

# ARA-DAC Weekly Analysis Result: 2191 (GFA)

## Technical Report

**GPS Week: 2191 (GFA)**

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

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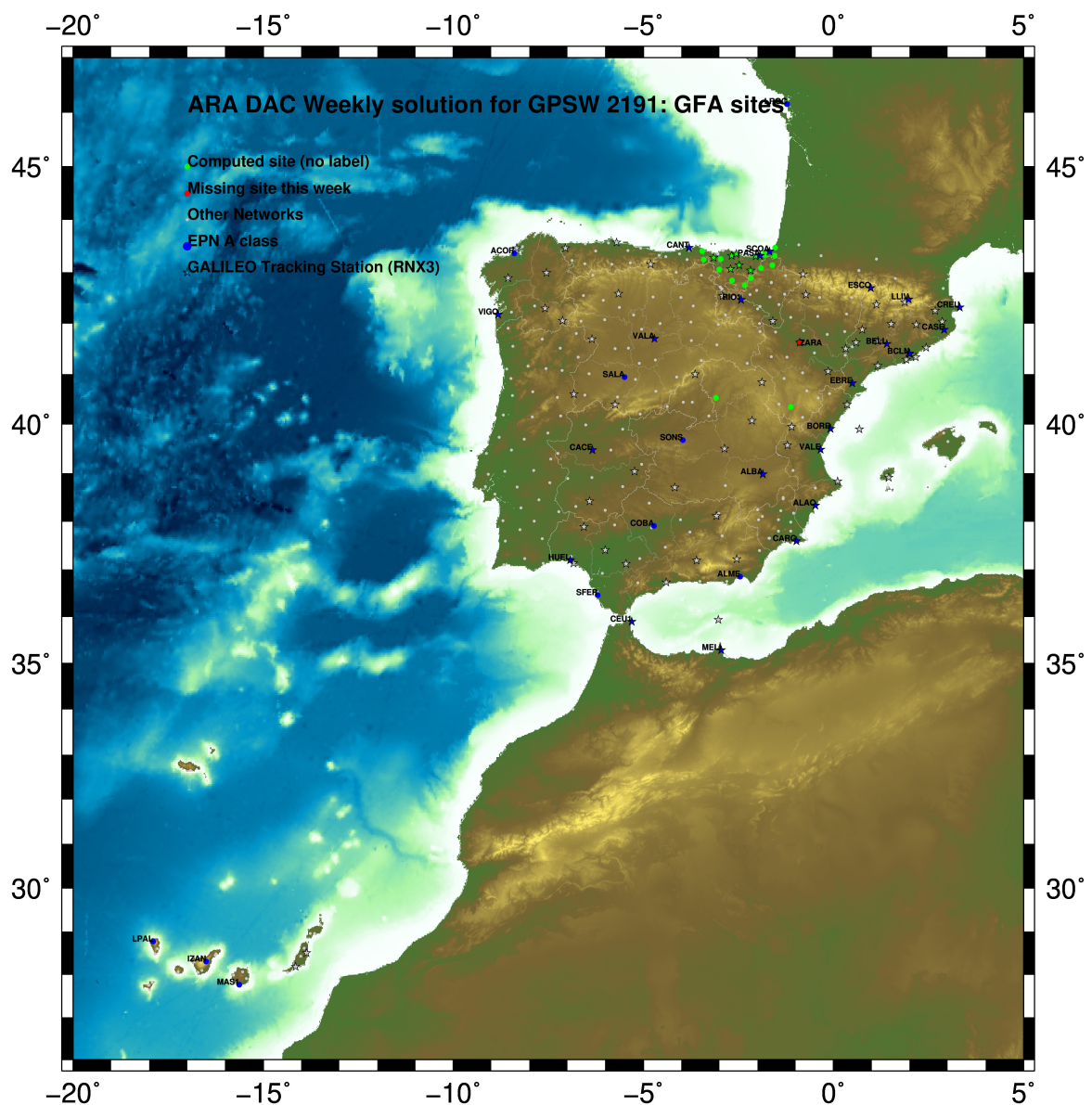
Report generated on 2022/01/26 at 13:18:48



# 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



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Fig.1: Computed Sites for GPS Week2191 (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 2191 WEEK FINAL COMBINATION: PRECISE ORBITS 26-JAN-22 09:36

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LOCAL GEODETIC DATUM: IGB14 EPOCH: 2022-01-05 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.53342	-678367.38876	4357066.31276	W
39	ALDA 19383M001	4687280.13063	-190876.51675	4308106.99410	A
50	ALSA 19419M001	4677250.79888	-176770.34393	4319079.90263	A
53	AMUR 19388M001	4661499.42055	-244591.20930	4332269.91603	A
100	BLAZ 10074M002	4634456.01829	-124344.92818	4365785.48944	A
101	BIDA 00000M000	4644177.78807	-145778.27575	4354832.51217	A
113	BRZR 19387M001	4662220.95825	-220769.85137	4333309.46790	A
104	CACE 13447M001	4899866.47698	-544566.98588	4033770.23549	W
116	CANT 13438M001	4625924.28596	-307096.18583	4365771.58685	W
154	CHER 00000M000	4645879.98478	-125721.86194	4353624.11427	A
162	CREU 13432M001	4715420.09545	273178.10875	4271946.87150	W
204	EBRE 13410M001	4833519.96190	41537.43858	4147461.74806	W
180	ELGE 19353S001	4657557.36207	-202241.42013	4338991.91497	A
182	EMAZ 17001M001	4645924.17525	-276949.81646	4347759.60474	A
209	GERN 19389M001	4642811.28664	-217222.87496	4353278.90655	A
257	HOND 15012M002	4640529.27810	-145676.93523	4358761.78213	A
235	IGEL 19352S001	4645951.39791	-165574.45310	4352550.44961	A
240	ISPS 19484M001	4640596.44560	-206963.72783	4356391.94347	A
245	KAST 19499M001	4646949.04651	-240747.22290	4348015.02388	A
252	LARE 19440M001	4632831.92336	-279026.09353	4360314.46001	A
256	LAZK 19354S001	4666098.29999	-178186.14121	4330463.69425	A
261	LEIT 19428M001	4663520.90371	-155858.66833	4334519.91556	A
334	ORON 19427M001	4659695.74556	-130864.68665	4338948.91224	A
345	PAS2 19351S001	4644909.02437	-156645.01940	4353623.10588	A
493	PASA 19351S001	4644909.02427	-156645.01938	4353623.10573	W
553	RID1 13448M002	4708446.79625	-199490.23522	4284089.76721	W
558	SALA 13469M001	4803054.45760	-462131.02205	4158379.11174	W
566	SCDA 10088M002	4639940.46424	-136224.89427	4359552.44140	W
418	SOPU 19386M001	4643997.87436	-255913.85890	4350063.17189	A
443	TERU 13487M001	4867391.28106	-95523.29587	4108341.71034	A
493	VITO 19385M001	4679397.67114	-218436.45482	4314898.39906	A
752	YEBE 13420M001	4848724.52984	-261631.87837	4123094.35580	A

### 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 2191 26-JAN-22 09:36

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LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2022-01-05 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.86086	-678367.97661	4357065.86169	W
39	ALDA 19383M001	4687280.51635	-190877.11405	4308106.54191	A
50	ALSA 19419M001	4677251.18721	-176770.94005	4319079.45144	A
53	AMUR 19388M001	4661499.80126	-244591.80383	4332269.46525	A
100	BLAZ 10074M002	4634456.41678	-124345.51930	4365785.04245	A
101	BIDA 00000M000	4644178.18302	-145778.86803	4354832.06410	A
113	BRZR 19387M001	4662221.34207	-220770.44592	4333309.01737	A
104	CACE 13447M001	4899866.79708	-544567.60779	4033769.76109	W
116	CANT 13438M001	4625924.66125	-307096.77650	4365771.13816	W
154	CHER 00000M000	4645880.38218	-125722.45435	4353623.66633	A
162	CREU 13432M001	4715420.53725	273177.50995	4271946.42299	W
204	EBRE 13410M001	4833520.36498	41536.82563	4147461.28686	W
180	ELGE 19353S001	4657557.74866	-202242.01410	4338991.46507	A
182	EMAZ 17001M001	4645924.55302	-276950.40932	4347759.15481	A
209	GERN 19389M001	4642811.67241	-217223.46730	4353278.45766	A
257	HOND 15012M002	4640529.67336	-145676.52710	4358781.33436	A
235	IGEL 19352S001	4645951.79018	-165575.04565	4352550.00114	A
240	ISPS 19484M001	4640596.83290	-206964.31989	4356391.49490	A
245	KAST 19499M001	4646949.42889	-240747.81577	4348014.57434	A
252	LARE 19440M001	4632832.30181	-279026.68491	4360314.01112	A
256	LAZK 19354S001	4666098.68899	-178186.73607	4330463.24396	A
261	LEIT 19428M001	4663521.29585	-155859.26284	4334519.46578	A
334	ORON 19427M001	4659696.14121	-130865.28064	4338948.46309	A
345	PAS2 19351S001	4644909.41785	-156645.61180	4353622.65761	A
493	PASA 19351S001	4644909.41775	-156645.61178	4353622.65746	W
553	RID1 13448M002	4708447.17906	-199490.83492	4284089.31316	W
558	SALA 13469M001	4803054.79758	-462131.63302	4158378.64644	W
566	SCDA 10088M002	4639940.86076	-136225.48604	4359551.99381	W
418	SOPU 19386M001	4643998.25497	-255914.45148	4350062.72239	A
443	TERU 13487M001	4867391.66382	-95523.91308	4108341.24457	A
493	VITO 19385M001	4679398.05387	-218437.05130	4314897.94715	A
752	YEBE 13420M001	4848724.89263	-261632.49398	4123093.88939	A

### 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 2191		26-JAN-22 09:36			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2022-01-05 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.82013	-678368.01428	4357065.91304	W
39	ALDA 19383M001	4687280.47326	-190877.15304	4308106.59313	A
50	ALSA 19419M001	4677251.14418	-176770.97914	4319079.50270	A
53	AMUR 19388M001	4661499.75861	-244591.84275	4332269.51652	A
100	BIAZ 10074M002	4634456.37402	-124345.55875	4365785.09386	A
101	BIDA 00000M000	4644178.14022	-145778.90737	4354832.11547	A
113	BRZR 19387M001	4662221.29933	-220770.48492	4333309.06865	A
104	CACE 13447M001	4899866.75270	-544567.64464	4033769.81164	W
116	CANT 13438M001	4625924.61916	-307096.81535	4365771.18951	W
154	CHER 00000M000	4645880.33930	-125722.49375	4353623.71770	A
162	CREU 13432M001	4715420.49219	273177.46948	4271946.47445	W
204	EBRE 13410M001	4833520.31952	41536.78645	4147461.33782	W
180	ELGE 19353S001	4657557.70592	-202242.05318	4338991.51637	A
182	EMAZ 17001M001	4645924.51064	-276950.44820	4347759.20611	A
209	GERN 19389M001	4642811.62986	-217223.50639	4353278.50900	A
257	HOND 15012M002	4640529.63060	-145676.56645	4358781.38575	A
235	IGEL 19352S001	4645951.74743	-165575.08491	4352550.05249	A
240	ISPS 19484M001	4640596.79035	-206964.35903	4356391.54625	A
245	KAST 19499M001	4646949.38638	-240747.85477	4348014.62566	A
252	LARE 19440M001	4632832.25956	-279026.72382	4360314.06247	A
256	LAZK 19354S001	4666098.64608	-178186.77520	4330463.29525	A
261	LEIT 19428M001	4663521.25290	-155859.30206	4334519.51708	A
334	ORON 19427M001	4659696.09820	-130865.31996	4338948.51443	A
345	PAS2 19351S001	4644909.37508	-156645.65109	4353622.70897	A
493	PASA 19351S001	4644909.37498	-156645.65107	4353622.70882	W
553	RI01 13448M002	4708447.13577	-199490.87380	4284089.36432	W
558	SALA 13469M001	4803054.75407	-462131.67058	4158378.69724	W
566	SOA 10088M002	4639940.81797	-136225.52543	4359552.04519	W
418	SOPU 19386M001	4643998.21254	-255914.49043	4350062.77371	A
443	TERU 13487M001	4867391.61846	-95523.95164	4108341.29536	A
493	VITD 19385M001	4679398.01095	-218437.09024	4314897.99838	A
752	YEBE 13420M001	4848724.84802	-261632.53204	4123093.94014	A

## 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).

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Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.91	0.71	3.04
ALDA 19383M001	6	XXXXXX	1.42	1.14	3.96
ALSA 19419M001	7	XXXXXX	1.30	0.84	3.64
AMUR 19388M001	7	XXXXXX	2.67	2.22	5.26
BLAZ 10074M002	7	XXXXXX	1.74	1.92	3.76
BIDA 00000M000	7	XXXXXX	1.32	1.46	3.44
BRZR 19387M001	7	XXXXXX	1.81	2.16	6.03
CACE 13447M001	7	XXXXXX	0.38	0.43	2.10
CANT 13438M001	7	XXXXXX	1.09	0.75	3.14
CHER 00000M000	7	XXXXXX	0.69	1.44	4.77
CREU 13432M001	7	XXXXXX	1.29	0.95	4.24
EBRE 13410M001	7	XXXXXX	0.97	1.66	4.19
ELGE 19353S001	7	XXXXXX	2.50	1.77	3.31
EMAZ 17001M001	7	XXXXXX	1.33	0.73	3.21
GERN 19389M001	7	XXXXXX	0.91	1.81	2.88
HOND 15012M002	7	XXXXXX	1.06	0.90	2.77
IGEL 19352S001	7	XXXXXX	1.11	0.53	3.90
ISPS 19484M001	7	XXXXXX	1.57	1.39	3.38
KAST 19499M001	7	XXXXXX	1.41	0.79	6.36
LARE 19440M001	7	XXXXXX	1.05	0.64	1.38
LAZK 19354S001	6	XXXXXX	0.65	2.22	8.55
LEIT 19428M001	7	XXXXXX	2.16	1.48	4.70
ORON 19427M001	7	XXXXXX	0.71	0.52	2.47
PAS2 19351S001	7	XXXXXX	0.87	0.89	2.02
PASA 19351S001	7	XXXXXX	0.88	0.94	2.37
RI01 13448M002	7	XXXXXX	1.34	0.61	1.29
SALA 13469M001	6	XXXX X	0.65	0.78	2.36
SCDA 10088M002	7	XXXXXX	2.67	1.10	3.75
SOPU 19386M001	7	XXXXXX	0.76	1.32	4.53
TERU 13487M001	6	XX XXX	1.04	0.73	3.25
VITD 19385M001	7	XXXXXX	0.90	1.21	2.28
YEBE 13420M001	7	XXXXXX	0.47	0.41	1.92

Comparison of individual solutions:

ACOR 13434M001	N	0.91	-0.37	1.68	0.55	-0.24	-0.77	-0.21	-1.00
ACOR 13434M001	E	0.71	-0.25	-0.44	-0.89	0.57	0.58	1.11	-0.20
ACOR 13434M001	U	3.04	0.12	5.67	-1.93	-1.95	3.64	-0.90	-1.24
ALDA 19383M001	N	1.42		-1.00	2.43	0.41	-0.52	-1.48	-0.72
ALDA 19383M001	E	1.14		-1.03	0.03	-0.91	-1.13	0.78	1.67
ALDA 19383M001	U	3.96		1.78	-4.52	1.75	3.89	-2.51	-5.51
ALSA 19419M001	N	1.30	-1.40	-1.33	0.56	-0.68	0.90	2.01	-0.91
ALSA 19419M001	E	0.84	0.60	0.87	-1.01	-0.85	-0.58	0.85	0.57
ALSA 19419M001	U	3.64	5.09	-2.41	-0.37	1.36	2.98	-5.93	1.37
AMUR 19388M001	N	2.67	1.70	0.61	-5.92	1.20	0.83	1.51	-0.03
AMUR 19388M001	E	2.22	0.94	0.11	-4.79	2.34	0.11	-0.26	0.26
AMUR 19388M001	U	5.26	-5.63	-0.21	5.69	1.29	-6.66	6.27	-4.10
BLAZ 10074M002	N	1.74	-2.31	-1.07	2.39	2.07	-0.11	-1.27	0.27
BLAZ 10074M002	E	1.92	-0.23	0.35	-4.23	0.73	-0.12	-0.29	1.83
BLAZ 10074M002	U	3.76	4.55	-3.79	-5.31	-2.39	0.39	3.92	0.38
BIDA 00000M000	N	1.32	-0.30	-2.91	0.17	0.16	-1.12	-0.43	0.57
BIDA 00000M000	E	1.46	-1.17	-2.63	1.30	-0.81	0.17	1.46	0.32
BIDA 00000M000	U	3.44	2.30	2.76	2.21	2.89	-6.21	0.59	2.46
BRZR 19387M001	N	1.81	-0.69	-2.92	-0.06	1.21	2.87	0.15	1.03
BRZR 19387M001	E	2.16	-0.76	-4.29	-0.40	1.75	1.53	1.44	1.15
BRZR 19387M001	U	6.03	-9.64	-4.62	0.99	5.37	-1.80	7.19	4.36
CACE 13447M001	N	0.38	0.31	-0.59	-0.06	0.08	0.11	0.16	0.62
CACE 13447M001	E	0.43	-0.59	-0.59	0.18	0.34	0.11	0.45	0.26
CACE 13447M001	U	2.10	3.91	-2.36	-2.22	0.24	0.37	-0.47	-0.47
CANT 13438M001	N	1.09	0.46	0.60	2.10	1.02	0.48	-0.93	-0.29
CANT 13438M001	E	0.75	0.12	-0.92	-0.24	0.09	0.40	1.51	0.06
CANT 13438M001	U	3.14	-0.92	-0.35	-6.42	-1.41	-1.89	1.98	2.75
CHER 00000M000	N	0.69	0.45	-0.22	0.18	-1.18	-0.61	-0.92	-0.04
CHER 00000M000	E	1.44	-0.53	-1.78	-1.77	1.65	1.09	-1.38	0.29
CHER 00000M000	U	4.77	4.15	6.01	-5.49	-1.68	-2.34	6.54	1.36
CREU 13432M001	N	1.29	0.35	0.04	-0.57	-2.90	0.28	0.76	0.67
CREU 13432M001	E	0.95	-0.83	-2.03	-0.13	0.61	-0.14	0.26	0.32
CREU 13432M001	U	4.24	0.19	3.78	-3.14	7.23	-0.32	-4.33	3.53
EBRE 13410M001	N	0.97	0.49	0.72	0.45	-0.94	0.55	-1.83	0.43
EBRE 13410M001	E	1.66	0.59	-0.73	-0.31	0.74	0.31	0.81	-3.76
EBRE 13410M001	U	4.19	-4.63	0.71	0.84	-1.08	1.32	8.82	-1.44
ELGE 19353S001	N	2.50	1.66	4.11	-2.71	-0.69	1.72	-2.58	0.53
ELGE 19353S001	E	1.77	-0.23	3.46	-1.06	-0.37	-1.46	1.49	-1.11
ELGE 19353S001	U	2.31	-2.52	1.67	-2.78	0.82	1.01	3.36	-1.51
EMAZ 17001M001	N	1.33	0.86	0.17	2.01	1.40	1.12	-1.61	0.19
EMAZ 17001M001	E	0.73	0.17	0.26	0.67	-1.21	-0.06	-0.02	1.08
EMAZ 17001M001	U	3.21	-5.36	-2.70	0.34	-1.64	-0.10	4.60	-1.35
GERN 19389M001	N	0.91	0.15	1.80	-0.29	-0.32	0.96	-0.58	-0.47
GERN 19389M001	E	1.81	-0.63	-0.75	-2.33	1.07	1.66	2.60	-1.59
GERN 19389M001	U	2.88	-5.25	0.84	0.88	0.59	-1.67	3.97	1.35
HOND 15012M002	N	1.06	0.25	-1.59	-1.81	-0.03	0.15	0.01	-0.93
HOND 15012M002	E	0.90	-1.70	-0.78	-0.05	-0.06	-0.43	0.71	0.82
HOND 15012M002	U	2.77	5.55	2.43	1.90	-0.53	-1.87	-1.04	0.80
IGEL 19352S001	N	1.11	-0.69	0.25	1.12	-1.23	-0.34	-1.69	-1.07
IGEL 19352S001	E	0.53	-0.88	-0.35	0.52	-0.47	-0.49	0.29	0.03
IGEL 19352S001	U	3.90	4.62	3.38	1.95	-0.57	-6.33	3.78	0.17
ISPS 19484M001	N	1.57	1.74	-2.46	1.40	0.76	1.15	0.09	-1.35
ISPS 19484M001	E	1.39	-1.08	-2.35	1.42	0.66	-0.43	1.51	-0.01
ISPS 19484M001	U	3.38	-2.11	1.71	-0.68	5.57	1.03	-0.95	-5.27
KAST 19499M001	N	1.41	-0.36	-2.52	0.65	0.99	1.82	0.82	-0.10
KAST 19499M001	E	0.79	-0.60	-0.92	1.45	0.47	-0.05	-0.36	0.18
KAST 19499M001	U	6.36	-5.85	-9.12	-0.88	7.16	-0.80	8.30	1.96
LARE 19440M001	N	1.05	-0.11	-0.11	0.27	-0.03	1.97	0.27	1.62
LARE 19440M001	E	0.64	-0.65	0.75	-0.69	0.31	0.78	0.54	-0.16

LARE	19440M001	U	1.38	-2.67	0.79	-0.89	-1.05	-0.68	-1.16	0.07
LAZK	19354S001	N	0.65		0.19	-0.34	-0.93	-0.28	1.00	-0.08
LAZK	19354S001	E	2.22		4.24	0.91	-1.11	-1.06	-1.50	-1.15
LAZK	19354S001	U	8.55		13.05	4.63	-9.49	2.78	-8.25	-2.79
LEIT	19428M001	N	2.16	-2.58	-2.77	3.49	0.14	0.21	0.87	-0.87
LEIT	19428M001	E	1.48	-0.18	-2.97	1.06	-0.78	-0.40	1.12	1.05
LEIT	19428M001	U	4.70	2.48	9.05	3.37	-3.39	-3.03	-3.43	-0.77
ORON	19427M001	N	0.71	-0.87	-0.98	1.07	-0.02	-0.24	0.09	-0.36
ORON	19427M001	E	0.52	0.12	0.18	-0.29	0.06	-0.69	-0.12	1.01
ORON	19427M001	U	2.47	2.07	0.87	4.65	0.62	-1.47	-1.92	-1.94
PAS2	19351S001	N	0.87	0.06	-0.63	-1.02	-0.46	-0.06	-1.70	-0.04
PAS2	19351S001	E	0.89	-1.07	-1.38	-0.83	0.75	0.30	0.39	0.52
PAS2	19351S001	U	2.02	1.68	1.62	3.68	-0.39	-1.31	-0.15	1.90
PASA	19351S001	N	0.88	0.19	-0.65	-1.09	-0.59	-0.03	-1.61	-0.16
PASA	19351S001	E	0.94	-1.12	-1.41	-0.96	0.78	0.35	0.40	0.52
PASA	19351S001	U	2.37	2.13	1.51	3.96	0.18	-2.57	0.35	2.10
RID1	13448M002	N	1.34	-1.05	-0.98	0.51	-0.08	-0.44	2.75	-0.80
RID1	13448M002	E	0.61	-0.45	0.84	0.36	0.00	-0.27	-0.25	1.01
RID1	13448M002	U	1.29	0.73	-2.53	-1.40	0.03	0.01	1.06	0.16
SALA	13469M001	N	0.65	-1.26	0.07	-0.40	0.14	-0.19		0.56
SALA	13469M001	E	0.78	0.83	0.01	-1.48	0.30	0.13		0.28
SALA	13469M001	U	2.36	4.12	-1.08	-0.12	-2.89	0.10		1.19
SCDA	10088M002	N	2.67	-0.09	0.98	2.08	2.86	-2.92	-3.62	-2.78
SCDA	10088M002	E	1.10	-1.77	-0.49	1.30	1.16	-0.84	0.20	-0.28
SCDA	10088M002	U	3.75	4.57	5.70	-4.36	-0.84	-2.85	1.49	1.08
SOPU	19386M001	N	0.76	-0.83	-0.07	0.56	-0.47	1.29	0.72	0.21
SOPU	19386M001	E	1.32	0.38	-1.51	-1.28	1.89	1.38	-0.94	0.25
SOPU	19386M001	U	4.53	-4.01	-2.94	3.84	5.03	-2.28	5.99	-4.15
TERU	13487M001	N	1.04	0.30	1.32	0.31		0.24	-1.71	0.72
TERU	13487M001	E	0.73	0.01	0.86	1.27		-0.48	-0.14	-0.17
TERU	13487M001	U	3.25	-0.87	-4.11	4.81		0.37	2.80	-2.00
VITO	19385M001	N	0.90	0.71	0.07	-1.24	1.11	1.11	0.08	-0.56
VITO	19385M001	E	1.21	0.05	-1.63	1.39	-0.09	-1.34	1.33	0.80
VITO	19385M001	U	2.28	0.63	-2.25	2.85	0.23	-3.30	-2.40	-0.91
YEBE	13420M001	N	0.47	-0.53	-0.68	0.03	0.28	-0.16	-0.50	0.51
YEBE	13420M001	E	0.41	-0.56	0.24	-0.16	0.27	0.43	0.60	-0.05
YEBE	13420M001	U	1.92	-3.13	1.10	-0.39	-1.19	2.86	0.72	-0.86

## 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	-0.43	0.16	-1.82
12	ALAC 13433M001	I W	-0.86	-0.38	2.20
15	ALBA 13452M001	I W	-0.43	-0.72	-2.57
21	ALME 13437M001	I W	-1.89	-0.77	4.81
47	BCLN 13412M001	I W	-0.87	-2.00	0.06
52	BELL 13431M001	I W	1.10	-1.74	1.60
71	BORR 13480M001	I W	-2.26	-1.21	-1.51
76	BRST 10004M004	I W	-0.06	-1.61	1.63
104	CACE 13447M001	I W	1.06	-0.94	4.03
116	CANT 13438M001	I W	0.00	0.26	-4.01
117	CARG 19412M001	I W	1.79	-2.13	-3.84
122	CASE 13494M001	I W	-2.01	1.40	-1.39
128	CEU1 13449M002	I W	0.13	-0.54	-1.22
143	COBA 13453M001	I W	-0.19	-0.22	-1.75
162	CREU 13432M001	I W	-0.92	0.57	1.06
204	EBRE 13410M001	I W	0.72	2.02	-4.26
222	ESCO 13435M001	I W	-2.97	-0.17	4.20
299	HUEL 13451M001	I W	-4.43	6.65	-4.13
316	IZAN 31309M002	I W	-1.35	0.06	-2.17
385	LLIV 13436M001	I W	0.03	1.58	0.97
390	LPAL 81701M001	I W	10.34	-3.63	6.88
392	LROC 10023M001	I W	-0.55	1.57	-0.79
421	MAS1 31303M002	I W	-0.29	-0.63	-0.68
432	MELI 19379M001	I W	1.44	0.65	-1.49
493	PASA 19351S001	I W	-0.54	-0.90	1.48
553	RID1 13448M002	I W	-1.51	-0.34	-0.90
558	SALA 13469M001	I W	0.31	1.21	-5.44
566	SCDA 10088M002	I W	0.34	0.50	0.32
574	SFER 13402M004	I W	1.60	-2.91	2.54
599	SONS 13446M001	I W	0.63	3.96	7.42
700	VALA 13463M002	I W	0.50	1.33	0.89
704	VALE 13439M001	I W	0.38	1.54	-2.31
715	VIGO 13450M001	I W	1.20	-2.62	0.20
764	ZIMM 14001M004	I W	-16.93	0.29	5.58
	RMS / COMPONENT		2.30	1.98	3.11
	MEAN		0.00	-0.00	-0.00
	MIN		-4.43	-3.63	-5.44
	MAX		10.34	6.65	7.42

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 99  
RMS OF TRANSFORMATION : 2.51 MM

BARYCENTER COORDINATES:

LATITUDE : 39 56 41.19  
LONGITUDE : - 3 36 49.12  
HEIGHT : -38.161 KM

PARAMETERS:

TRANSLATION IN N : 0.49 +- 0.44 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          18321530
NUMBER OF UNKNOWN               217239
NUMBER OF DEGREES OF FREEDOM    18104291
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  1.666034971314859

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
  1  0.00179    -0.0061 -0.0032  0.0058  0.0000 -0.0003 -0.0001  0.00016
  2  0.00201     0.0091 -0.0153 -0.0124  0.0003  0.0005 -0.0004  0.00018
  3  0.00216    -0.0039 -0.0236 -0.0031  0.0005 -0.0000 -0.0006  0.00055
  4  0.00189     0.0085  0.0157 -0.0038 -0.0003  0.0003  0.0004 -0.00045
  5  0.00169     0.0057  0.0063 -0.0029 -0.0001  0.0002  0.0001 -0.00026
  6  0.00192    -0.0109 -0.0112  0.0120  0.0002 -0.0005 -0.0003 -0.00002
  7  0.00163    -0.0094 -0.0110  0.0083  0.0002 -0.0004 -0.0003  0.00023
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00128    2599733      1.63      2631269      3      954      30585      0
  2  0.00128    2596190      1.63      2628006      3      975      30844      0
  3  0.00136    2456455      1.85      2488579      3      936      31191      0
  4  0.00133    2473407      1.77      2505537      3      942      31191      0
  5  0.00123    2635952      1.52      2667451      3      987      30515      0
  6  0.00128    2669818      1.65      2702352      3      990      31547      0
  7  0.00126    2666991      1.58      2698336      3      987      30361      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 22:002:00000 22:008:86370 LEICA GR50 -----
ALDA  A  1 P 22:003:00090 22:008:86370 LEICA GR10 -----
ALSA  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
AMUR  A  1 P 22:002:00000 22:008:86370 LEICA GR10 -----
BIAZ  A  1 P 22:002:00000 22:008:81690 SPECTRA SP90M -----
BIDA  A  1 P 22:002:00000 22:008:86370 LEICA GR10 -----
BRZR  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
CACE  A  1 P 22:002:00000 22:008:86370 TRIMBLE NETR9 -----
CANT  A  1 P 22:002:00000 22:008:86370 LEICA GR10 -----
CHER  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
CREU  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
EBRE  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
ELGE  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
EMAZ  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
GERN  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
HOND  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
IGEL  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
ISPS  A  1 P 22:002:00000 22:008:86370 TRIMBLE NETR9 -----
KAST  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
LARE  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
LAZK  A  1 P 22:003:00000 22:008:86370 LEICA GR30 -----
LEIT  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
ORON  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
PAS2  A  1 P 22:002:00030 22:008:86370 STONEX SC2200 -----
PASA  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
RIO1  A  1 P 22:002:00000 22:008:86370 LEICA GR25 -----
SALA  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
SCOA  A  1 P 22:002:00000 22:008:86370 LEICA GR25 -----
SOPU  A  1 P 22:002:00000 22:008:86370 LEICA GR30 -----
TERU  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
VITO  A  1 P 22:002:00000 22:008:86370 LEICA GR10 -----
YEBE  A  1 P 22:002:00000 22:008:86370 LEICA GR50 -----
```

### 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 22:002:00000 22:008:86370 LEIAS04      LEIS -----
ALDA  A  1 P 22:003:00090 22:008:86370 LEIAS10      NONE -----
ALSA  A  1 P 22:002:00000 22:008:86370 LEIAS10      NONE -----
AMUR  A  1 P 22:002:00000 22:008:86370 LEIAS10      NONE -----
```

BLAZ	A	1	P	22:002:00000	22:008:81690	LEIAR25	LEIT	----
BIDA	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
BRZR	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
CACE	A	1	P	22:002:00000	22:008:86370	TRM29659.00	NONE	----
CANT	A	1	P	22:002:00000	22:008:86370	LEIAR25.R4	LEIT	25066
CHER	A	1	P	22:002:00000	22:008:86370	LEIAR10	NONE	----
CREU	A	1	P	22:002:00000	22:008:86370	LEIAR25.R4	NONE	26357
EBRE	A	1	P	22:002:00000	22:008:86370	LEIAR25.R4	NONE	26359
ELGE	A	1	P	22:002:00000	22:008:86370	LEIAR25.R4	LEIT	----
EMAZ	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
GERN	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
HOND	A	1	P	22:002:00000	22:008:86370	LEIAR20	LEIM	41012
IGEL	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
ISPS	A	1	P	22:002:00000	22:008:86370	TRM59900.00	SCIS	----
KAST	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
LARE	A	1	P	22:002:00000	22:008:86370	LEIAR20	LEIM	----
LAZK	A	1	P	22:003:00000	22:008:86370	LEIAR25.R4	LEIT	----
LEIT	A	1	P	22:002:00000	22:008:86370	LEIAR10	NONE	----
ORDN	A	1	P	22:002:00000	22:008:86370	LEIAR10	NONE	----
PAS2	A	1	P	22:002:00030	22:008:86370	LEIAR20	LEIM	73034
PASA	A	1	P	22:002:00000	22:008:86370	LEIAR20	LEIM	73034
RIO1	A	1	P	22:002:00000	22:008:86370	LEIAR25.R4	LEIT	25138
SALA	A	1	P	22:002:00000	22:008:86370	LEIAR25	NONE	----
SCDA	A	1	P	22:002:00000	22:008:86370	TRM55971.00	NONE	----
SOPU	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
TERU	A	1	P	22:002:00000	22:008:86370	LEIAR20	LEIM	49044
VITO	A	1	P	22:002:00000	22:008:86370	LEIAS10	NONE	----
YEBE	A	1	P	22:002:00000	22:008:86370	LEIAR20	LEIM	49016

### 7.3 Eccentricities

*S	PT	SOLN	T	DATA_START_	DATA_END_	AXE	ARP->BENCHMARK(M)	UP	NORTH	EAST
ACOR	A	1	P	22:002:00000	22:008:86370	UNE	3.0460	0.0000	0.0000	0.0000
ALDA	A	1	P	22:003:00090	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
ALSA	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
AMUR	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
BLAZ	A	1	P	22:002:00000	22:008:81690	UNE	0.0000	0.0000	0.0000	0.0000
BIDA	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
BRZR	A	1	P	22:002:00000	22:008:86370	UNE	0.0771	0.0000	0.0000	0.0000
CACE	A	1	P	22:002:00000	22:008:86370	UNE	0.0600	0.0000	0.0000	0.0000
CANT	A	1	P	22:002:00000	22:008:86370	UNE	3.0490	0.0000	0.0000	0.0000
CHER	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
CREU	A	1	P	22:002:00000	22:008:86370	UNE	0.0770	0.0000	0.0000	0.0000
EBRE	A	1	P	22:002:00000	22:008:86370	UNE	0.0770	0.0000	0.0000	0.0000
ELGE	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
EMAZ	A	1	P	22:002:00000	22:008:86370	UNE	0.0350	0.0000	0.0000	0.0000
GERN	A	1	P	22:002:00000	22:008:86370	UNE	0.0771	0.0000	0.0000	0.0000
HOND	A	1	P	22:002:00000	22:008:86370	UNE	0.0771	0.0000	0.0000	0.0000
IGEL	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
ISPS	A	1	P	22:002:00000	22:008:86370	UNE	0.0350	0.0000	0.0000	0.0000
KAST	A	1	P	22:002:00000	22:008:86370	UNE	0.0350	0.0000	0.0000	0.0000
LARE	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
LAZK	A	1	P	22:003:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
LEIT	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
ORDN	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
PAS2	A	1	P	22:002:00030	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
PASA	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
RIO1	A	1	P	22:002:00000	22:008:86370	UNE	0.0606	0.0000	0.0000	0.0000
SALA	A	1	P	22:002:00000	22:008:86370	UNE	0.0600	0.0000	0.0000	0.0000
SCDA	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
SOPU	A	1	P	22:002:00000	22:008:86370	UNE	0.0771	0.0000	0.0000	0.0000
TERU	A	1	P	22:002:00000	22:008:86370	UNE	0.0600	0.0000	0.0000	0.0000
VITO	A	1	P	22:002:00000	22:008:86370	UNE	0.0000	0.0000	0.0000	0.0000
YEBE	A	1	P	22:002:00000	22:008:86370	UNE	0.0600	0.0000	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:

2022-01-24	13:36	UTC		GERN0020.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-24	13:36	UTC		SOPU0020.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-24	21:34	UTC		GERN0030.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-24	21:34	UTC		SOPU0030.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-18	23:15	UTC		GERN0040.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-18	23:15	UTC		SOPU0040.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-19	23:24	UTC		GERN0050.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-19	23:24	UTC		SOPU0050.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-25	12:00	UTC		GERN0060.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-25	12:00	UTC		SOPU0060.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-25	14:51	UTC		GERN0070.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-25	14:51	UTC		SOPU0070.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-26	01:28	UTC		GERN0080.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403
2022-01-26	01:28	UTC		SOPU0080.220		RECEIVER FIRM. VERS.		4.51/7.710	->	4.31/7.403

## 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)

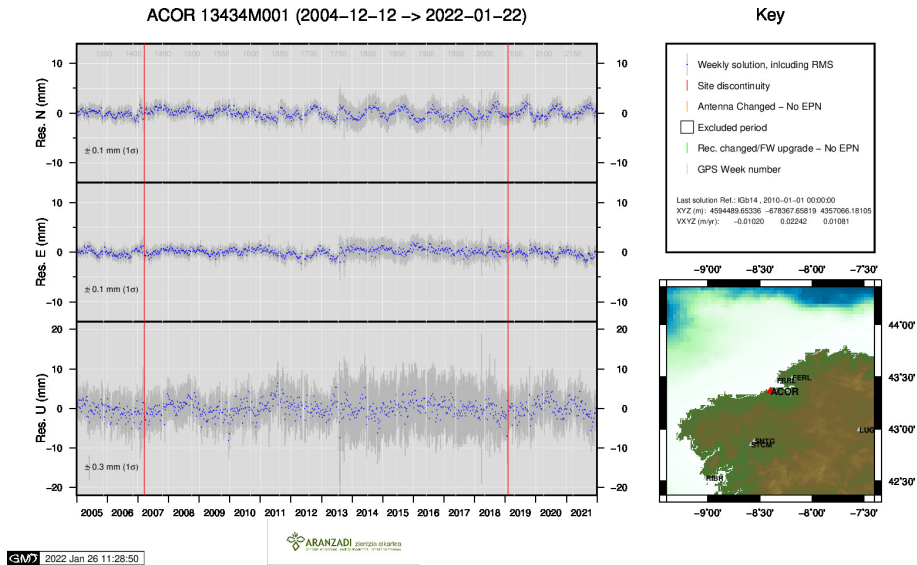
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](http://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

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)

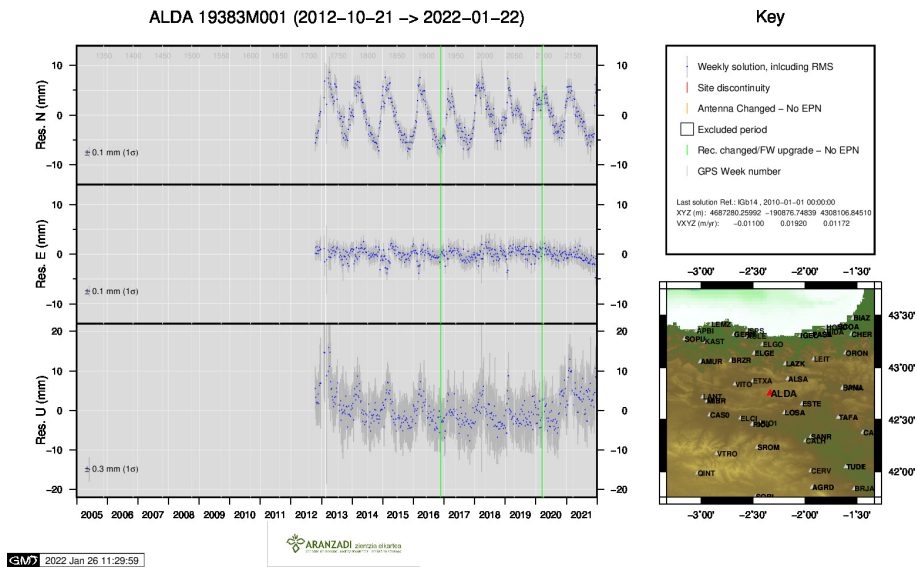


## 10 Cumulative Time Series

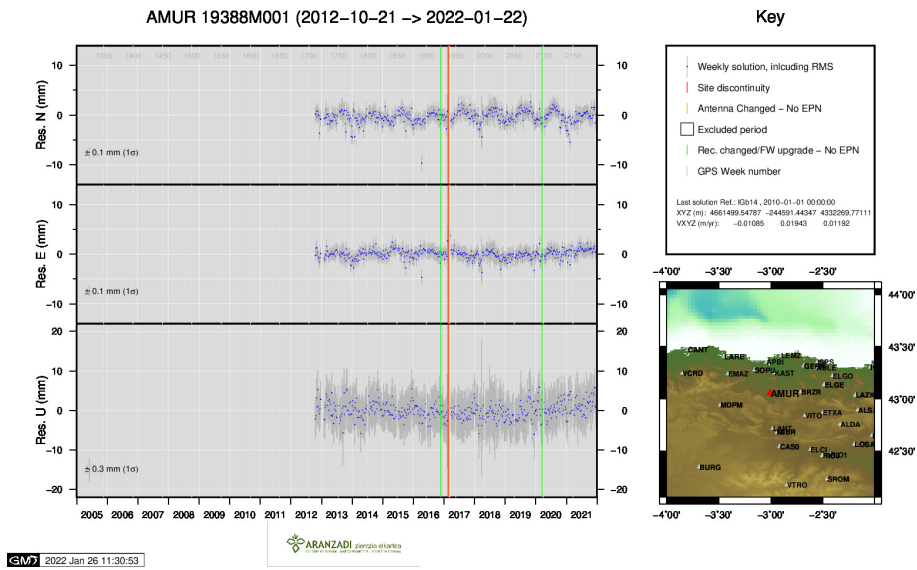
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



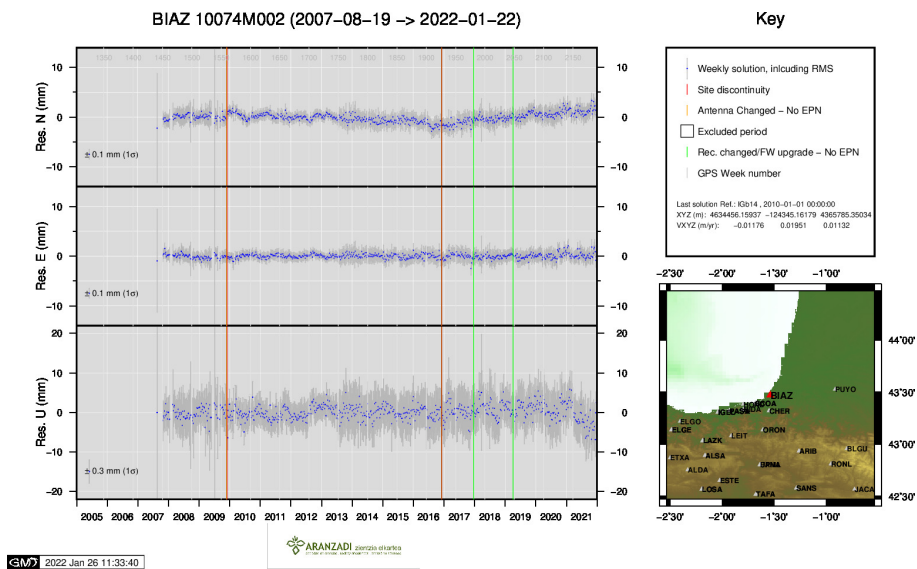
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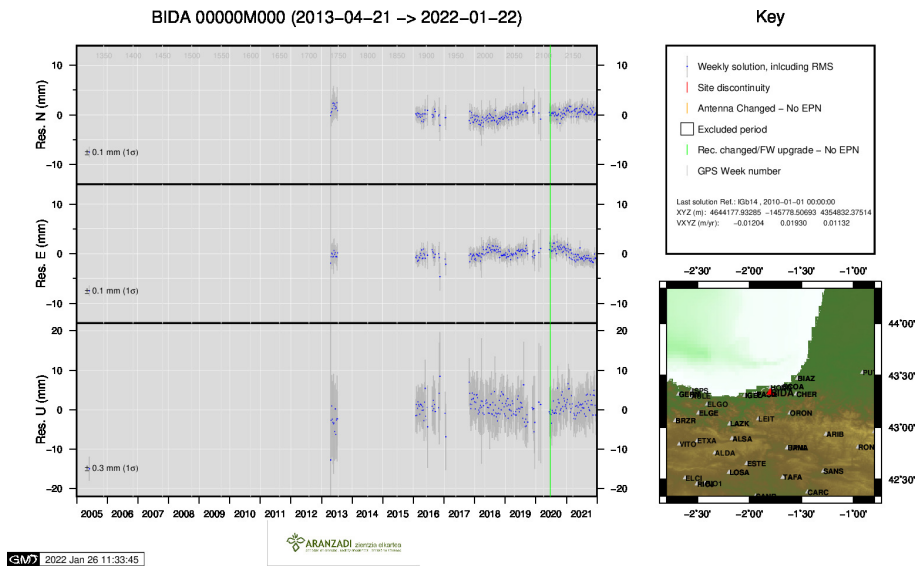
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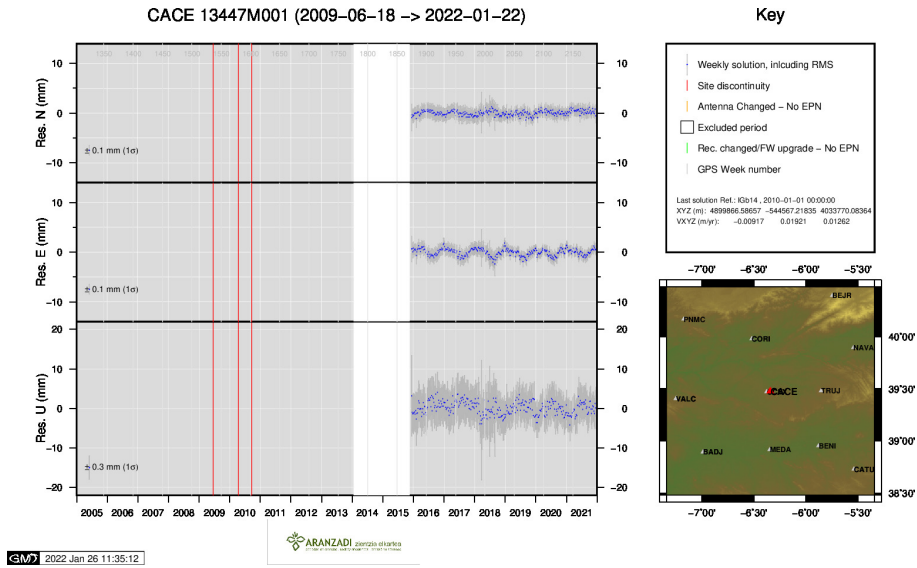
3 ) AMUR



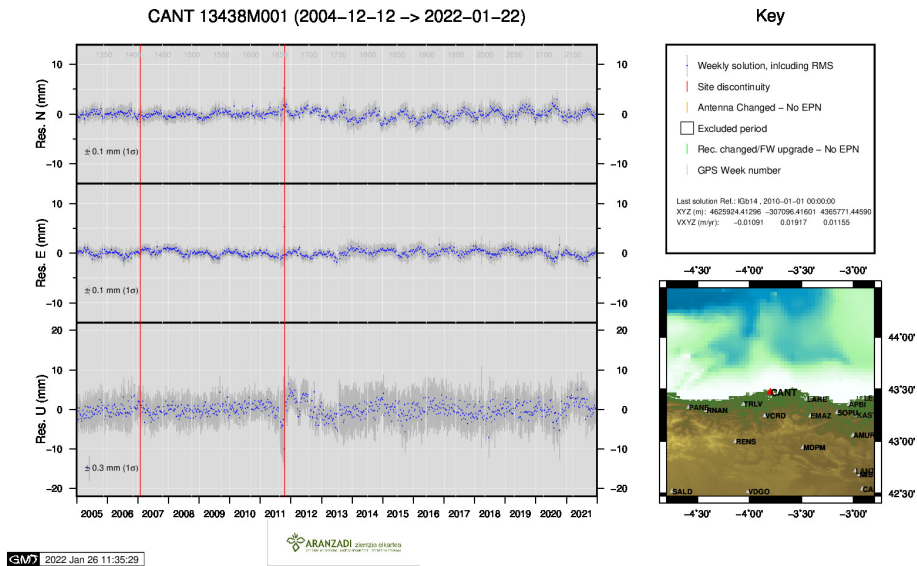
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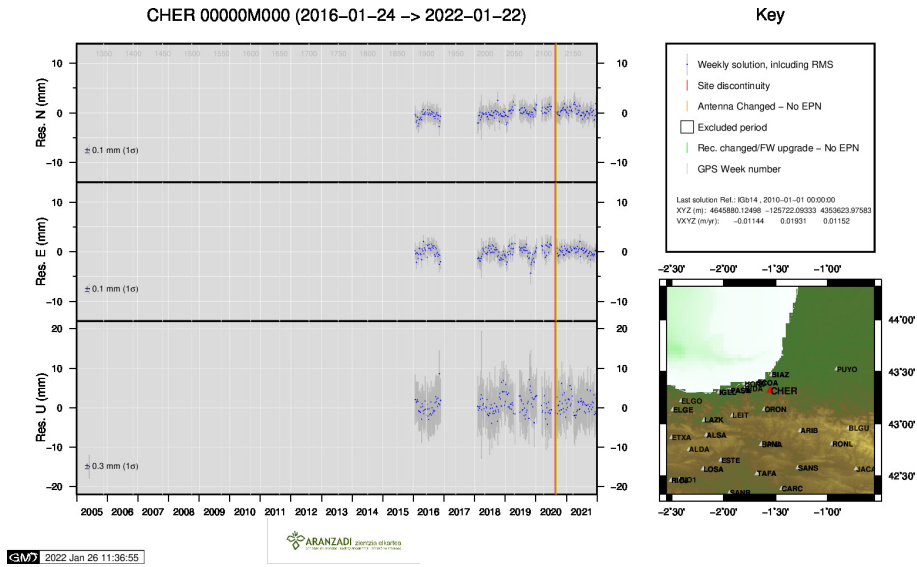
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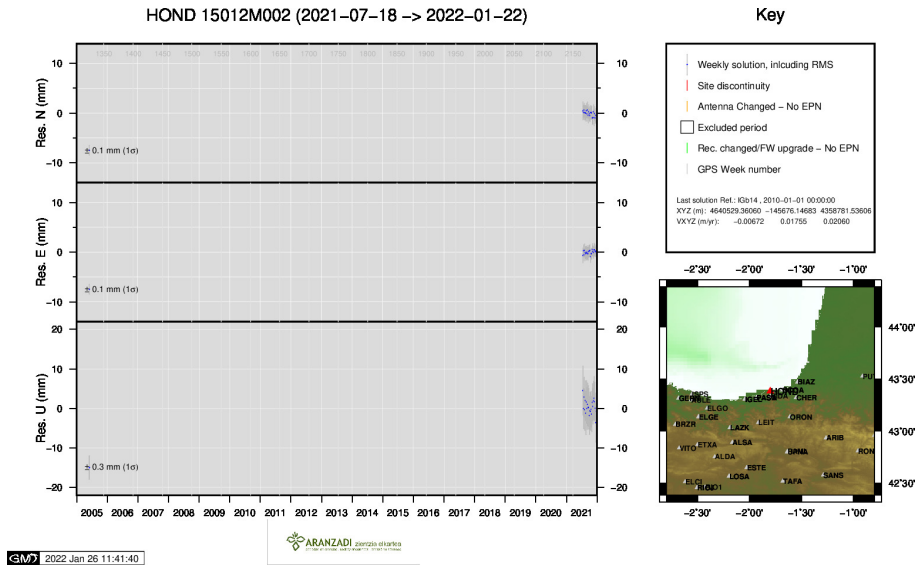


7 ) CANT

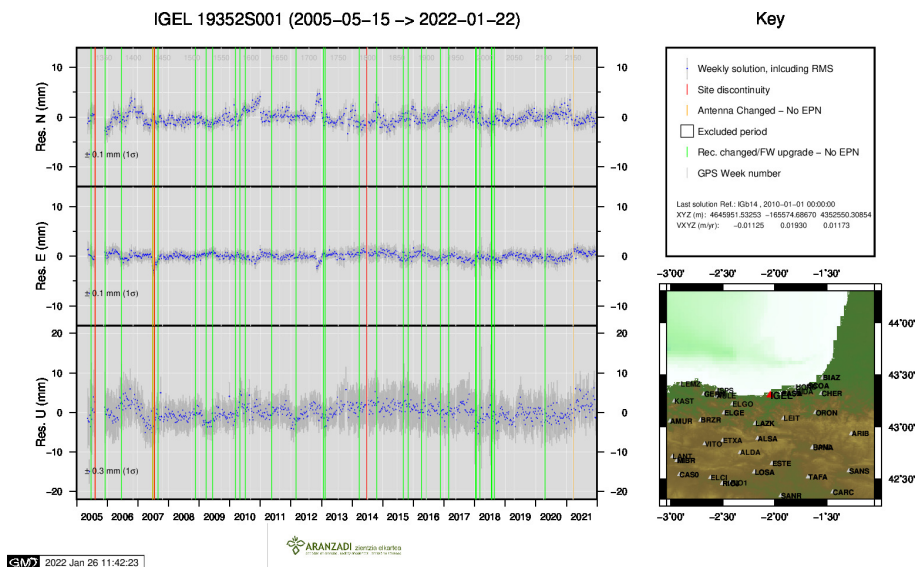


8 ) CHER

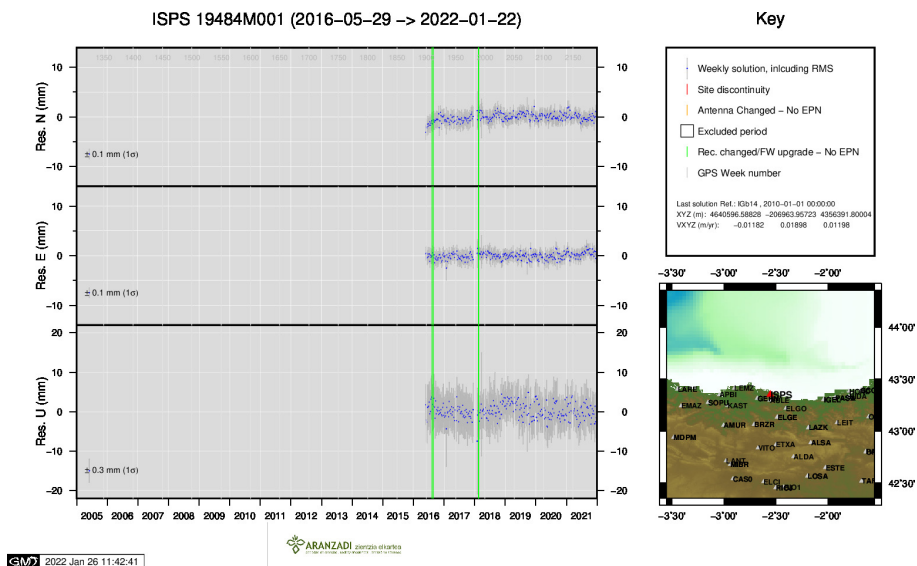




12 ) HOND

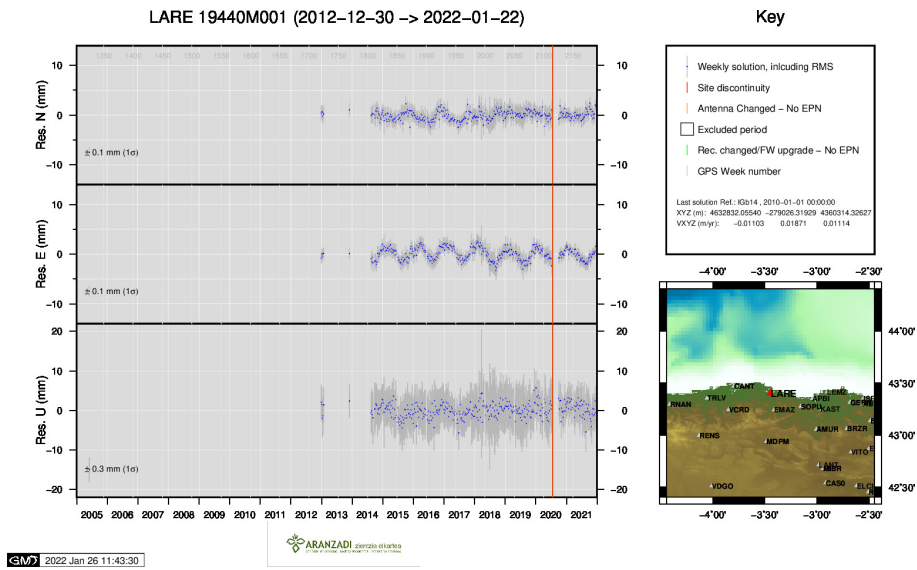


13 ) IGEL

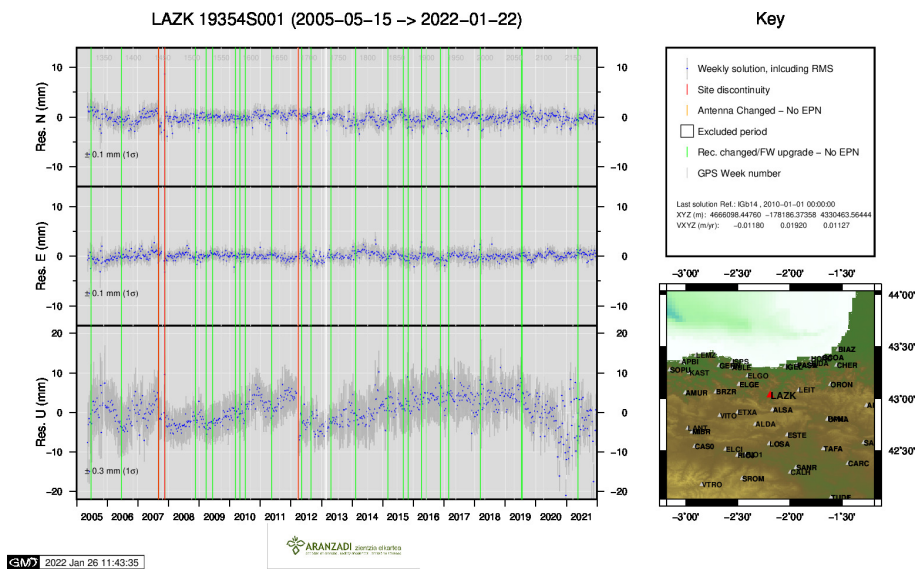


14 ) ISPS

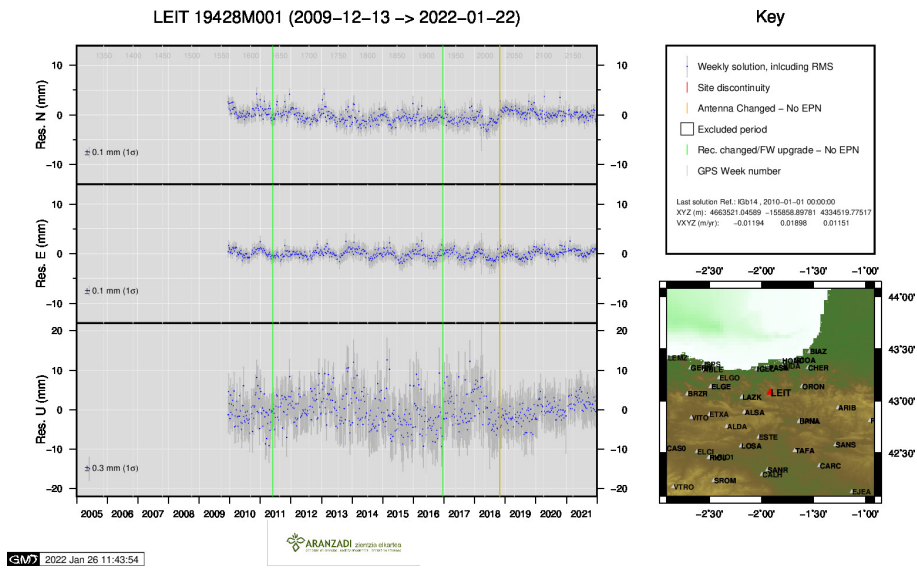




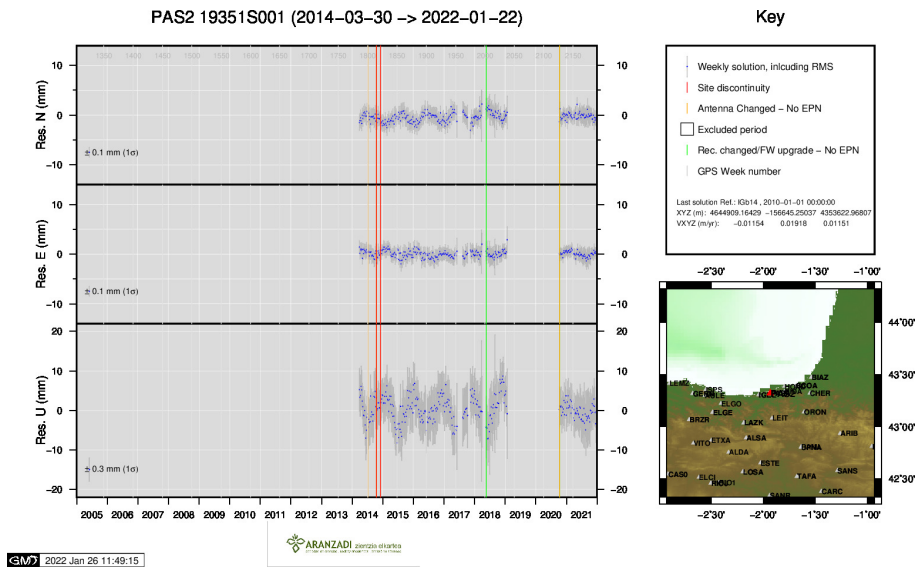
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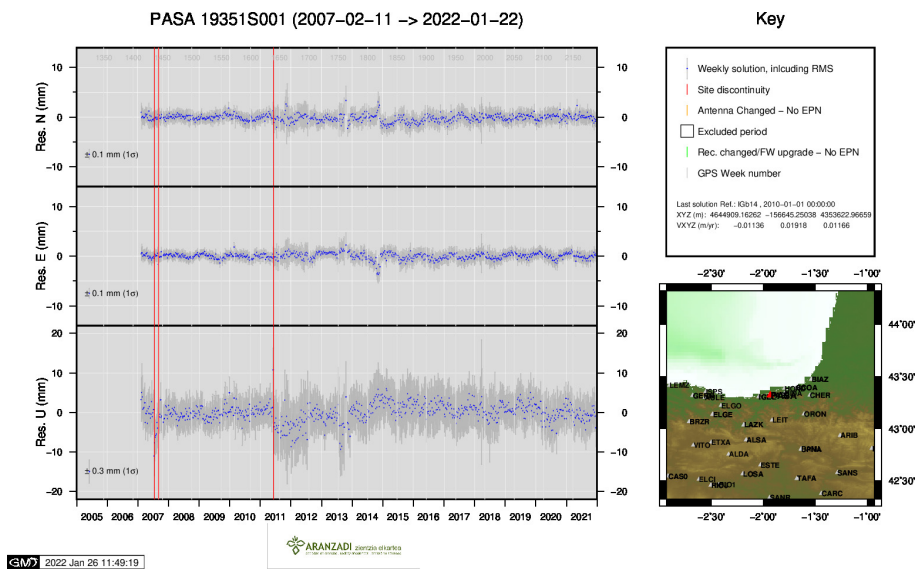
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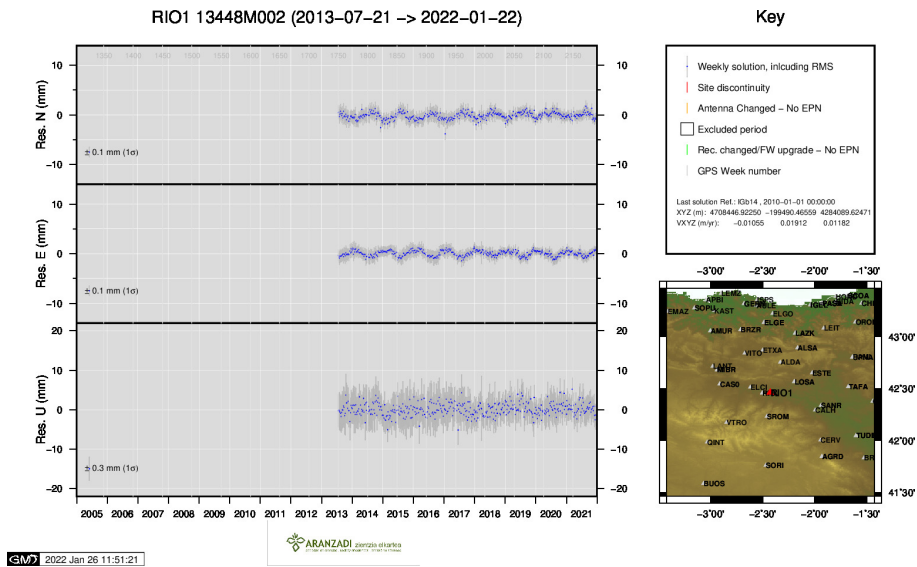
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18 ) PAS2



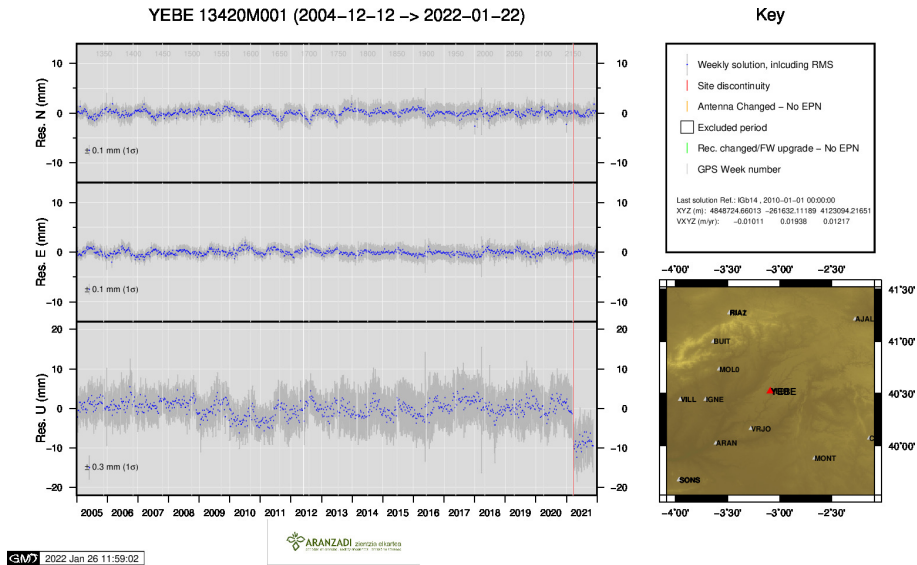
19 ) PASA



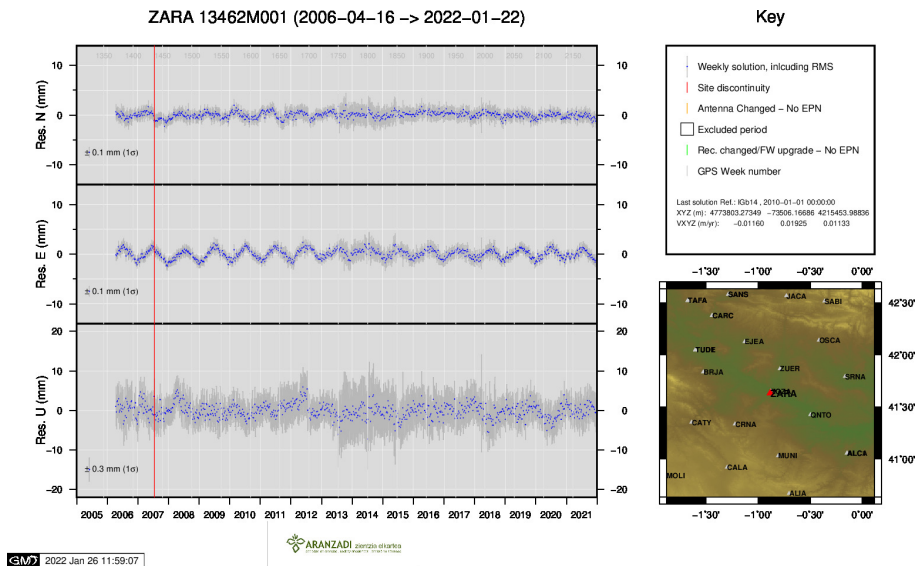
20 ) RIO1







24 ) YEBE



25 ) ZARA