

# ARA-DAC Weekly Analysis Result: 2285 (GFA)

## Technical Report

**GPS Week: 2285 (GFA)**

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

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Report generated on 2023/11/13 at 06:38:44

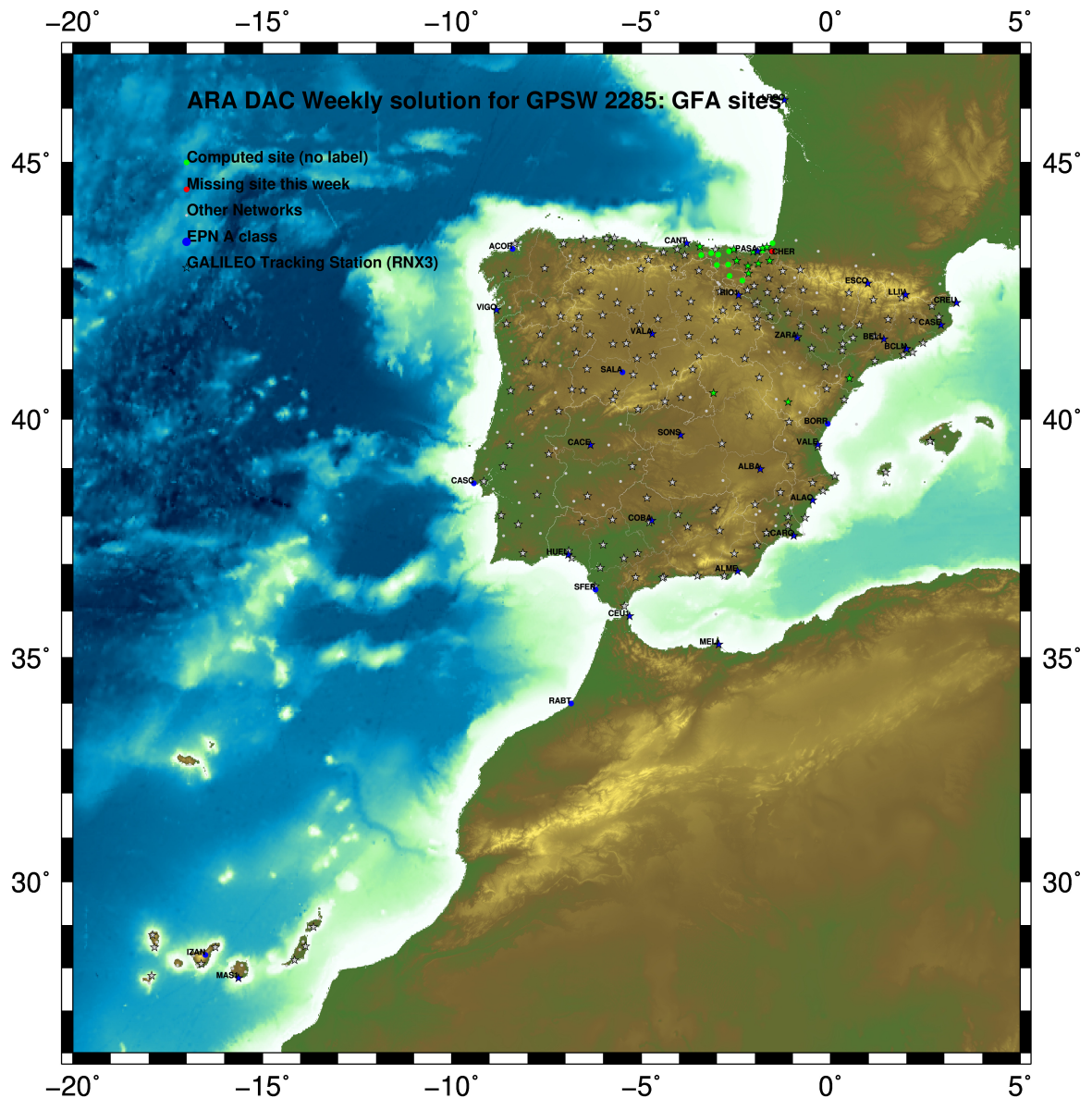


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## 1 Introduction

In may 2015 ARA (EUREF's acronym of the ARANZADI's Department of Applied Geodesy), kicks off as a EUREF's Operational Center. In July 2015, the Densification solutions ARA computes routinely in a weekly basis start being submitted to the EUREF's EPN Densification Project.

## 2 Map of Computed Sites



GM 2023 Nov 13 06:38:39

Fig.1: Computed Sites for GPS Week2285 (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 is used if available starting GPS week 1986)
- 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.I20 file and individual calibrations from EPNC\_20.ATX. In case no calibration values of an antenna/radome pairs are not available for a certain GNSS system at some station, the observation of this/these GNSS/GNSSs are excluded from the analysis of that station.
- EPN\_A class sites (CRD + VEL) IGS20 used to define the reference frame (no EPN release is available at the time this report is generated). Following the EUREF guidelines, no other individual calibrations are included in the analysis starting GPSW 2238 (IGS20).
- Calibraciones de antena: calibraciones absolutas del IGS, incluidas en el fichero igs20.atx. A partir de la semana GPS 2238 (IGS20) No se incluyen calibraciones absolutas individuales de ninguna otra antena.
- El datum se establece con las estaciones EPN de clase A (coordenadas y velocidades) en datum IGS20 (solución PRELIMINAR, basada en IGB14). En caso de no disponer de datos de calibración de una determinada antena/radomo para cierto sistema GNSS, las observaciones de éste se omiten en el cálculo de la estación.
- Troposphere:
  - minimum elevation is 3 deg.; elevation dependent weighting.
  - VMF3 mapping function. ZPD parameters are estimated using the VMF3 mapping function.
  - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2014b (Scherneck).
- Atmospheric loading: not corrected, following the latest recommendations for IGS20 products.
- Tidal displacements:
  - Mean pole model : IERS2010\_v1.2.0
  - Subdaily pole model: DESAI2016
  - Nutation model : IAU2000R06

## 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. DE421 planetary ephemeris and JGM3 Earth geopotential model is used.
- Ambiguity: an advanced ambiguity resolution (AR) scheme is included:
  - Code-Based Widelane (WL) and Narrow Line (NR) 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 IGS20

The Reference Frame considered in this section is a PRELIMINARY IGS20, based on the previously used IGB14 solution.

ARA FINAL WEEKLY COMBINATION: FINAL ORBITS 13-NOV-23 05:33

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LOCAL GEODETIC DATUM: IGS20 EPOCH: 2023-10-25 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
4	ACOR 13434M001	4594489.51082	-678367.35102	4357066.33096	W	G
39	ALDA 19383M001	4687280.11355	-190876.48370	4308107.00593	A	GR
50	ALSA 19419M001	4677250.77960	-176770.31496	4319079.92638	A	GRE
53	AMUR 19388M001	4661499.40079	-244591.17299	4332269.94112	A	GR
100	BIAZ 10074M002	4634455.99254	-124344.89304	4365785.50692	A	GR
101	BIDA 00000M000	4644177.76978	-145778.23914	4354832.53372	A	GR
152	BRZE 19387M001	4652220.93562	-220769.82419	4333309.48365	A	GR
104	CACE 13447M001	4899866.45809	-544566.95311	4033770.25715	W	GRE
116	CANT 13438M001	4625924.26654	-307096.15448	4365771.61498	W	GRE
162	CREU 13432M001	4715420.07250	273178.14285	4271946.89431	W	GRE
204	EBRE 13410M001	4833519.93890	41537.47899	4147461.77118	A	GRE
180	ELGE 19353S001	4657557.34577	-202241.38828	4338991.94206	A	GRE
182	EMAZ 17001M001	4645924.16143	-276949.78689	4347759.62627	A	GR
209	GERN 19389M001	4642811.26858	-217222.84432	4353278.93227	A	GR
257	HOND 15012M002	4640529.26649	-145676.90303	4358761.80934	A	GRE
235	IGEL 19352S001	4645951.37524	-165574.42147	4352550.47768	A	GRE
240	ISPS 19484M001	4640596.42662	-206963.69458	4356391.96790	A	GRE
245	KAST 19499M001	4646949.02000	-240747.18632	4348015.04018	A	GR
252	LARE 19440M001	4632831.90610	-279026.06232	4360314.48319	A	GRE
256	LAZK 19354S001	4666098.29300	-178186.10753	4330463.72804	A	GRE
261	LEIT 19428M001	4663520.88641	-155858.63670	4334519.94262	A	GRE
334	ORDN 19427M001	4659695.72792	-130864.65352	4338948.93853	A	GRE
345	PAS2 19351S001	4644909.00876	-156644.98762	4353623.12994	A	GRE
493	PASA 19351S001	4644909.00887	-156644.98817	4353623.13036	W	GRE
553	RID1 13448M002	4708446.77573	-199490.19991	4284089.78981	W	GRE
558	SALA 13469M001	4803054.43659	-462130.98734	4158379.13162	W	GR
566	SCDA 10088M002	4639940.45301	-136224.86161	4359552.47546	A	GRE
418	SOPU 19386M001	4643997.85529	-255913.82488	4350063.19353	A	GR
443	TERU 13487M001	4867391.27106	-95523.26038	4108341.73858	A	GR
493	VITO 19385M001	4679397.65211	-218436.42133	4314898.42268	A	GR
752	YEBE 13420M001	4848724.51920	-261631.84435	4123094.38474	A	GRE
755	ZARA 13462M001	4773803.11873	-73505.90202	4215454.15105	W	GRE

### 5.2 ETRF2000 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

CONVERT TO ETRF2000 13-NOV-23 05:33

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LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2023-10-25 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
4	ACOR 13434M001	4594489.84997	-678367.97518	4357065.85852	W	
39	ALDA 19383M001	4687280.51412	-190877.11803	4308106.53233	A	
50	ALSA 19419M001	4677251.18293	-176770.94805	4319079.45383	A	
53	AMUR 19388M001	4661499.79610	-244591.80437	4332269.46899	A	
100	BIAZ 10074M002	4634456.40661	-124345.52088	4365785.03878	A	
101	BIDA 00000M000	4644178.18011	-145778.86820	4354832.06445	A	
113	BRZE 19387M001	4652221.33420	-220770.45561	4333309.01179	A	
104	CACE 13447M001	4899866.78937	-544567.61324	4033769.76024	W	
116	CANT 13438M001	4625924.65615	-307096.78177	4365771.14505	W	
162	CREU 13432M001	4715420.53221	273177.50675	4271946.42461	W	
204	EBRE 13410M001	4833520.35773	41536.82806	4147461.28814	A	
180	ELGE 19353S001	4657557.74728	-202242.01909	4338991.47086	A	
182	EMAZ 17001M001	4645924.55364	-276950.41651	4347759.15504	A	
209	GERN 19389M001	4642811.66922	-217223.47340	4353278.46213	A	
257	HOND 15012M002	4640529.67715	-145676.53165	4358781.34038	A	
235	IGEL 19352S001	4645951.78274	-165575.05080	4352550.00798	A	
240	ISPS 19484M001	4640596.82889	-206964.32338	4356391.49809	A	
245	KAST 19499M001	4646949.41708	-240747.81596	4348014.56936	A	
252	LARE 19440M001	4632832.29903	-279026.69037	4360314.01305	A	
256	LAZK 19354S001	4666098.69705	-178186.73929	4330463.25643	A	
261	LEIT 19428M001	4663521.29377	-155859.26810	4334519.47155	A	
334	ORDN 19427M001	4659696.13898	-130865.28439	4338948.46813	A	
345	PAS2 19351S001	4644909.41754	-156645.61679	4353622.66046	A	
493	PASA 19351S001	4644909.41765	-156645.61734	4353622.66088	W	
553	RID1 13448M002	4708447.17323	-199490.83677	4284089.31426	W	
558	SALA 13469M001	4803054.78889	-462131.63597	4158378.64425	W	
566	SCDA 10088M002	4639940.86499	-136225.49014	4359552.00668	A	
418	SOPU 19386M001	4643998.25050	-255914.45420	4350062.72275	A	
443	TERU 13487M001	4867391.66844	-95523.91575	4108341.25074	A	
493	VITO 19385M001	4679398.04953	-218437.05479	4314897.94937	A	
752	YEBE 13420M001	4848724.89553	-261632.49796	4123093.89622	A	
755	ZARA 13462M001	4773803.52761	-73506.54627	4215453.67160	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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CONVERT TO ETRF2014                                     13-NOV-23 05:33
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LOCAL GEODETIC DATUM: ETRF2014           EPOCH: 2023-10-25 11:59:45
NUM STATION NAME          X (M)          Y (M)          Z (M)    FLAG    SYSTEM
4  ACRD 13434M001         4594489.80984    -678368.01217   4357065.91076    W
39 ALDA 19383M001         4687280.47150    -190877.15642   4308106.58443    A
50 ALSA 19419M001         4677251.14037    -176770.98654   4319079.50598    A
53 AMUR 19388M001         4661499.75394    -244591.84268   4332269.52115    A
100 BIAZ 10074M002         4634456.36433    -124345.55975   4365785.09109    A
101 BIDA 00000M000         4644178.13780    -145778.90694   4354832.11671    A
113 BRZR 19387M001         4662221.29196    -220770.49400   4333309.06396    A
104 CACE 13447M001         4899866.74540    -544567.64937   4033769.81164    W
116 CANT 13438M001         4625924.61458    -307096.82000   4365771.19729    W
162 CREU 13432M001         4715420.48751    273177.46680    4271946.47696    W
204 EBRE 13410M001         4833520.31260    41536.78947     4147461.33998    A
180 ELGE 19353S001         4657557.70503    -202242.05757   4338991.52305    A
182 EMAZ 17001M001         4645924.51177    -276950.45476   4347759.20723    A
209 GERN 19389M001         4642811.62718    -217223.51189   4353278.51436    A
257 HOND 15012M002         4640529.63488    -145676.57042   4358781.39266    A
235 IGEL 19352S001         4645951.74048    -165575.08946   4352550.06023    A
240 ISPS 19484M001         4640596.78683    -206964.36192   4356391.55033    A
245 KAST 19499M001         4646949.37507    -240747.85435   4348014.62156    A
252 LARE 19440M001         4632832.25730    -279026.72867   4360314.06528    A
256 LAZK 19354S001         4666098.65461    -178186.77782   4330463.30861    A
261 LEIT 19428M001         4663521.25129    -155859.30672   4334519.52374    A
334 ORDN 19427M001         4659696.09645    -130865.32312   4338948.52035    A
345 PAS2 19351S001         4644909.37526    -156645.65550   4353622.71271    A
493 PASA 19351S001         4644909.37537    -156645.65605   4353622.71313    W
553 RIO1 13448M002         4708447.13040    -199490.87503   4284089.36630    W
558 SALA 13469M001         4803054.74582    -462131.67284   4158378.69592    W
566 SOA 10088M002         4639940.82270    -136225.52894   4359552.05897    A
418 SOPU 19386M001         4643998.20857    -255914.49255   4350062.77496    A
443 TERU 13487M001         4867391.62343    -95523.95368    4108341.30239    A
493 VITO 19385M001         4679398.00709    -218437.09311   4314898.00149    A
752 YEBE 13420M001         4848724.85131    -261632.53537   4123093.94783    A
755 ZARA 13462M001         4773803.48360    -73506.58470    4215453.72352    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 IGS20 solution and are given with respect to the Local frame (North-East-Up).

GFA FINAL WEEKLY COMBINATION: FINAL ORBITS 13-NOV-23 05:33

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	1.20	0.64	3.80
ALDA 19383M001	7	XXXXXX	1.58	1.70	2.93
ALSA 19419M001	7	XXXXXX	1.20	3.74	6.71
AMUR 19388M001	6	XXXXX	1.73	1.16	4.06
BLAZ 10074M002	7	XXXXXX	1.14	1.50	4.00
BIDA 00000M000	7	XXXXXX	1.03	2.11	5.25
BRZR 19387M001	5	X XX XX	2.68	4.16	7.03
CACE 13447M001	7	XXXXXX	0.67	0.49	2.41
CANT 13438M001	7	XXXXXX	0.72	0.65	2.77
CREU 13432M001	6	XX XXXX	1.29	1.24	7.01
EBRE 13410M001	7	XXXXXX	0.85	2.26	4.04
ELGE 19353S001	7	XXXXXX	2.28	2.63	6.23
EMAZ 17001M001	7	XXXXXX	1.75	1.13	4.73
GERN 19389M001	7	XXXXXX	1.75	3.18	5.46
HOND 15012M002	6	XX XXXX	1.24	0.86	3.84
IGEL 19352S001	7	XXXXXX	2.08	0.80	2.53
ISPS 19484M001	7	XXXXXX	1.93	2.18	2.88
KAST 19499M001	6	X XXXXX	2.37	1.62	9.65
LARE 19440M001	7	XXXXXX	0.91	1.43	1.64
LAZK 19354S001	7	XXXXXX	2.44	1.75	3.51
LEIT 19428M001	7	XXXXXX	2.14	0.89	6.70
ORON 19427M001	7	XXXXXX	0.83	1.08	4.10
PAS2 19351S001	7	XXXXXX	1.64	1.21	8.06
PASA 19351S001	6	XXXX X	1.32	1.42	5.02
RI01 13448M002	7	XXXXXX	0.87	1.68	3.35
SALA 13469M001	7	XXXXXX	0.97	0.47	1.94
SCDA 10088M002	7	XXXXXX	1.34	0.97	4.13
SOPU 19386M001	7	XXXXXX	0.76	1.82	3.19
TERU 13487M001	7	XXXXXX	0.77	1.71	3.42
VITD 19385M001	7	XXXXXX	1.99	1.69	4.89
YEBE 13420M001	7	XXXXXX	0.81	0.42	2.43
ZARA 13462M001	7	XXXXXX	0.87	1.25	1.18

Comparison of individual solutions:

Station	Day	Weekday	N	E	U	N	E	U		
ACOR 13434M001	N	1.20	1.18	-0.28	-0.30	-1.21	-0.06	-1.41	1.90	
ACOR 13434M001	E	0.64	0.90	0.99	-0.66	-0.15	0.03	0.40	0.27	
ACOR 13434M001	U	3.80	-0.63	-2.22	-2.84	7.37	-1.34	-3.29	2.54	
ALDA 19383M001	N	1.58	2.19	1.45	-1.36	1.09	0.12	1.75	1.38	
ALDA 19383M001	E	1.70	-0.10	0.63	-3.29	0.44	0.43	2.30	0.63	
ALDA 19383M001	U	2.93	-1.18	-0.34	2.36	1.18	-2.81	4.68	3.63	
ALSA 19419M001	N	1.20	1.74	0.27	-1.22	-1.34	-0.22	0.34	1.43	
ALSA 19419M001	E	3.74	3.43	2.39	2.35	-5.91	0.81	-4.93	-0.90	
ALSA 19419M001	U	6.71	5.23	3.98	-3.20	-13.76	5.19	-0.42	0.30	
AMUR 19388M001	N	1.73	-2.52	-0.07	1.20	1.38	2.03	1.07		
AMUR 19388M001	E	1.16	-1.02	-0.55	1.83	-0.63	-0.86	-0.95		
AMUR 19388M001	U	4.06	-5.12	3.30	3.95	3.93	0.33	3.78		
BLAZ 10074M002	N	1.14	0.43	0.73	-0.62	0.02	2.08	-1.25	0.88	
BLAZ 10074M002	E	1.50	0.27	0.76	-0.36	0.30	1.55	-1.51	-2.81	
BLAZ 10074M002	U	4.00	-4.89	5.63	-0.89	4.16	-3.46	2.52	2.00	
BIDA 00000M000	N	1.03	-0.54	1.96	-0.13	-0.21	1.45	0.08	-0.26	
BIDA 00000M000	E	2.11	0.52	-2.00	-1.07	0.12	-1.02	-2.17	3.94	
BIDA 00000M000	U	5.25	-3.62	7.43	-2.50	5.48	2.92	2.61	-6.76	
BRZR 19387M001	N	2.68	3.98		-1.19	1.27		-1.70	2.64	
BRZR 19387M001	E	4.16	5.79		1.94	0.37		-4.14	-3.83	
BRZR 19387M001	U	7.03	9.88		0.46	-6.70		-0.01	-7.43	
CACE 13447M001	N	0.67	0.41	0.42	-0.71	-1.03	0.49	-0.69	0.33	
CACE 13447M001	E	0.49	-0.10	-0.42	-0.44	-0.61	0.65	0.28	-0.43	
CACE 13447M001	U	2.41	1.88	-4.63	1.01	-0.05	1.39	-0.73	2.51	
CANT 13438M001	N	0.72	0.46	0.22	-0.76	-0.22	-0.22	0.72	1.28	
CANT 13438M001	E	0.65	0.11	0.01	-0.96	0.43	0.11	-0.36	-1.14	
CANT 13438M001	U	2.77	0.09	-2.77	-0.01	1.19	0.93	1.11	-5.91	
CREU 13432M001	N	1.29	1.42	0.60		0.85	-2.20	0.53	-0.28	
CREU 13432M001	E	1.24	1.73	-1.00		1.22	-1.33	0.33	-0.54	
CREU 13432M001	U	7.01	2.05	-12.55		2.76	-0.75	8.54	-1.84	
EBRE 13410M001	N	0.85	0.69	-0.63	0.29	-0.19	1.71	-0.63	0.27	
EBRE 13410M001	E	2.26	0.28	0.87	-0.49	3.37	-3.48	1.82	-1.64	
EBRE 13410M001	U	4.04	1.34	5.74	1.76	-5.01	-0.13	-5.89	-0.24	
ELGE 19353S001	N	2.28	1.47	-1.52	0.62	4.28	0.08	2.35	-1.62	
ELGE 19353S001	E	2.63	-0.51	0.47	2.65	-0.19	1.63	0.90	-5.51	
ELGE 19353S001	U	6.23	-1.25	2.18	9.56	3.94	-3.18	-0.80	-10.45	
EMAZ 17001M001	N	1.75	-0.02	-0.64	0.40	-0.86	1.79	-0.65	3.67	
EMAZ 17001M001	E	1.13	-1.15	-1.27	-0.72	-0.30	1.47	1.39	0.00	
EMAZ 17001M001	U	4.73	-0.58	2.63	-3.26	0.75	5.71	-1.09	-9.05	
GERN 19389M001	N	1.75	3.29	1.29	-0.28	1.66	-1.16	-0.34	-1.27	
GERN 19389M001	E	3.18	1.52	-7.31	0.97	1.39	0.01	1.43	-0.08	
GERN 19389M001	U	5.46	-3.45	7.35	-1.55	-4.43	5.85	3.87	-6.45	
HOND 15012M002	N	1.24	2.29	0.81		0.50	0.36	-1.10	-0.48	
HOND 15012M002	E	0.86	-0.37	-0.21		-0.75	-0.42	-1.42	0.86	
HOND 15012M002	U	3.84	0.66	4.88		2.83	1.58	1.27	-6.11	
IGEL 19352S001	N	2.08	0.26	-1.57	0.16	0.13	-1.49	-0.06	4.59	
IGEL 19352S001	E	0.80	-0.29	-0.45	1.09	-1.05	-0.26	-1.03	0.39	
IGEL 19352S001	U	2.53	-1.45	3.07	3.70	-1.99	1.07	2.36	-1.65	
ISPS 19484M001	N	1.93	1.80	0.04	-0.86	-0.19	-0.54	-1.22	4.08	
ISPS 19484M001	E	2.18	-1.59	-3.76	-1.64	2.54	1.01	1.03	0.71	
ISPS 19484M001	U	2.88	-0.97	1.34	-1.60	-1.41	2.98	4.15	-4.04	
KAST 19499M001	N	2.37	-1.01		-1.42	-0.71	4.20	-0.73	2.51	
KAST 19499M001	E	1.62	2.08		-0.87	-2.15	-0.69	-1.30	1.14	
KAST 19499M001	U	9.65	4.26		-10.15	2.72	14.15	1.24	-11.64	
LARE 19440M001	N	0.91	-0.00	0.88		-0.53	0.23	-0.53	1.08	1.57
LARE 19440M001	E	1.43	1.00	-0.99	2.47	-1.21	-1.34	-0.62	-0.71	
LARE 19440M001	U	1.64	-0.39	-0.04	-0.83	1.09	-0.59	-0.39	-3.69	
LAZK 19354S001	N	2.44	-0.31	0.20	-1.84	0.71	-2.86	1.12	4.72	
LAZK 19354S001	E	1.75	-2.31	-1.61	-0.21	3.06	-0.88	-0.47	-0.10	

LAZK	19354S001	U	3.51	0.11	-5.37	4.55	0.94	-4.52	-0.28	1.65
LEIT	19428M001	N	2.14	0.02	0.64	-1.32	-1.64	-0.65	0.04	4.70
LEIT	19428M001	E	0.89	-0.39	0.39	0.78	0.51	-0.73	-1.35	-1.11
LEIT	19428M001	U	6.70	-7.56	-0.80	-5.10	-4.00	-2.45	4.83	11.84
ORDN	19427M001	N	0.83	1.35	1.31	-0.35	0.14	0.08	-0.45	0.50
ORDN	19427M001	E	1.08	-0.53	-0.37	0.55	1.14	-1.26	-0.53	-1.75
ORDN	19427M001	U	4.10	1.81	2.62	4.21	-3.85	-4.45	4.58	-4.19
PAS2	19351S001	N	1.64	0.61	0.99	1.07	-3.22	0.83	1.52	-0.43
PAS2	19351S001	E	1.21	-0.58	0.23	1.81	0.28	-0.93	-1.13	-1.69
PAS2	19351S001	U	8.06	0.08	6.90	-5.74	12.18	4.47	-0.05	-11.89
PASA	19351S001	N	1.32	1.19	1.29	0.59	-0.23	0.79		-2.14
PASA	19351S001	E	1.42	0.01	-0.01	0.65	1.25	-0.46		-2.81
PASA	19351S001	U	5.02	-0.26	5.87	-2.45	3.14	3.22		-8.09
RID1	13448M002	N	0.87	0.34	0.30	-0.66	-1.09	1.17	1.16	-0.08
RID1	13448M002	E	1.68	0.15	-0.14	0.00	-0.40	-2.58	-2.29	2.19
RID1	13448M002	U	3.35	-2.74	1.60	-0.18	-3.59	-4.63	3.26	3.47
SALA	13469M001	N	0.97	-0.40	1.28	0.28	-1.11	0.05	-1.58	-0.26
SALA	13469M001	E	0.47	0.26	0.23	0.35	0.24	-0.97	-0.18	-0.19
SALA	13469M001	U	1.94	0.14	-0.70	0.34	-1.20	3.90	0.64	-2.25
SCDA	10088M002	N	1.34	1.56	0.67	-1.13	-0.84	-0.45	-0.38	2.35
SCDA	10088M002	E	0.97	-1.18	-0.82	0.47	0.42	0.23	-1.64	0.63
SCDA	10088M002	U	4.13	-1.18	3.80	3.73	5.26	-3.46	3.23	-4.73
SOPU	19386M001	N	0.76	-0.21	0.76	0.33	-0.21	0.86	0.44	1.34
SOPU	19386M001	E	1.82	1.21	0.38	-2.32	0.27	1.48	-0.11	-3.24
SOPU	19386M001	U	3.19	-3.59	1.47	-2.19	0.25	6.08	1.50	-1.40
TERU	13487M001	N	0.77	0.78	0.32	0.38	-0.42	-0.67	1.39	-0.35
TERU	13487M001	E	1.71	-0.33	1.07	0.29	-3.02	1.61	-2.12	-0.07
TERU	13487M001	U	3.42	1.13	5.14	0.54	-2.99	0.53	5.66	1.06
VITO	19385M001	N	1.99	2.55	1.41	-0.26	-3.08	0.23	-2.15	-0.99
VITO	19385M001	E	1.69	-1.43	0.44	-1.02	-2.27	0.77	-2.82	-0.21
VITO	19385M001	U	4.89	1.33	2.19	0.35	-3.08	2.89	-7.10	-8.27
YEBE	13420M001	N	0.81	-0.86	0.94	-0.75	-0.91	-0.72	-0.11	0.61
YEBE	13420M001	E	0.42	-0.56	0.45	0.29	-0.48	-0.02	-0.26	0.42
YEBE	13420M001	U	2.43	3.86	-1.13	1.24	-0.84	-3.97	0.99	-0.46
ZARA	13462M001	N	0.87	0.27	-1.44	0.18	0.88	0.05	0.41	1.17
ZARA	13462M001	E	1.25	-1.21	-2.07	-0.76	0.78	-1.50	-0.45	0.15
ZARA	13462M001	U	1.18	0.29	-2.09	-0.78	0.48	-0.42	0.75	1.54

### 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.

TRANSFORMATION IN EQUATORIAL SYSTEM (X, Y, Z):  
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

LIST OF REMOVED STATIONS:

OUTLIER CRITERIA: 15.00 15.00 20.00

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-1.86	3.62	1.74
2	ALAC 13433M001	I W	-1.78	0.97	3.77
3	ALBA 13452M001	I W	3.77	-1.34	-6.75
4	ALME 13437M001	I W	-1.10	0.19	7.60
5	BCLN 13412M001	I W	1.93	-1.53	3.37
6	BELL 13431M001	I W	-0.88	-1.86	1.68
7	BORR 13480M001	I W	-2.84	1.17	1.03
8	BRST 10004M004	I W	-2.13	1.98	3.73
9	CACE 13447M001	I W	1.37	1.60	6.88
10	CANT 13438M001	I W	-4.33	3.47	-9.04
11	CARG 19412M001	I W	2.51	0.79	-1.81
12	CASE 13494M001	I W	-4.61	0.34	-1.48
13	CEU1 13449M002	I W	1.70	-0.66	-0.54
14	COBA 13453M001	I W	1.50	1.59	-5.42
15	CREU 13432M001	I W	-2.35	1.40	0.64
17	ESCO 13435M001	I W	-3.68	0.15	-3.48
18	HUEL 13451M001	I W	9.67	-8.82	4.84
20	IZAN 31309M002	I W	1.97	1.24	0.35
21	LLIV 13436M001	I W	-0.53	-0.81	-2.18
23	LROC 10023M001	I W	-0.64	4.48	4.24
25	MAS1 31303M002	I W	1.12	-1.50	3.87
26	MELI 19379M001	I W	4.02	2.91	-1.35
27	PASA 19351S001	I W	0.74	2.23	-6.10
28	PDEL 31906M004	I W	-0.21	-1.12	9.11
29	RABT 35001M002	I W	0.97	1.07	-10.85
30	RIO1 13448M002	I W	-3.19	-1.18	-0.67
31	SALA 13469M001	I W	0.72	1.91	-1.91
33	SFER 13402M004	I W	-3.36	-10.08	7.68
34	SONS 13446M001	I W	0.27	4.40	-1.91
35	VALA 13463M002	I W	0.49	0.72	-5.99
36	VALE 13439M001	I W	-4.44	2.81	-9.34
37	VIGO 13450M001	I W	2.33	0.51	3.30
40	ZARA 13462M001	I W	-1.18	1.59	-3.84
41	ZIMM 14001M004	I W	-2.08	-1.71	2.36
298	CASC 13909S001	A W	5.36	-8.44	5.36
RMS / COMPONENT			3.02	3.33	5.08
IQR			3.82	3.09	7.25
MEAN			-0.02	0.06	-0.03
MEDIAN			-0.21	0.79	0.35
MIN			-4.61	-10.08	-10.85
MAX			9.67	4.48	9.11
OVERALL RMS/IQR/MAX(3D)			3.92	3.83	13.96
					HUEL 13451M001 #SUM
ALL RMS / COMPONENT			3.02	3.33	5.08
ALL IQR			3.82	3.09	7.25
ALL MEAN			-0.02	0.06	-0.03
ALL MEDIAN			-0.21	0.79	0.35
ALL MIN			-4.61	-10.08	-10.85
ALL MAX			9.67	4.48	9.11
ALL OVERALL RMS/IQR/MAX(3D)			3.92	3.83	13.96
					HUEL 13451M001 #SUM_ALL

NUMBER OF PARAMETERS : 3  
NUMBER OF STATIONS : 35  
NUMBER OF COORDINATES : 105  
RMS OF TRANSFORMATION : 3.92 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.66 MM  
TRANSLATION IN Y : 0.00 +- 0.66 MM  
TRANSLATION IN Z : 0.00 +- 0.66 MM

NUMBER OF ITERATIONS : 1

### 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          19054972
NUMBER OF UNKNOWN(S)           221185
NUMBER OF DEGREES OF FREEDOM    18833787
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  8.095126650806950
```

## 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 23:295:00000 23:301:86370 LEICA GR50 -----
ALDA A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
ALSA A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
AMUR A 1 P 23:295:00000 23:300:86370 LEICA GR30 -----
BIAZ A 1 P 23:295:00000 23:301:86370 SPECTRA SP90M -----
BIDA A 1 P 23:295:00000 23:301:86370 LEICA GR10 -----
BRZR A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
CACE A 1 P 23:295:00000 23:301:86370 TRIMBLE NETR9 -----
CANT A 1 P 23:295:00000 23:301:86370 LEICA GR10 -----
CREU A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
EBRE A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
ELGE A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
EMAZ A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
GERN A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
HOND A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
IGEL A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
ISPS A 1 P 23:295:00000 23:301:86370 TRIMBLE NETR9 -----
KAST A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
LARE A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
LAZK A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
LEIT A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
ORON A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
PAS2 A 1 P 23:295:00000 23:301:86370 STONEX SC2200 -----
PASA A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
RIO1 A 1 P 23:295:00000 23:301:86370 LEICA GR25 -----
SALA A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
SCOA A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
SOPU A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
TERU A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
VITO A 1 P 23:295:00000 23:301:86370 LEICA GR30 -----
YEBE A 1 P 23:295:00000 23:301:86370 LEICA GR50 -----
ZARA A 1 P 23:295:00000 23:301:86370 TRIMBLE NETR9 -----
```

### 7.2 Antennas

Serial number ONLY provided in case individual calibrations are used.

```
*SITE PT SOLN T DATA_START_ DATA_END_ DESCRIPTION----- S/N_ DAZI
ACOR A 1 P 23:295:00000 23:301:86370 LEIAT504 LEIS -----
ALDA A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
ALSA A 1 P 23:295:00000 23:301:86370 LEIAR10 NONE -----
AMUR A 1 P 23:295:00000 23:300:86370 LEIAS10 NONE -----
BIAZ A 1 P 23:295:00000 23:301:86370 LEIAR25 LEIT -----
BIDA A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
BRZR A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
CACE A 1 P 23:295:00000 23:301:86370 TRM29659.00 NONE -----
CANT A 1 P 23:295:00000 23:301:86370 LEIAR25_R4 LEIT -----
CREU A 1 P 23:295:00000 23:301:86370 LEIAR25_R4 NONE -----
EBRE A 1 P 23:295:00000 23:301:86370 LEIAR25_R4 NONE -----
ELGE A 1 P 23:295:00000 23:301:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
GERN A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
HOND A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
IGEL A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
ISPS A 1 P 23:295:00000 23:301:86370 TRM59900.00 SCIS -----
KAST A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
LARE A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
LAZK A 1 P 23:295:00000 23:301:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 23:295:00000 23:301:86370 LEIAR10 NONE -----
ORON A 1 P 23:295:00000 23:301:86370 LEIAR10 NONE -----
PAS2 A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
PASA A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
RIO1 A 1 P 23:295:00000 23:301:86370 LEIAR25_R4 LEIT -----
SALA A 1 P 23:295:00000 23:301:86370 LEIAR25 NONE -----
SCOA A 1 P 23:295:00000 23:301:86370 TRM55971.00 NONE -----
SOPU A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
TERU A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
VITO A 1 P 23:295:00000 23:301:86370 LEIAS10 NONE -----
YEBE A 1 P 23:295:00000 23:301:86370 LEIAR20 LEIM -----
ZARA A 1 P 23:295:00000 23:301:86370 TRM29659.00 NONE -----
```

### 7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START__ DATA_END_____ AXE ARP->BENCHMARK(M)-----
ACDR A 1 P 23:295:00000 23:301:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 23:295:00000 23:300:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 23:295:00000 23:301:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 23:295:00000 23:301:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 23:295:00000 23:301:86370 UNE 3.0490 0.0000 0.0000
CREU A 1 P 23:295:00000 23:301:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 23:295:00000 23:301:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 23:295:00000 23:301:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 23:295:00000 23:301:86370 UNE 0.0771 0.0000 0.0000
HOND A 1 P 23:295:00000 23:301:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 23:295:00000 23:301:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 23:295:00000 23:301:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
RI01 A 1 P 23:295:00000 23:301:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 23:295:00000 23:301:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 23:295:00000 23:301:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 23:295:00000 23:301:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 23:295:00000 23:301:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 23:295:00000 23:301:86370 UNE 0.0600 0.0000 0.0000
ZARA A 1 P 23:295:00000 23:301:86370 UNE 3.2590 0.0000 0.0000
    
```

## 8 Inconsistencies (logsheet-RINEX metadata)

The following inconsistencies were found comparing the data available in the logsheets and the RINEX headers:

```

2023-11-12 20:37 UTC | ELGE3000.230 | RECEIVER FIRM. VERS. | 4.52/7.711 -> 4.70/7.813 (source: elge00esp_20231031.log
2023-11-12 20:37 UTC | IGEL3000.230 | RECEIVER FIRM. VERS. | 4.52/7.711 -> 4.70/7.813 (source: igel00esp_20231031.log
2023-11-12 04:52 UTC | LARE2950.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-12 08:06 UTC | LARE2960.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-12 11:10 UTC | LARE2970.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-12 14:32 UTC | LARE2980.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-12 17:28 UTC | LARE2990.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-12 20:37 UTC | LARE3000.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-13 01:53 UTC | LARE3010.230 | RECEIVER FIRM. VERS. | 4.70/7.813 -> 4.61/7.811 (source: lare00esp_20230308.log
2023-11-12 20:37 UTC | LAZK3000.230 | RECEIVER FIRM. VERS. | 4.52/7.711 -> 4.70/7.813 (source: lazko0esp_20231031.log
    
```

## 9 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)

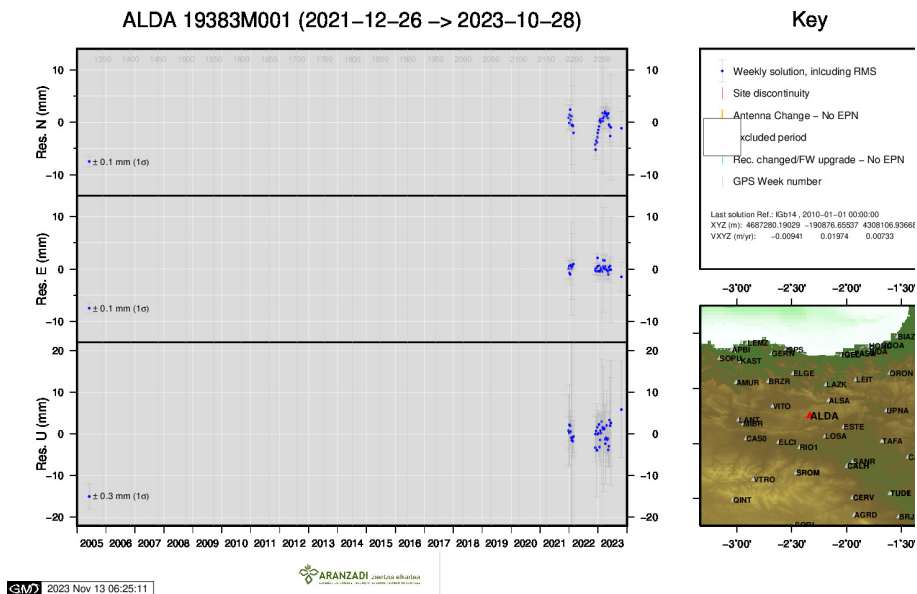
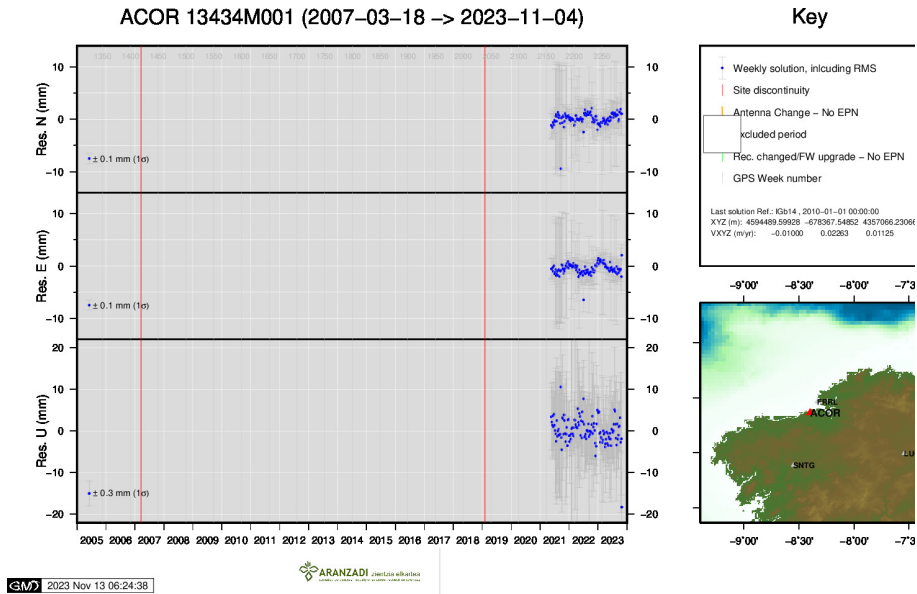
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](http://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

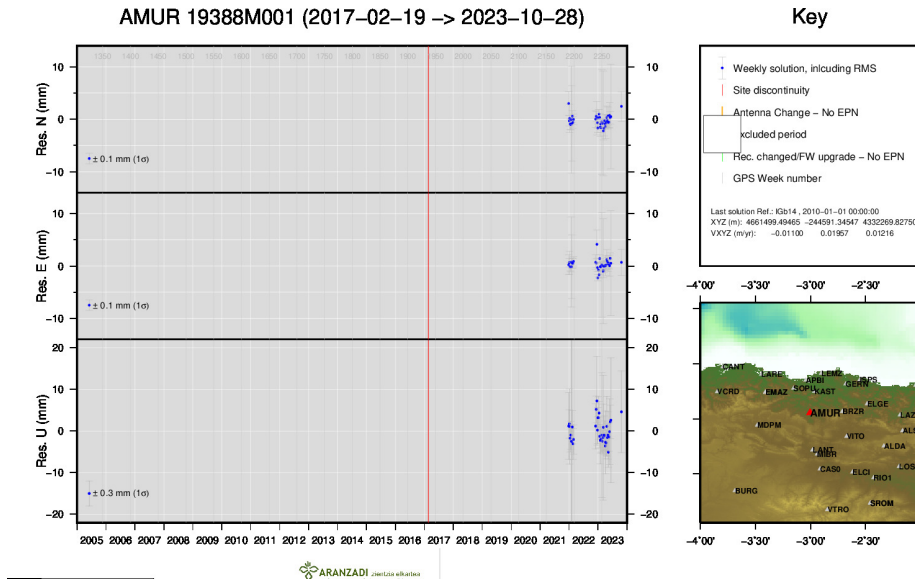
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)



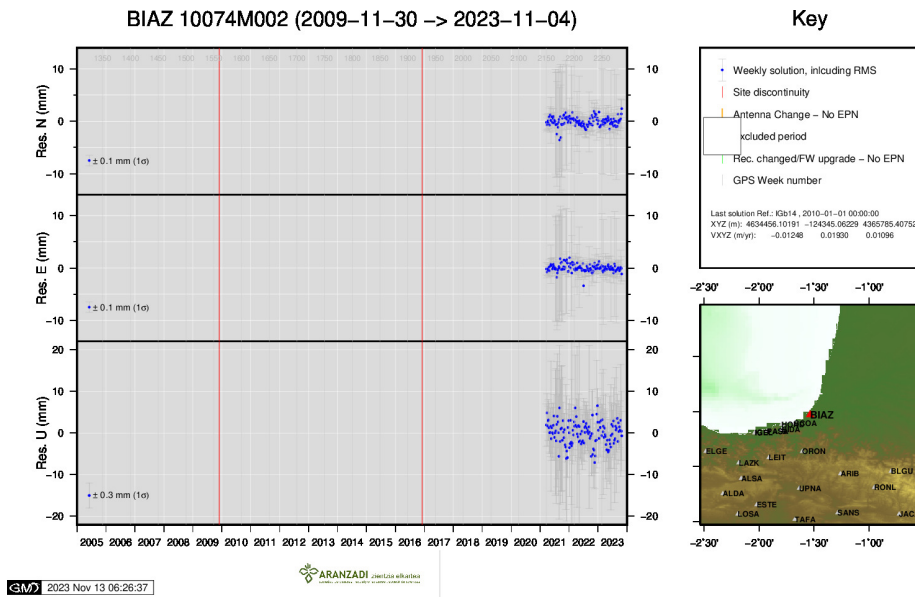
## 10 Cumulative Time Series

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

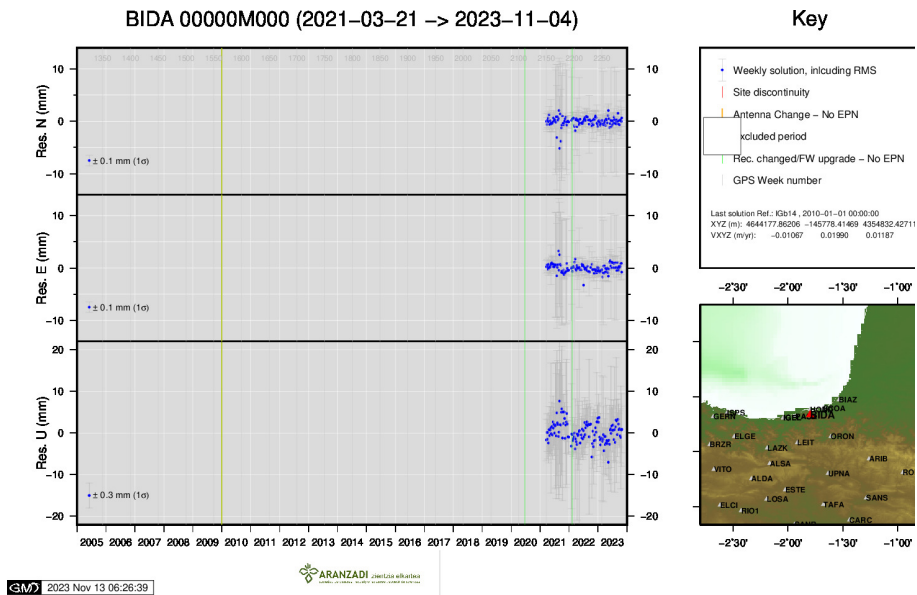




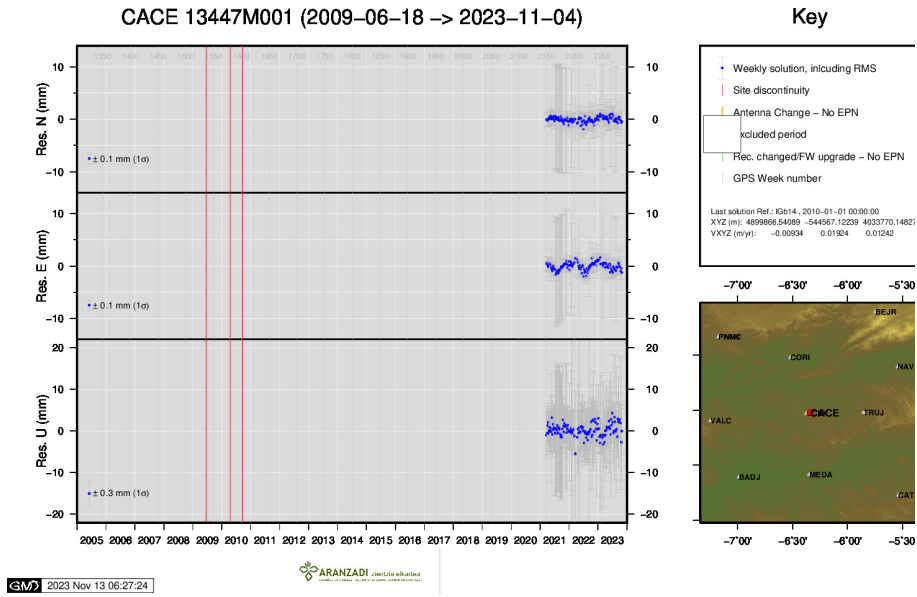
3 ) AMUR



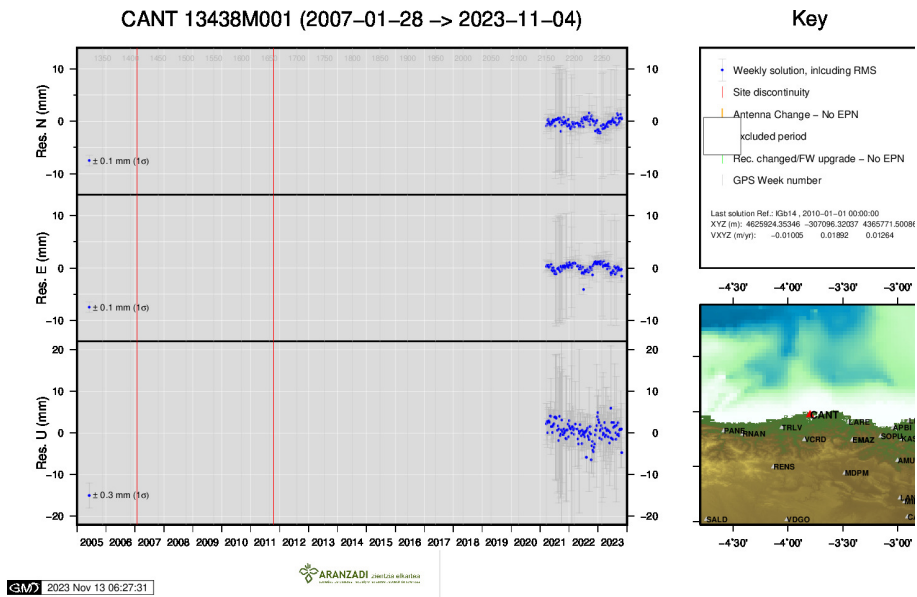
4 ) BIAZ



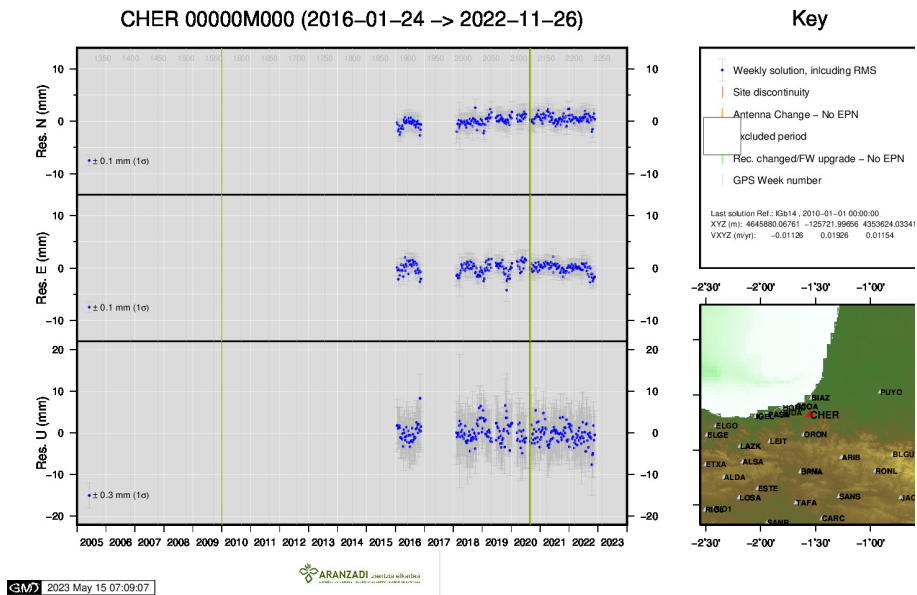
5 ) BIDA



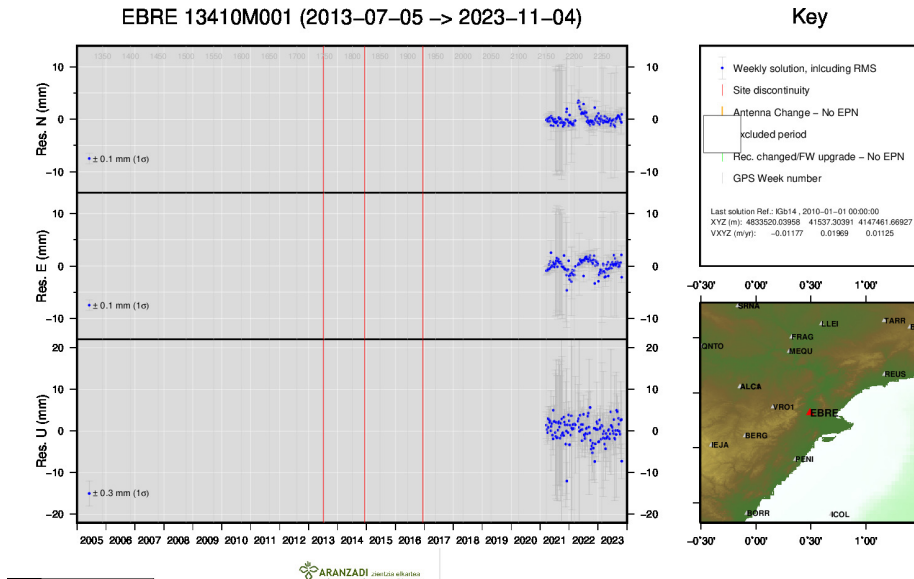
6 ) CACE



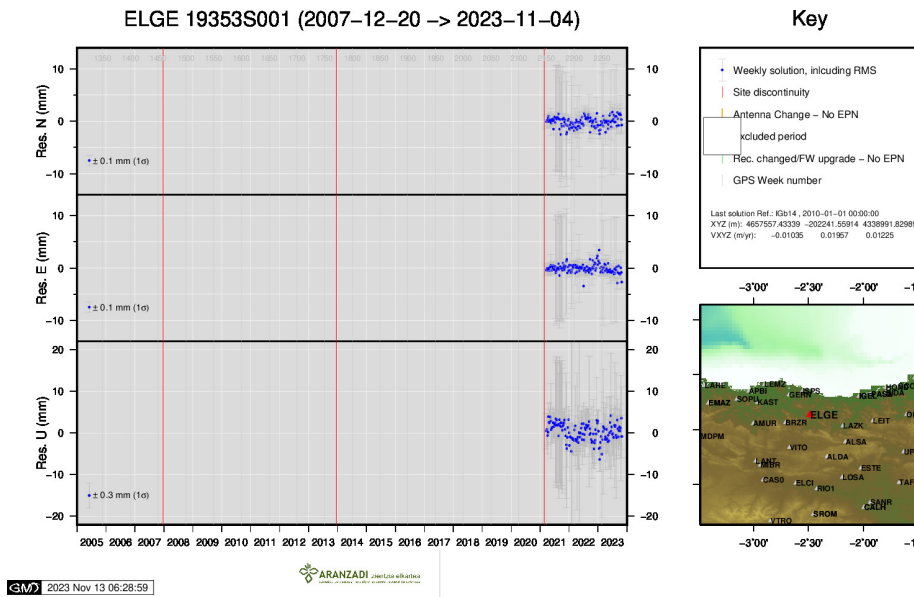
7 ) CANT



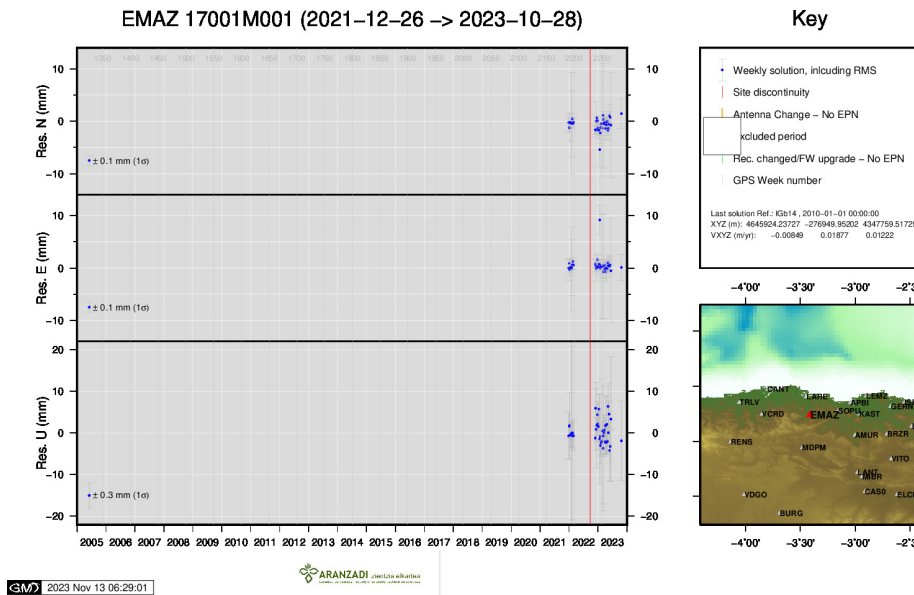
8 ) CHER



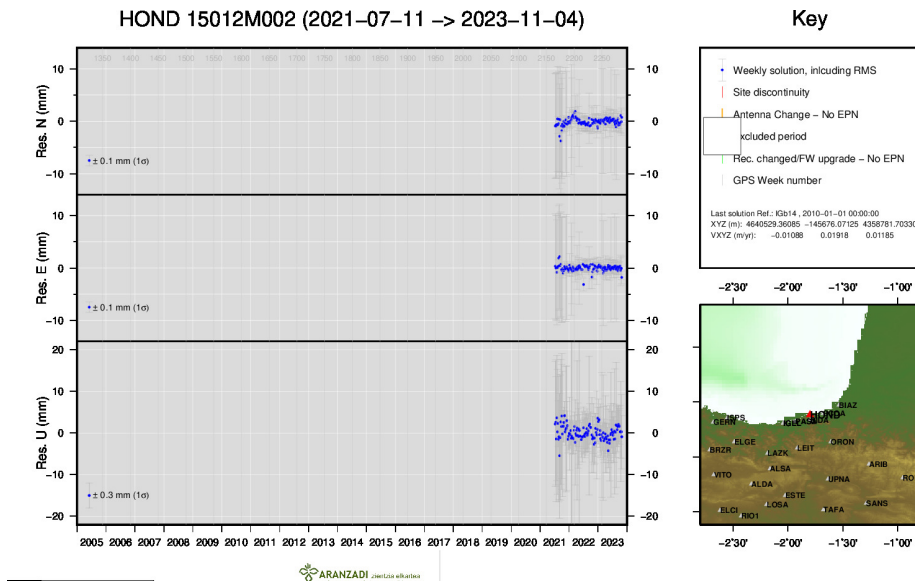
9 ) EBRE



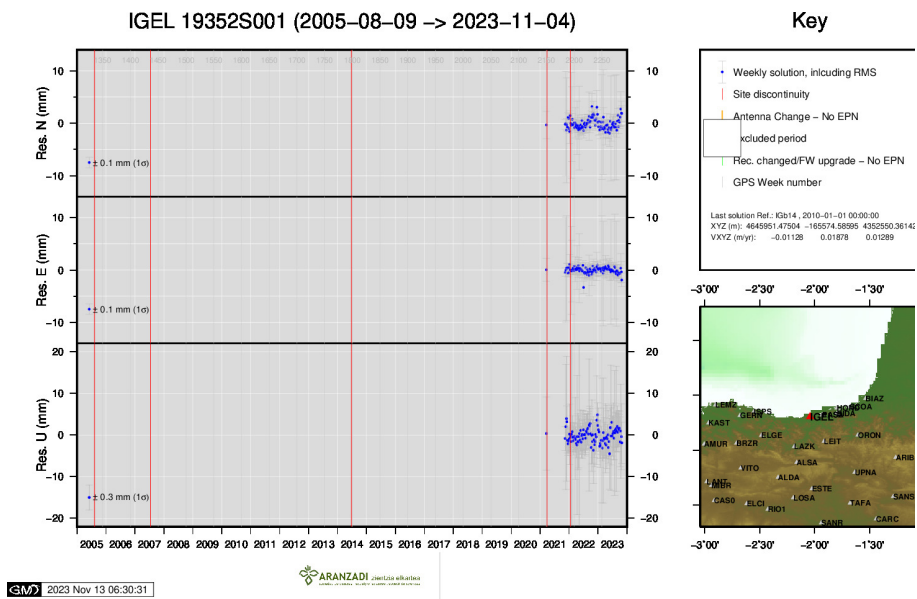
10 ) ELGE



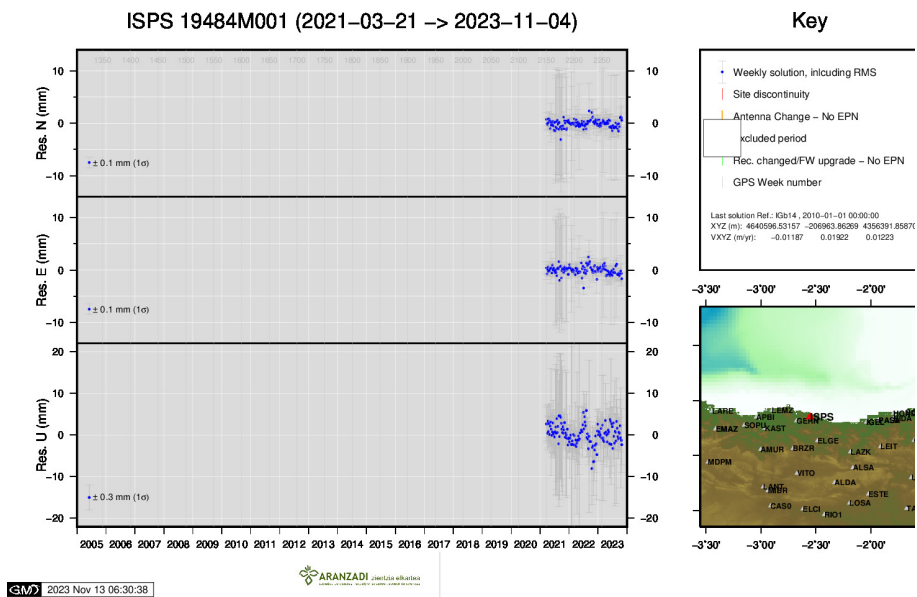
11 ) EMAZ



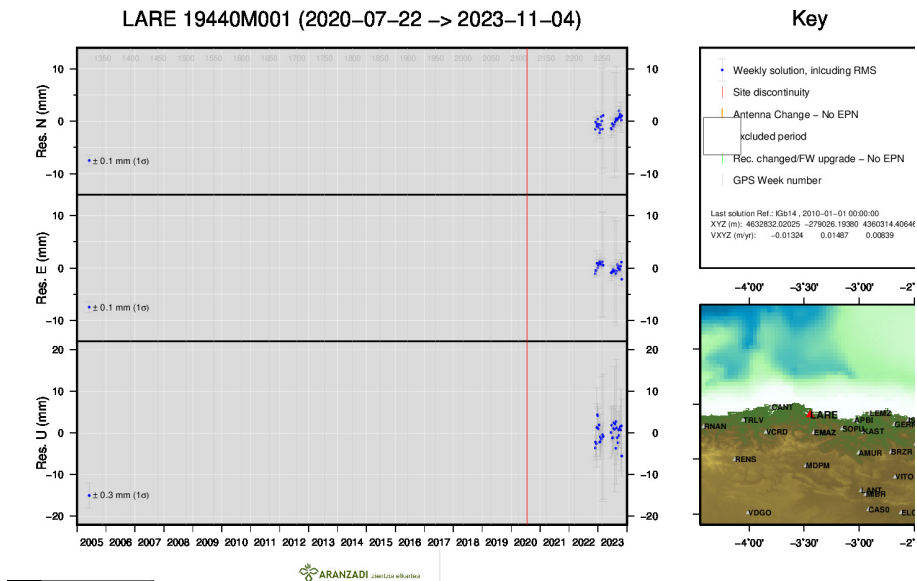
12 ) HOND



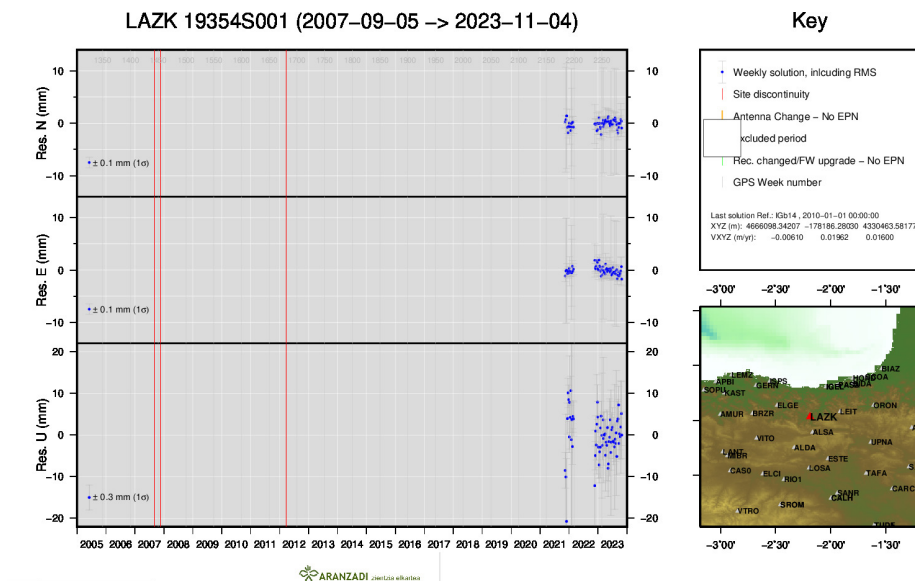
13 ) IGEL



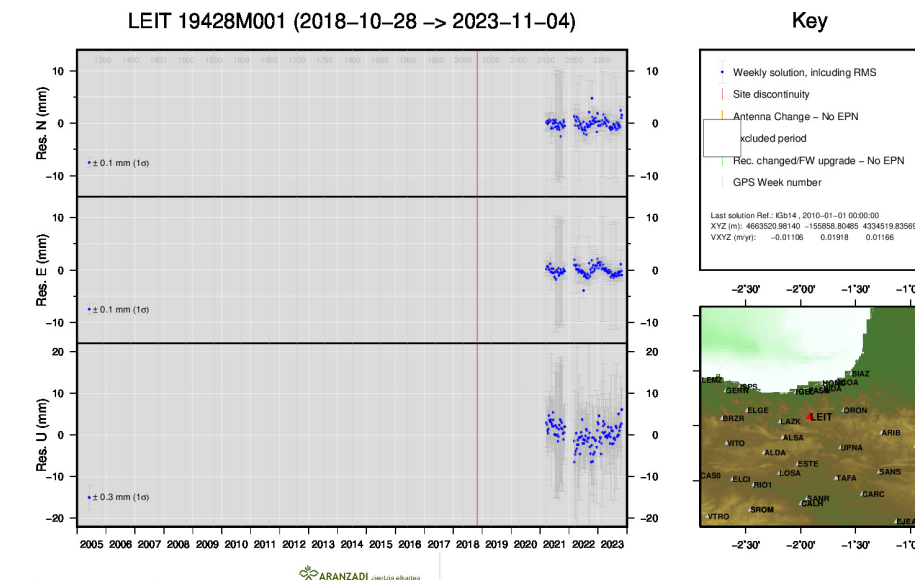
14 ) ISPS



15 ) LARE

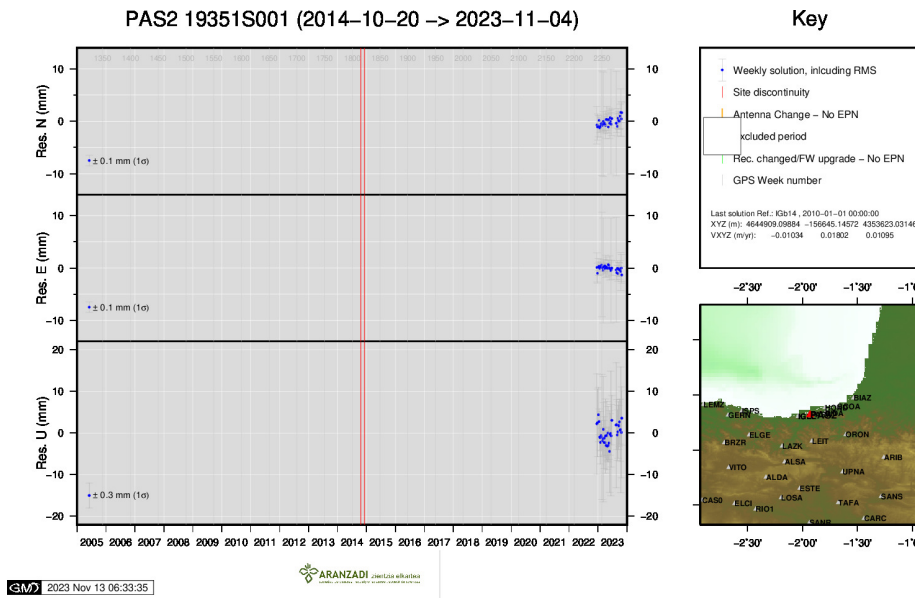


16 ) LAZK

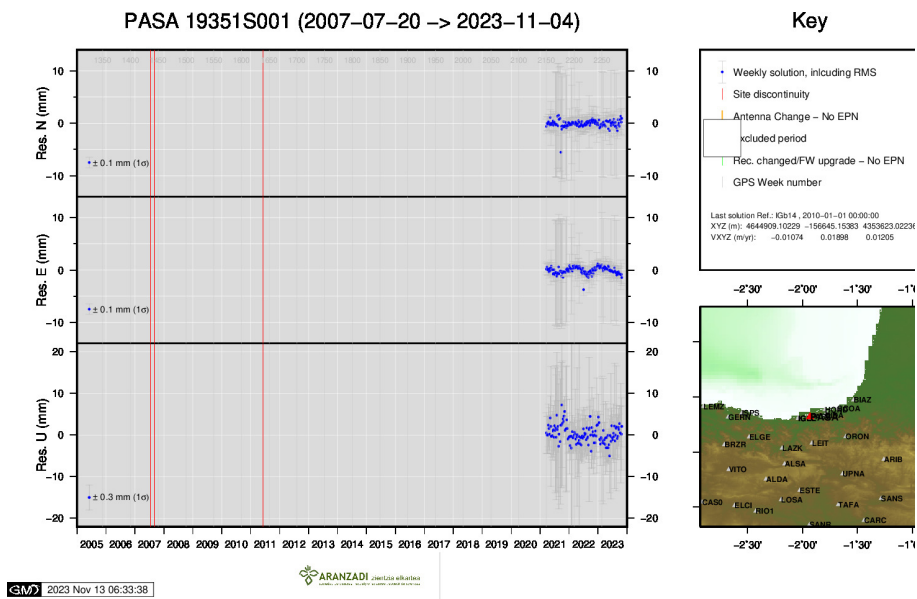


17 ) LEIT

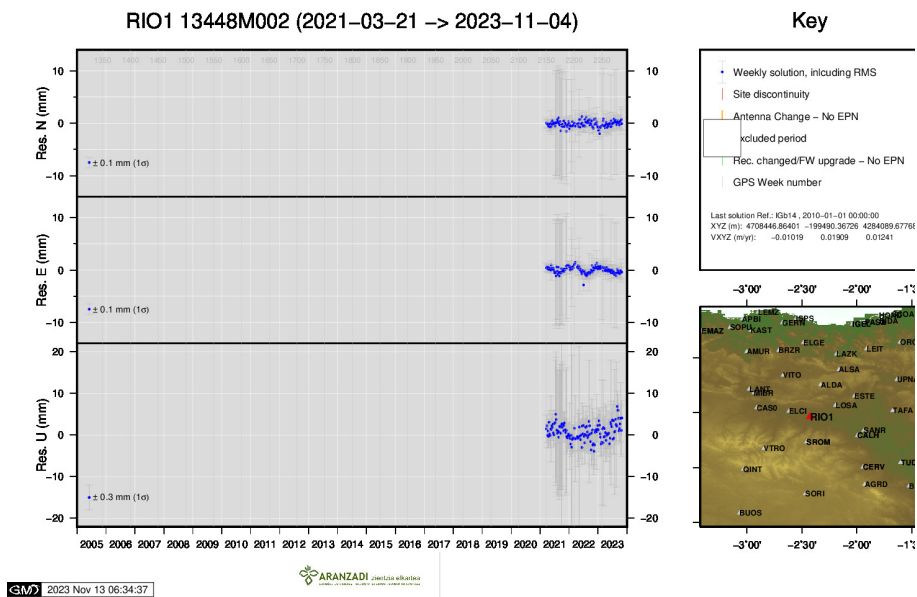




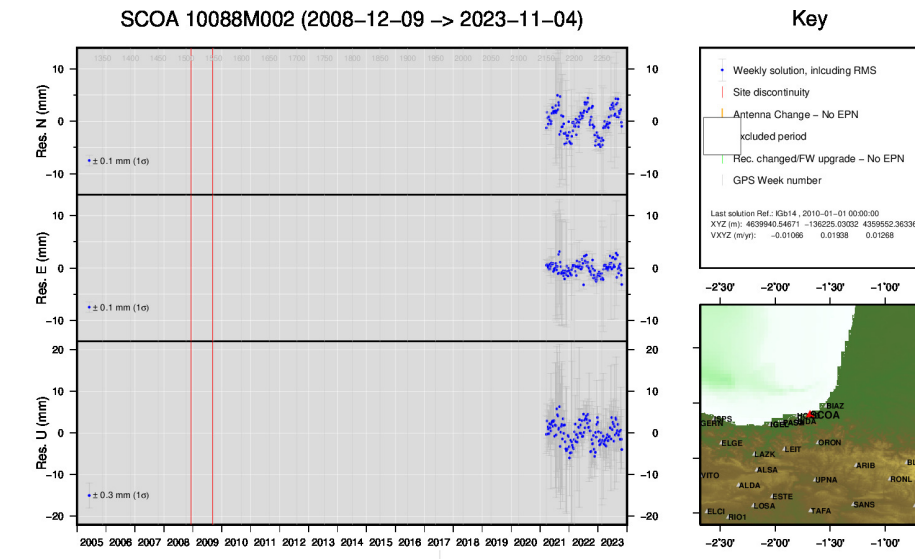
18 ) PAS2



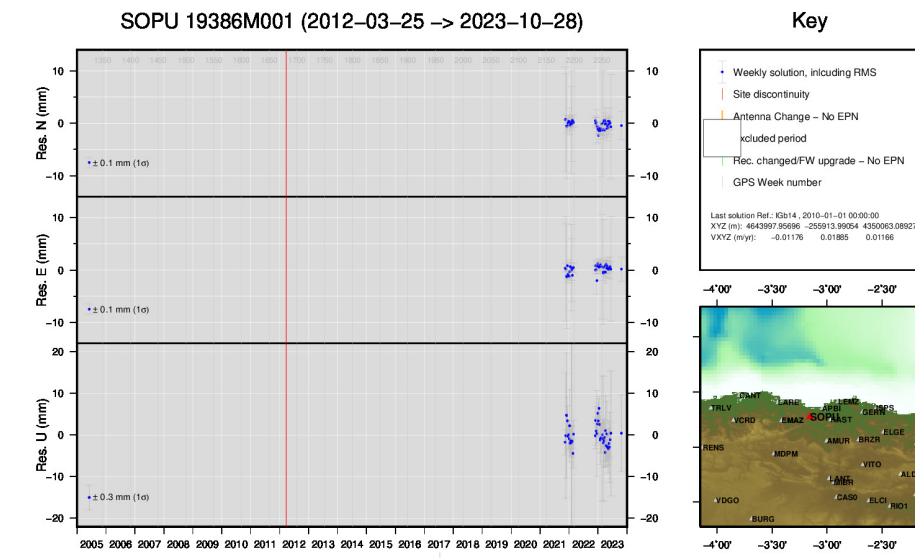
19 ) PASA



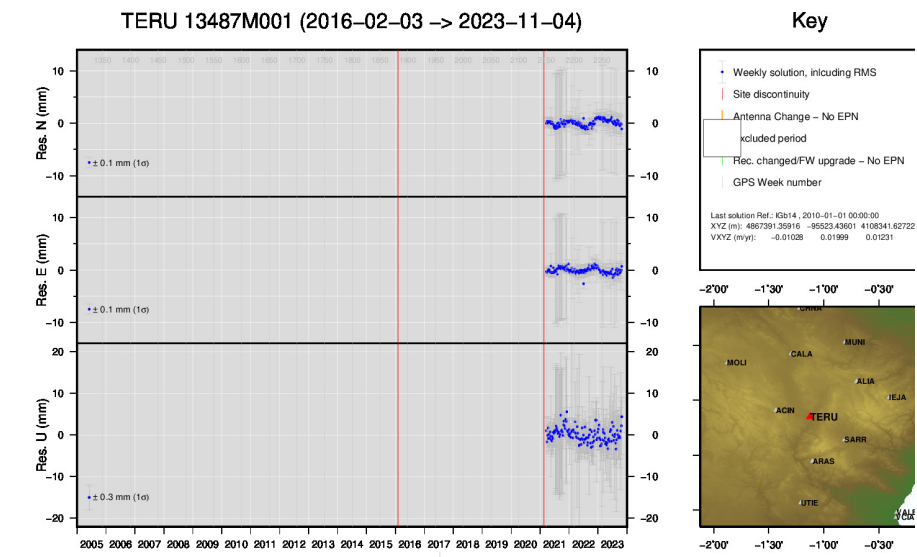
20 ) RIO1



21 ) SCOA

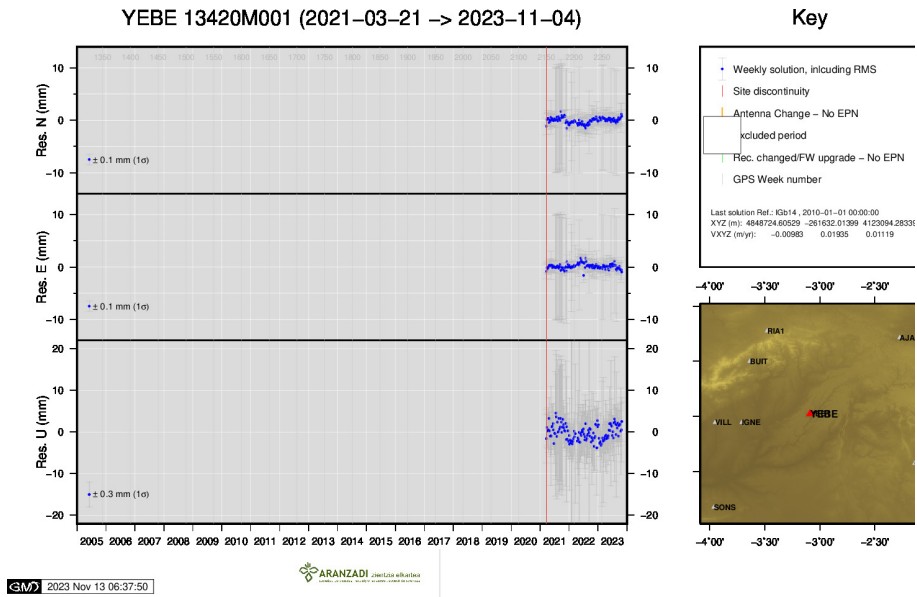


22 ) SOPU

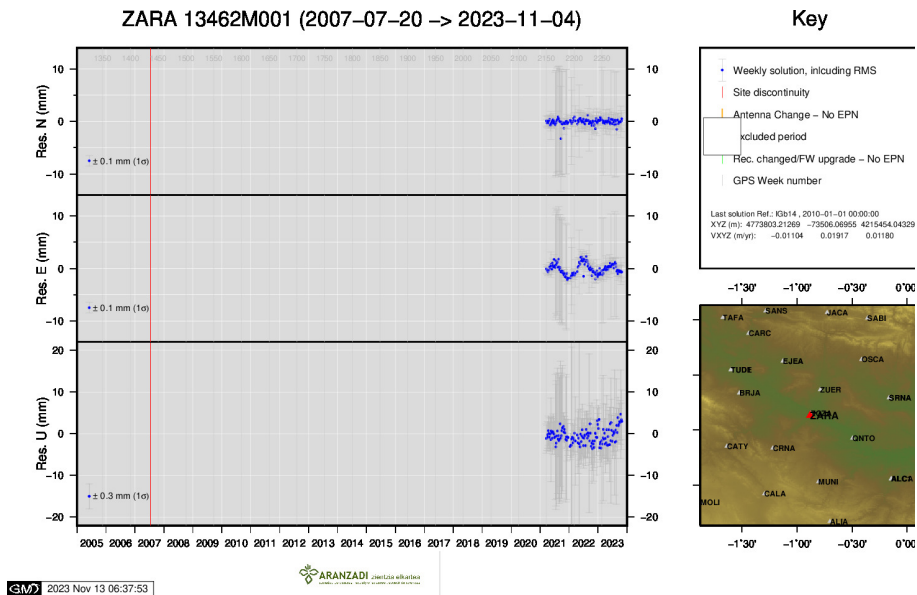


23 ) TERU





24 ) YEBE



25 ) ZARA