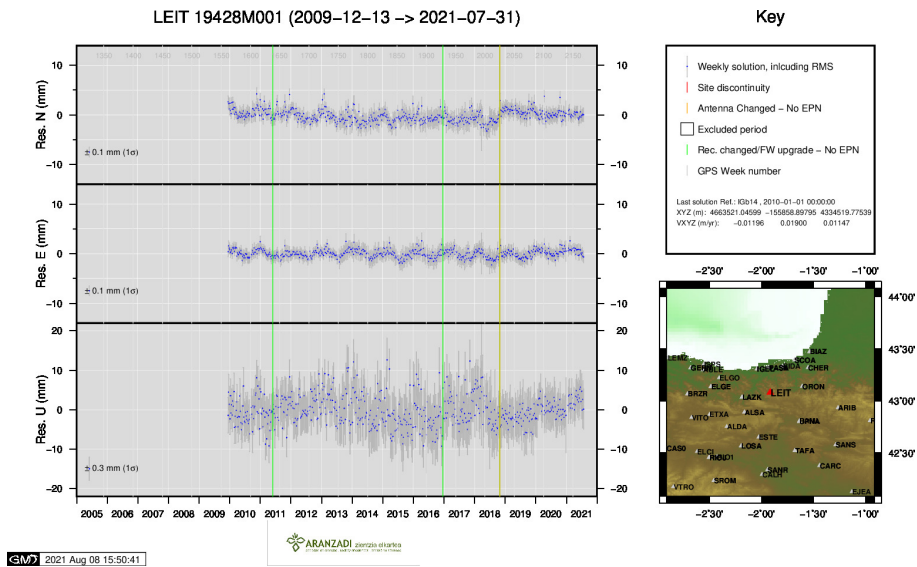
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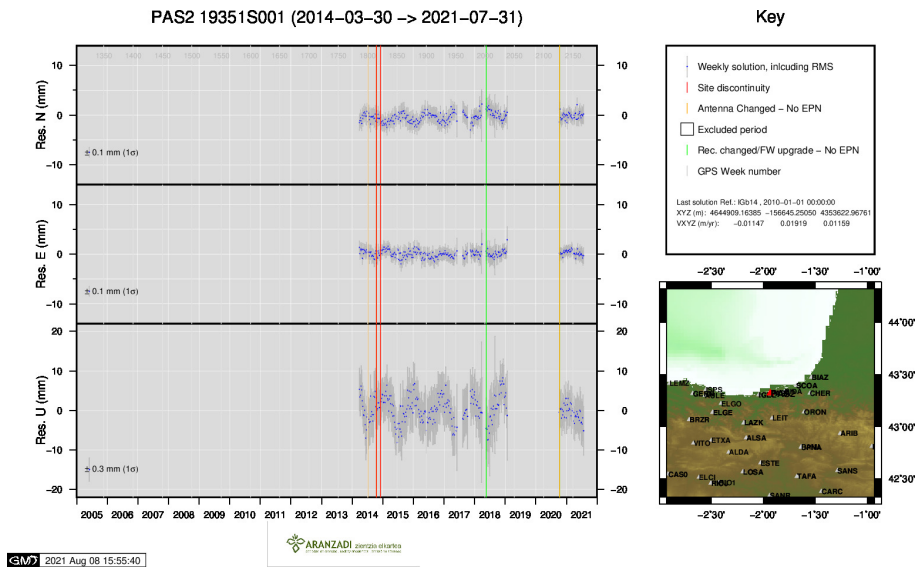
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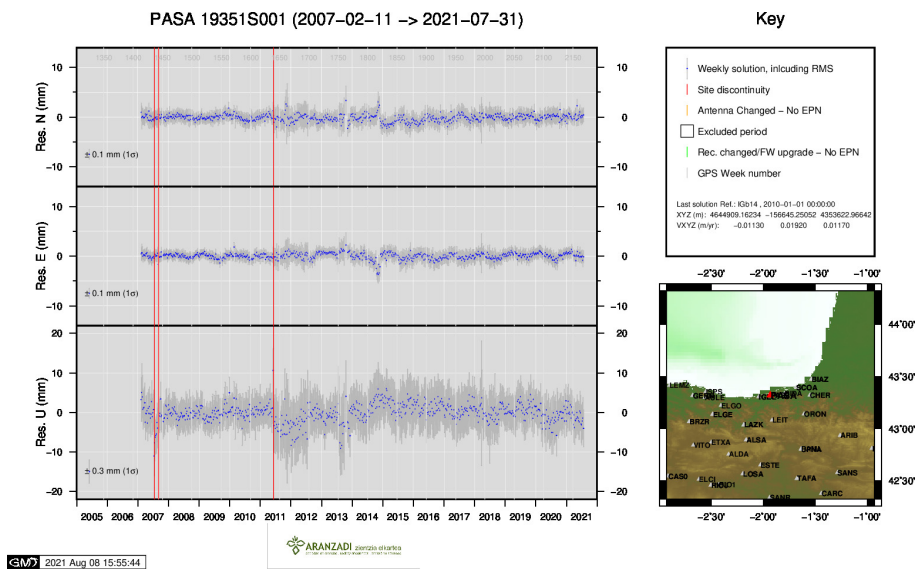
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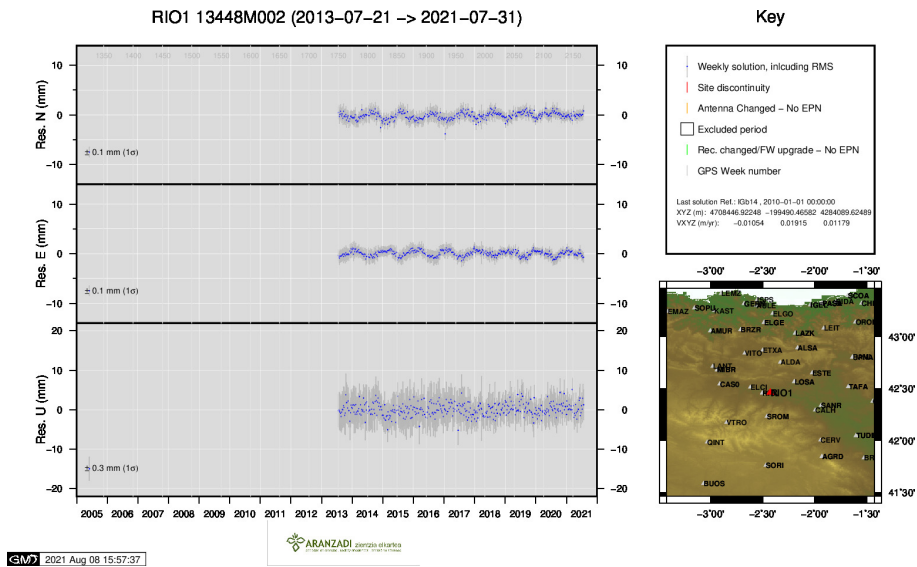
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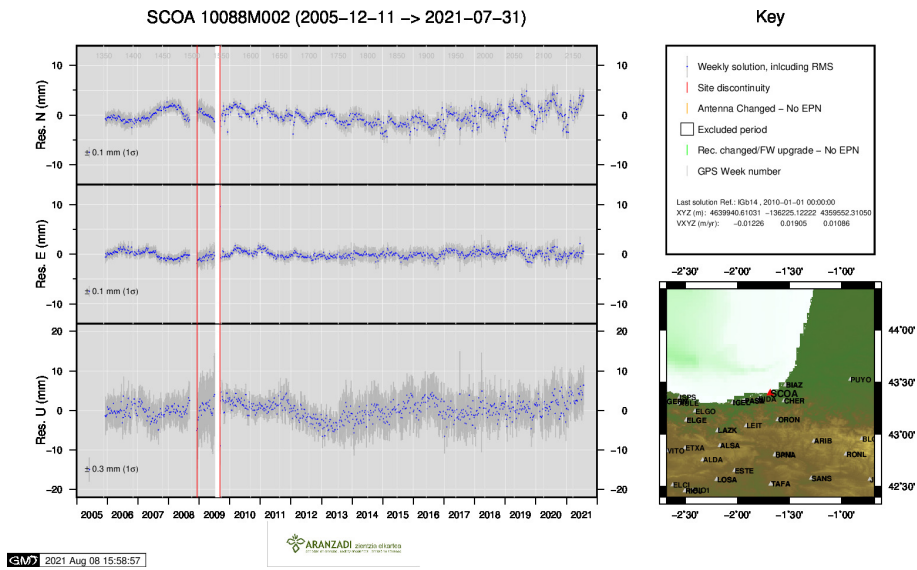
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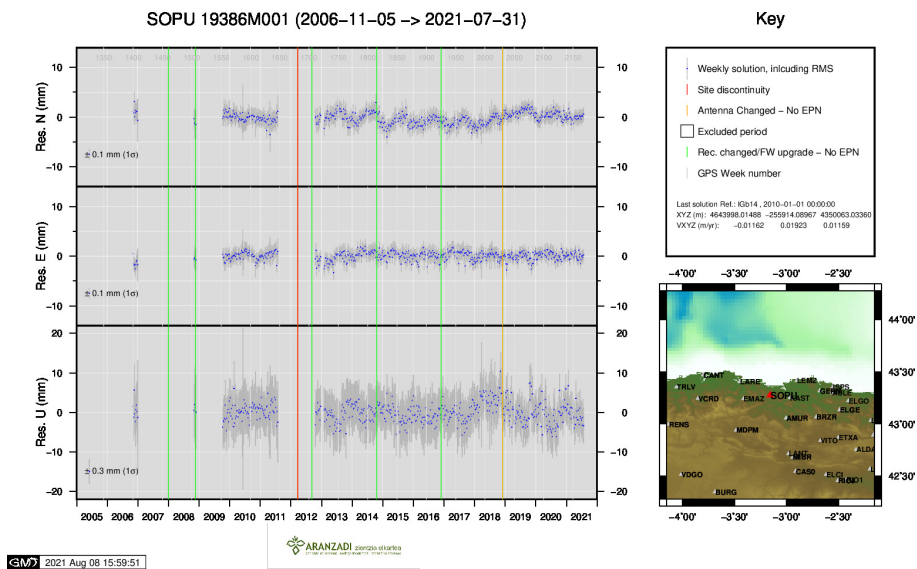
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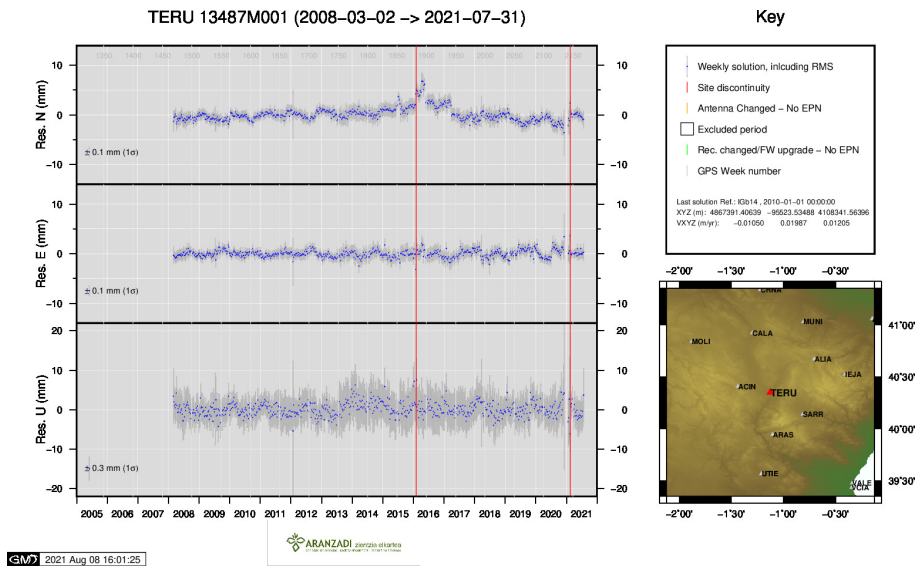
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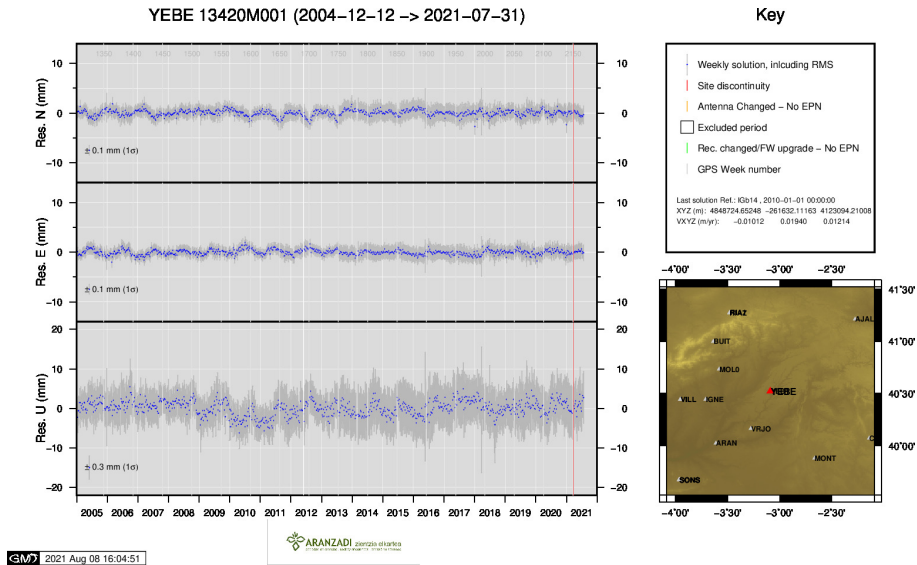
21 ) SCOA



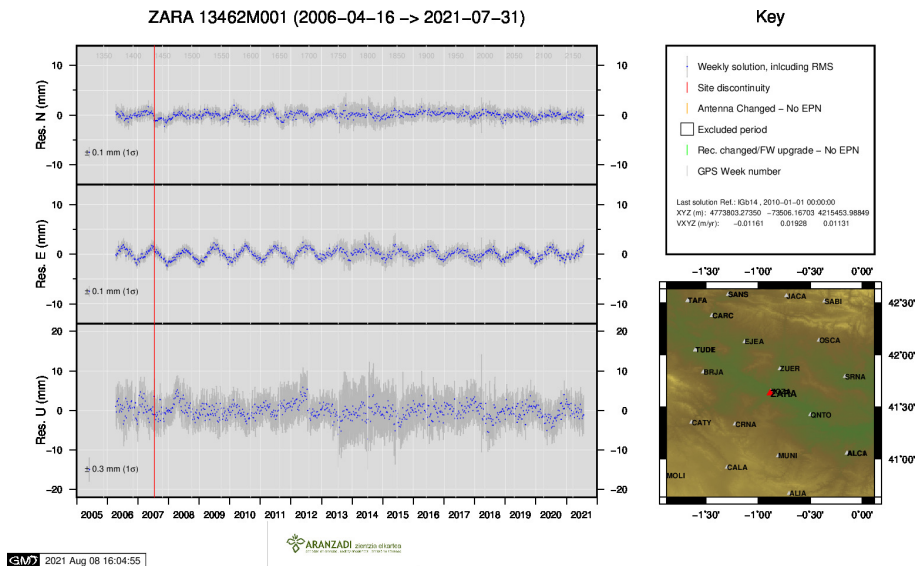
22 ) SOPU



23 ) TERU



24 ) YEBE



25 ) ZARA