

# ARA-DAC Weekly Analysis Result: 2114 (GFA)

## Technical Report

**GPS Week: 2114 (GFA)**

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

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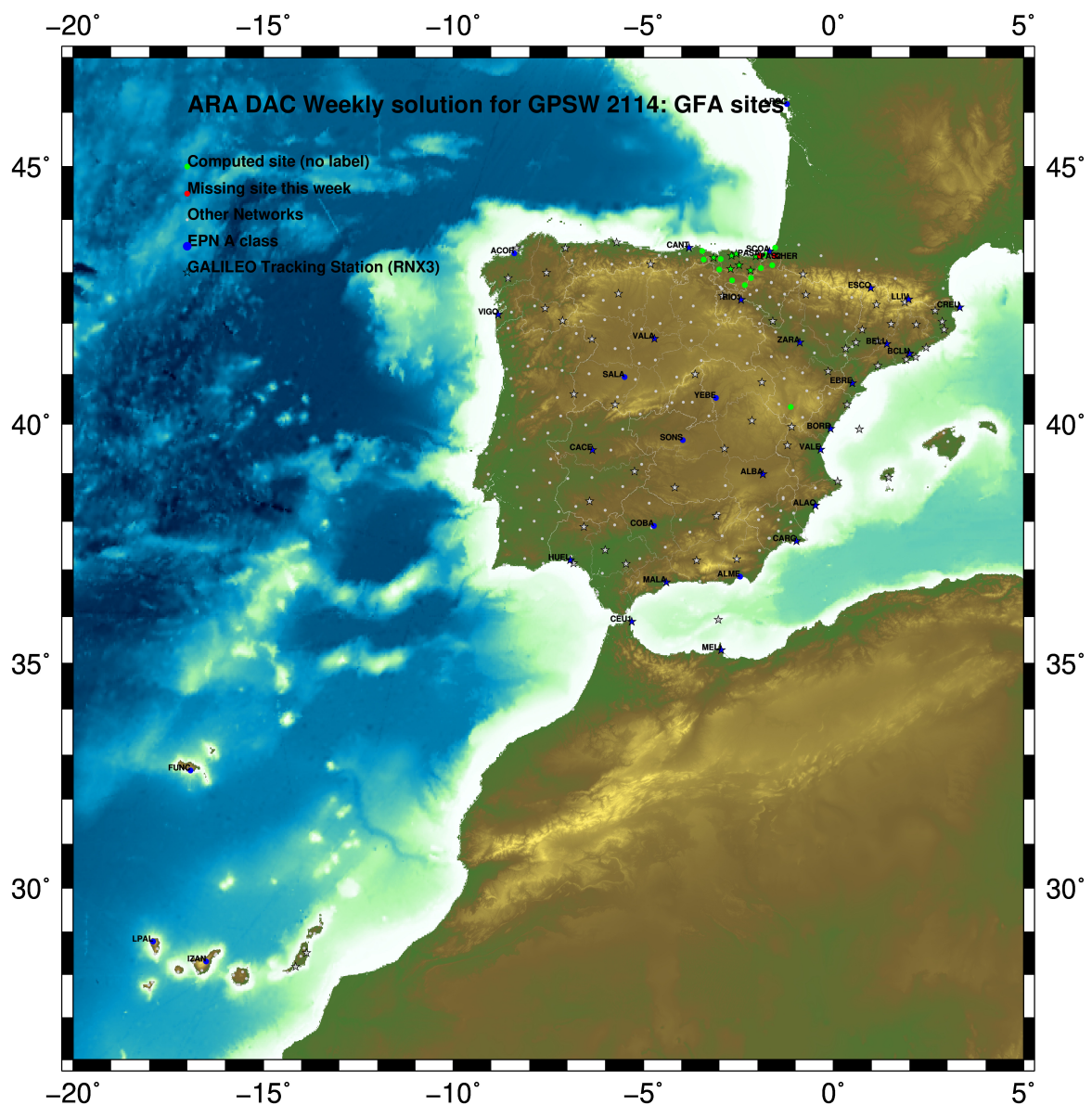
Report generated on 2020/08/02 at 14:53:59



# 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 2020 Aug 02 14:53:50

Fig.1: Computed Sites for GPS Week2114 (GFA)

### 3 Main Computation Parameters

The main parameters considered in the ARA analysis follow strictly the EPN recommendations.

- Preprocessing: Independent baselines are defined by the criterion of maximum common observations. Cycle slips are fixed with the MAUPRP program, analysing triple phase differences for each independent baseline. If MAUPRP does not fix all slips for one station, that station is edited out.
- Basic Observable : Carrier phase,  $L_1$  and  $L_2$ ; a priori sigma of single differences:0.002 m.
  - sampling (for ambiguity resolution): 30 s
  - sampling (for final processing): 180 s
  - Systems: GPS+GLONASS observations are used (Galileo also used if available from GPSW 1986 on)
- Modelled observable: Double differences of carrier phase using different combinations based on the distance.
- Ground antenna phase center calibrations: Group APCV used from the PCV\_COD.I14 file and individual calibrations from EPNC\_14.ATX. EPN\_A class sites (CRD + VEL) IGS14 used to define the reference frame (from GPSW 1934). If individual calibrations, other from these, are available, they are also included in the analysis.
- Troposphere:
  - 3 deg elev. cutoff; elevation dependent weighting
  - VMF1 mapping function. ZPD parameters are estimated using the VMF1 mapping function.
  - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2004 (Scherneck).
- Atmosph. Loading: computed from a global grid using the GRDS1S2 program of Bernese 5.2.

### 4 Estimated Parameters

- Adjustment: Least Squares
- Rejection Criteria: 3\*rms of single differences, in the weekly combination of daily normal equations (ADDNEQ)
- Station coordinates: minimum constraints (MC) to EPN A class sites (only translations).
- Troposphere: 3 deg. After having obtained coordinates valid for the entire week, tropospheric zenith delay is solved at each site at intervals of 1 hour throughout the week, holding the coordinates constrained at the weekly values.
- Ionospheric: second and third "High Order Ionosphere (HOI)" corrections used, using CODE files, to improve Ambiguity Resolution.
- Satellite clock bias: not estimated because are eliminated by double differencing the phase data.
- Receiver clock bias: not estimated because are eliminated by double differencing the phase data.
- Orbits and ERPs: CODE's orbits and ERP for both rapid and final solutions. DE405 planetary ephemeris and JGM3 Earth geopotential model is used.
- Tidal displacements: according to IERS2010 Conventions. Atmospheric loading corrections used.

- Ambiguity: an advanced ambiguity resolution (AR) scheme is included:
  - Code-Based Widelane (WL) AR for baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane and narrow-lane AR is computed.
  - Phase-Based Widelane ( $L_5$ ) AR for baselines shorter than 200km, the code-based wide-lane AR is replaced by a phase-only wide-lane with a subsequent narrow-lane AR.
  - Quasi-Ionosphere-Free (QIF)AR for the remaining real-valued ambiguities for baselines shorter than 2000km.
  - Direct  $L_1/L_2$  AR for baselines shorter than 20km
- AR Verification: Each baseline is processed by introducing the resolved integer ambiguities and checking the residuals. If there is any problem, the ambiguities are re-initialized.

## 5 Computed Coordinates

In this section the adjusted coordinates are summarized. Note that the sites with an A flag are the computed ones, whereas sites flagged as W are the ones used in the Minimal Constraints condition.

### 5.1 IGS14

The Reference Frame considered in this section is IGS14, release C2085.

```
ARA LAC 2114 WEEK FINAL COMBINATION: PRECISE ORBITS          02-AUG-20 11:35
-----
LOCAL GEODETIC DATUM: IGS14          EPOCH: 2020-07-15 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
 4 ACRD 13434M001          4594489.54700          -678367.42313          4357066.29765          W
39 ALDA 19383M001          4687280.14427          -190876.54684          4308106.97124          A
50 ALSA 19419M001          4677250.81955          -176770.37238          4319079.89078          A
53 AMUR 19388M001          4661499.43286          -244591.23741          4332269.89731          A
100 BIAZ 10074M002          4634456.03533          -124344.95566          4365785.47018          A
101 BIDA 00000M000          4644177.80444          -145778.30297          4354832.49398          A
113 BRZR 19387M001          4662220.97573          -220769.87974          4333309.45513          A
98 CACE 13447M001          4899866.49261          -544567.01744          4033770.21935          W
109 CANT 13438M001          4625924.29762          -307096.21500          4365771.56938          W
154 CREU 13432M001          4715420.11486          273178.08001          4271946.85490          W
190 EBRE 13410M001          4833519.97248          41537.41257          4147461.73041          W
180 ELGE 19353S001          4657557.38800          -202241.45383          4338991.88327          A
182 EMAZ 17001M001          4645924.18925          -276949.84558          4347759.58912          A
209 GERN 19389M001          4642811.30105          -217222.90562          4353278.89278          A
235 IGEL 19352S001          4645951.41285          -165574.48334          4352550.43189          A
240 ISPS 19484M001          4640596.46456          -206963.75692          4356391.92722          A
245 KAST 19499M001          4646949.06217          -240747.25463          4348015.00537          A
252 LARE 19440M001          4632831.93648          -279026.12107          4360314.44121          A
256 LAZK 19354S001          4666098.32328          -178186.17079          4330463.68478          A
261 LEIT 19428M001          4663520.92120          -155858.69823          4334519.89802          A
334 ORDN 19427M001          4659695.76019          -130864.71429          4338948.89358          A
456 PASA 19351S001          4644909.04112          -156645.04841          4353623.08770          W
513 RID1 13448M002          4708446.81285          -199490.26414          4284089.75167          W
518 SALA 13469M001          4803054.46879          -462131.04932          4158379.08901          W
526 SCDA 10088M002          4639940.48205          -136224.92113          4359552.43015          W
418 SOPU 19386M001          4643997.88986          -255913.88748          4350063.15467          A
443 TERU 13487M001          4867391.30879          -95523.33132          4108341.69565          A
493 VITO 19385M001          4679397.68430          -218436.48560          4314899.38115          A
698 YEBE 13420M001          4848724.55557          -261631.91055          4123094.34439          W
701 ZARA 13462M001          4773803.14944          -73505.96333          4215454.10687          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 2114          02-AUG-20 11:35
-----
LOCAL GEODETIC DATUM: ETRF2000        EPOCH: 2020-07-15 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
 4 ACRD 13434M001          4594489.86308          -678367.98254          4357065.86688          W
39 ALDA 19383M001          4687280.51605          -190877.11515          4308106.53938          A
50 ALSA 19419M001          4677251.19382          -176770.93956          4319079.45989          A
53 AMUR 19388M001          4661499.79985          -244591.80309          4332269.46680          A
100 BIAZ 10074M002          4634456.41930          -124345.51805          4365785.04331          A
101 BIDA 00000M000          4644178.18503          -145778.86648          4354832.06607          A
113 BRZR 19387M001          4662221.34569          -220770.44543          4333309.02487          A
98 CACE 13447M001          4899866.80176          -544567.60935          4033769.76621          W
109 CANT 13438M001          4625924.65942          -307096.77701          4365771.14088          W
154 CREU 13432M001          4715420.54022          273177.51039          4271946.42655          W
190 EBRE 13410M001          4833520.36089          41536.82937          4147461.28990          W
180 ELGE 19353S001          4657557.76061          -202242.01896          4338991.45361          A
182 EMAZ 17001M001          4645924.55343          -276950.40968          4347759.15943          A
209 GERN 19389M001          4642811.67286          -217223.46920          4353278.46409          A
235 IGEL 19352S001          4645951.79087          -165575.04711          4352550.00360          A
240 ISPS 19484M001          4640596.83784          -206964.32023          4356391.49883          A
245 KAST 19499M001          4646949.43075          -240747.81873          4348014.57606          A
252 LARE 19440M001          4632832.30130          -279026.68375          4360314.01252          A
256 LAZK 19354S001          4666098.69819          -178186.73677          4330463.25474          A
261 LEIT 19428M001          4663521.29911          -155859.26387          4334519.46847          A
334 ORDN 19427M001          4659696.14145          -130865.27943          4338948.46464          A
456 PASA 19351S001          4644909.42030          -156645.61203          4353622.65960          W
513 RID1 13448M002          4708447.18186          -199490.83475          4284089.31803          W
518 SALA 13469M001          4803054.79691          -462131.63076          4158378.64548          W
526 SCDA 10088M002          4639940.86413          -136225.48415          4359552.00270          W
418 SOPU 19386M001          4643998.25585          -255914.45130          4350062.72540          A
443 TERU 13487M001          4867391.67779          -95523.91863          4108341.25077          A
493 VITO 19385M001          4679398.05322          -218437.05314          4314899.94956          A
698 YEBE 13420M001          4848724.90549          -261632.49637          4123093.89890          W
701 ZARA 13462M001          4773803.52880          -73506.54055          4215453.66965          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 2114		02-AUG-20 11:35			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2020-07-15 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.82089	-678368.02069	4357065.91580	W
39	ALDA 19383M001	4687280.47158	-190877.15469	4308106.58819	A
50	ALSA 19419M001	4677251.14941	-176770.97919	4319079.50873	A
53	AMUR 19388M001	4661499.75581	-244591.84254	4332269.51566	A
100	BLAZ 10074M002	4634456.37516	-124345.55804	4365785.09228	A
101	BIDA 00000M000	4644178.14085	-145778.90636	4354832.11502	A
113	BRZR 19387M001	4662221.30157	-220770.48497	4333309.07373	A
98	CACE 13447M001	4899866.75600	-544567.64676	4033769.81444	W
109	CANT 13438M001	4625924.61593	-307096.81638	4365771.18980	W
154	CREU 13432M001	4715420.49387	273177.46931	4271946.47560	W
190	EBRE 13410M001	4833520.31411	41536.78959	4147461.33851	W
180	ELGE 19353S001	4657557.71648	-202242.05858	4338991.50249	A
182	EMAZ 17001M001	4645924.50965	-276950.44908	4347759.20831	A
209	GERN 19389M001	4642811.62893	-217223.50882	4353278.51300	A
235	IGEL 19352S001	4645951.74675	-165575.08690	4352550.05252	A
240	ISPS 19484M001	4640596.79390	-206964.35990	4356391.54775	A
245	KAST 19499M001	4646949.38685	-240747.85825	4348014.62495	A
252	LARE 19440M001	4632832.25765	-279026.72319	4360314.06144	A
256	LAZK 19354S001	4666098.65390	-178186.77644	4330463.30361	A
261	LEIT 19428M001	4663521.25478	-155859.30363	4334519.51735	A
334	ORON 19427M001	4659696.09707	-130865.31930	4338948.51355	A
456	PASA 19351S001	4644909.37616	-156645.65187	4353622.70854	W
513	RI01 13448M002	4708447.13720	-199490.87417	4284089.36679	W
518	SALA 13469M001	4803054.75201	-462131.66886	4158378.69393	W
526	SOA 10088M002	4639940.81997	-136225.52408	4359552.05165	W
418	SOPU 19386M001	4643998.21202	-255914.49078	4350062.77429	A
443	TERU 13487M001	4867391.63111	-95523.95778	4108341.29922	A
493	VITO 19385M001	4679398.00892	-218437.09261	4314897.99838	A
698	YEBE 13420M001	4848724.85953	-261632.53501	4123093.94731	W
701	ZARA 13462M001	4773803.48305	-73506.58017	4215453.71832	W

## 6 Quality Control

### 6.1 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repeatabilities refer to the IGS14 solution and are given with respect the Local frame (North-East-Up).

ARA LAC 2114 WEEK FINAL COMBINATION: PRECISE ORBITS 02-AUG-20 11:35

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.99	1.12	3.13
ALDA 19383M001	7	XXXXXX	2.70	0.96	4.41
ALSA 19419M001	7	XXXXXX	1.11	0.95	2.06
AMUR 19388M001	7	XXXXXX	0.49	0.84	3.65
BLAZ 10074M002	7	XXXXXX	1.01	0.82	3.79
BIDA 00000M000	7	XXXXXX	1.13	0.90	3.80
BRZR 19387M001	7	XXXXXX	1.19	0.98	1.73
CACE 13447M001	7	XXXXXX	0.27	0.79	2.85
CANT 13438M001	7	XXXXXX	0.73	0.48	2.71
CREU 13432M001	7	XXXXXX	1.52	0.94	2.80
EBRE 13410M001	7	XXXXXX	1.16	0.49	2.97
ELGE 19353S001	7	XXXXXX	0.58	0.76	2.35
EMAZ 17001M001	7	XXXXXX	1.30	2.41	3.48
GERN 19389M001	7	XXXXXX	1.15	1.26	3.83
IGEL 19352S001	7	XXXXXX	1.13	0.83	1.49
ISPS 19484M001	7	XXXXXX	0.77	1.07	2.00
KAST 19499M001	7	XXXXXX	0.80	0.85	3.34
LARE 19440M001	4	XXXX	0.82	0.83	2.53
LAZK 19354S001	7	XXXXXX	0.76	0.34	4.14
LEIT 19428M001	7	XXXXXX	1.01	1.31	4.81
ORDN 19427M001	7	XXXXXX	0.56	1.28	3.48
PASA 19351S001	7	XXXXXX	0.64	0.68	3.05
RI01 13448M002	7	XXXXXX	0.55	0.74	4.47
SALA 13469M001	7	XXXXXX	0.61	0.63	2.32
SCDA 10088M002	7	XXXXXX	0.86	2.24	1.95
SOPU 19386M001	7	XXXXXX	1.43	1.48	4.52
TERU 13487M001	7	XXXXXX	0.85	0.69	4.17
VITD 19385M001	7	XXXXXX	0.99	0.82	4.73
YEBE 13420M001	7	XXXXXX	0.67	1.16	4.54
ZARA 13462M001	7	XXXXXX	0.70	0.51	4.04

Comparison of individual solutions:

ACOR 13434M001	N	0.99	0.53	-1.48	-0.77	0.68	-1.27	-0.71	0.43
ACOR 13434M001	E	1.12	-1.78	-0.20	1.00	1.29	-1.09	-0.22	0.65
ACOR 13434M001	U	3.13	1.56	2.31	4.32	-3.10	4.75	-0.21	-0.25
ALDA 19383M001	N	2.70	-2.82	0.23	2.74	3.14	-1.03	-4.17	-0.09
ALDA 19383M001	E	0.96	0.86	-0.00	-1.05	-0.74	-0.74	-1.02	1.24
ALDA 19383M001	U	4.41	-3.62	0.70	-1.51	8.95	-4.21	1.28	-1.22
ALSA 19419M001	N	1.11	-2.13	1.18	0.73	0.63	0.06	0.10	-0.70
ALSA 19419M001	E	0.95	0.39	1.53	0.58	-0.09	-0.83	-0.77	-1.16
ALSA 19419M001	U	2.06	2.01	1.32	-0.83	-2.64	-3.39	0.70	0.07
AMUR 19388M001	N	0.49	-0.00	-0.22	-0.40	0.05	0.41	-0.92	0.44
AMUR 19388M001	E	0.84	-0.01	0.84	0.97	-0.23	-1.12	-0.52	-1.00
AMUR 19388M001	U	3.65	4.11	4.56	-5.72	-0.96	2.32	1.29	-1.21
BLAZ 10074M002	N	1.01	0.33	-1.99	-0.29	0.73	0.71	-0.05	-0.97
BLAZ 10074M002	E	0.82	-0.37	0.40	-0.13	-0.92	-0.87	-0.88	-1.18
BLAZ 10074M002	U	3.79	-0.78	-1.16	-3.72	5.48	-0.93	5.73	2.59
BIDA 00000M000	N	1.13	-1.82	-0.71	0.47	1.40	-0.28	1.07	-0.65
BIDA 00000M000	E	0.90	0.05	-0.45	-0.26	-0.68	-1.35	0.46	1.44
BIDA 00000M000	U	3.80	5.05	-0.11	-3.35	2.41	-5.45	2.40	-2.91
BRZR 19387M001	N	1.19	-0.50	-1.66	1.71	1.24	-0.37	0.89	0.35
BRZR 19387M001	E	0.98	1.19	0.34	0.71	-0.74	-0.36	0.70	-1.62
BRZR 19387M001	U	1.73	3.37	1.74	0.88	0.65	-1.53	-0.11	-0.20
CACE 13447M001	N	0.27	-0.35	0.38	0.07	0.33	-0.10	-0.02	-0.17
CACE 13447M001	E	0.79	-0.58	-1.25	0.14	-0.77	0.72	0.85	0.21
CACE 13447M001	U	2.85	-3.44	-4.00	-2.48	3.57	1.45	0.13	-0.11
CANT 13438M001	N	0.73	-1.09	0.74	0.15	0.42	0.10	-1.06	0.41
CANT 13438M001	E	0.48	0.07	0.41	0.39	-0.30	0.36	-0.58	-0.72
CANT 13438M001	U	2.71	4.17	2.14	-3.65	-2.43	-1.50	-0.49	-0.64
CREU 13432M001	N	1.52	1.97	-0.35	-0.29	1.14	-2.50	-1.45	0.30
CREU 13432M001	E	0.94	0.52	0.29	-0.07	1.09	-1.57	-1.06	0.42
CREU 13432M001	U	2.80	2.85	1.65	-3.99	-2.23	3.73	0.47	1.12
EBRE 13410M001	N	1.16	-0.16	0.14	-2.24	1.66	0.07	-0.18	-0.46
EBRE 13410M001	E	0.49	0.30	-0.11	0.42	-0.41	0.16	-0.90	0.41
EBRE 13410M001	U	2.97	4.64	1.65	-2.38	-2.97	2.16	-0.53	3.03
ELGE 19353S001	N	0.58	-0.71	0.02	-0.11	0.69	0.34	0.86	0.43
ELGE 19353S001	E	0.76	0.38	0.77	0.75	-1.13	-0.90	0.05	0.28
ELGE 19353S001	U	2.35	1.90	-0.31	3.79	-2.87	-0.80	0.32	2.47
EMAZ 17001M001	N	1.30	0.44	-0.87	-1.96	-1.59	-0.39	0.14	1.64
EMAZ 17001M001	E	2.41	-2.00	0.94	4.92	0.98	0.30	-0.39	-2.15
EMAZ 17001M001	U	3.48	3.98	5.49	0.67	-0.41	-3.10	1.54	-3.76
GERN 19389M001	N	1.15	-1.81	0.07	0.49	2.01	-0.12	0.26	0.54
GERN 19389M001	E	1.26	0.52	2.24	-1.99	0.00	-0.48	-0.22	0.12
GERN 19389M001	U	3.83	2.63	-0.67	3.57	6.59	-4.43	-1.93	-0.93
IGEL 19352S001	N	1.13	0.50	-2.15	0.40	-0.41	0.19	0.58	1.45
IGEL 19352S001	E	0.83	0.05	1.16	0.19	-0.72	-1.39	0.53	0.08
IGEL 19352S001	U	1.49	2.82	1.02	1.00	-1.62	-0.63	-0.02	0.55
ISPS 19484M001	N	0.77	-0.91	0.45	-0.42	1.19	0.15	0.17	0.95
ISPS 19484M001	E	1.07	1.12	0.09	-0.10	-0.05	-2.13	0.24	1.02
ISPS 19484M001	U	2.00	2.69	-1.12	0.11	-0.20	-1.78	2.28	2.68
KAST 19499M001	N	0.80	-0.88	-0.12	1.10	0.69	-0.60	0.67	0.76
KAST 19499M001	E	0.85	1.04	0.21	-0.62	-1.46	0.78	0.33	-0.14
KAST 19499M001	U	3.34	6.26	-3.03	-1.07	2.76	1.65	1.09	-2.46
LARE 19440M001	N	0.82	-1.26	-0.65	0.17	0.01			
LARE 19440M001	E	0.83	1.28	0.62	-0.08	0.03			
LARE 19440M001	U	2.53	-0.18	4.08	0.58	-1.48			
LAZK 19354S001	N	0.76	-1.29	0.49	-0.31	1.03	0.43	-0.47	0.13
LAZK 19354S001	E	0.34	-0.32	0.54	-0.22	-0.07	-0.38	0.23	-0.21
LAZK 19354S001	U	4.14	0.98	1.35	-8.47	-3.24	0.66	3.73	1.91
LEIT 19428M001	N	1.01	-1.33	-0.64	0.03	1.12	0.67	1.12	-0.98
LEIT 19428M001	E	1.31	0.46	-1.63	-1.38	-0.60	-0.17	1.09	1.97
LEIT 19428M001	U	4.81	0.75	2.92	6.39	1.88	-5.61	-6.88	-2.60
ORDN 19427M001	N	0.56	0.57	-0.69	0.73	-0.46	-0.29	-0.28	0.40

ORDN 19427M001	E	1.28	0.46	0.46	-2.56	-0.33	-0.55	0.80	1.35
ORDN 19427M001	U	3.48	-1.48	-0.92	-7.43	2.99	2.13	0.79	0.50
PASA 19351S001	N	0.64	0.01	0.49	-0.38	-0.85	-0.41	0.75	0.78
PASA 19351S001	E	0.68	0.34	0.26	0.23	-0.90	-1.03	0.71	0.38
PASA 19351S001	U	3.05	2.24	1.97	5.58	-2.79	-1.89	-0.00	-2.12
RID1 13448M002	N	0.55	0.20	0.63	0.72	-0.42	0.62	-0.50	-0.28
RID1 13448M002	E	0.74	0.14	-0.63	0.68	1.02	-1.04	-0.02	-0.54
RID1 13448M002	U	4.47	-2.83	5.16	1.21	-8.57	1.25	-0.53	-2.93
SALA 13469M001	N	0.61	0.88	-0.35	0.79	-0.52	-0.06	0.36	-0.56
SALA 13469M001	E	0.63	-0.45	-0.21	-0.69	0.95	-0.54	0.56	0.37
SALA 13469M001	U	2.32	-1.83	-1.19	2.34	-2.72	3.12	2.15	0.45
SCDA 10088M002	N	0.86	-1.29	0.16	0.99	0.01	-1.02	0.85	-0.04
SCDA 10088M002	E	2.24	-0.12	0.71	1.50	-3.59	-2.34	0.53	2.95
SCDA 10088M002	U	1.95	1.41	-2.54	0.16	1.44	-2.15	1.66	-2.24
SOPU 19386M001	N	1.43	-1.14	0.58	2.79	1.14	-1.16	-0.19	-0.47
SOPU 19386M001	E	1.48	2.00	-1.58	-1.67	-1.15	0.49	1.15	0.96
SOPU 19386M001	U	4.52	8.66	-5.46	2.88	0.14	-2.51	-0.65	1.74
TERU 13487M001	N	0.85	-0.82	-0.89	0.05	0.99	0.01	1.09	-0.80
TERU 13487M001	E	0.69	-0.38	0.63	0.36	0.08	-0.44	-0.83	1.13
TERU 13487M001	U	4.17	1.07	-0.13	9.05	-3.00	-0.75	-0.25	3.44
VITO 19385M001	N	0.99	-1.76	0.19	1.24	0.66	0.48	-0.70	-0.08
VITO 19385M001	E	0.82	-0.08	1.21	-0.13	0.73	-0.85	-0.96	-0.59
VITO 19385M001	U	4.73	7.29	2.33	-7.20	-0.09	-2.16	2.20	-3.82
YEBE 13420M001	N	0.67	-0.50	0.27	-0.13	-1.18	0.43	0.52	0.69
YEBE 13420M001	E	1.16	-1.04	-0.61	-0.81	0.31	1.45	1.43	-1.33
YEBE 13420M001	U	4.54	-5.33	-2.57	2.17	8.29	-2.43	-1.82	-2.43
ZARA 13462M001	N	0.70	-0.06	0.43	1.09	0.70	-0.37	-0.75	-0.60
ZARA 13462M001	E	0.51	-0.73	0.29	-0.23	-0.40	-0.25	-0.21	0.80
ZARA 13462M001	U	4.04	6.66	-0.69	-3.10	-1.22	-4.18	-3.75	-3.25



## 6.2 Datum verification

In this section, the datum verification is shown. A 3 parameter Helmert 3D (3 translations) is computed to the minimally constrained sites.

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

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
4	ACOR 13434M001	I W	-1.84	1.30	-0.79
10	ALAC 13433M001	I W	-1.10	0.78	0.20
13	ALBA 13452M001	I W	0.58	-0.70	-2.93
19	ALME 13437M001	I W	0.74	2.01	-3.71
41	BCLN 13412M001	I W	-0.91	-0.44	-2.06
46	BELL 13431M001	I W	-1.09	-1.10	3.37
65	BORR 13480M001	I W	0.85	-1.73	-3.25
70	BRST 10004M004	I W	-2.48	0.29	2.96
98	CACE 13447M001	I W	0.92	2.85	-0.12
109	CANT 13438M001	I W	-1.02	1.43	1.21
110	CARG 19412M001	I W	0.30	0.87	-4.79
121	CEU1 13449M002	I W	-0.64	0.07	0.82
135	COBA 13453M001	I W	1.44	0.36	-3.43
154	CREU 13432M001	I W	-0.77	1.55	0.03
190	EBRE 13410M001	I W	-2.47	-0.72	1.50
208	ESCO 13435M001	I W	0.50	3.12	-3.59
219	FUNC 13911S001	I W	-2.95	-9.80	1.68
286	HUEL 13451M001	I W	3.48	-2.25	-6.47
300	IZAN 13109M002	I W	1.56	0.06	2.75
359	LLIV 13436M001	I W	0.82	1.27	-0.51
364	LPAL 81701M001	I W	0.08	-0.61	2.52
366	LROC 10023M001	I W	1.33	0.58	-0.48
400	MELI 19379M001	I W	2.18	-1.44	-4.87
456	PASA 19351S001	I W	-0.46	1.02	4.37
464	PDEL 13196M004	I W	1.63	-1.18	7.00
513	RID1 13448M002	I W	-1.43	1.40	-1.86
518	SALA 13469M001	I W	0.80	0.96	1.75
526	SCOA 10088M002	I W	-5.08	0.51	-2.21
557	SONS 13446M001	I W	-1.24	-0.11	-2.42
588	TERC 13190M001	I W	4.57	-4.80	-0.23
654	VALA 13463M002	I W	0.92	-0.53	1.92
658	VALE 13439M001	I W	-0.43	0.50	-2.94
669	VIGO 13450M001	I W	0.56	0.74	1.05
698	YEBE 13420M001	I W	1.10	2.11	2.37
701	ZARA 13462M001	I W	-0.37	0.08	5.80
710	ZIMM 14001M004	I W	-1.07	1.12	1.96
84	MALA 13443M001	I W	1.00	0.47	3.40
RMS / COMPONENT			1.79	2.21	3.10
MEAN			0.00	0.00	0.00
MIN			-5.08	-9.80	-6.47
MAX			4.57	3.12	7.00

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 111  
RMS OF TRANSFORMATION : 2.43 MM

BARYCENTER COORDINATES:

LATITUDE : 40 6 47.82  
LONGITUDE : - 4 54 27.69  
HEIGHT : -47.728 KM

PARAMETERS:

TRANSLATION IN N : 0.01 +- 0.40 MM  
TRANSLATION IN E : 0.01 +- 0.40 MM  
TRANSLATION IN U : 0.00 +- 0.40 MM

### 6.3 Adjustment Statistics

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

```
* STATISTICAL PARAMETER-----VALUE(S)-----
NUMBER OF OBSERVATIONS          1440570
NUMBER OF UNKNOWN               190970
NUMBER OF DEGREES OF FREEDOM    14214600
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.331472662010164

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
  1  0.00232     0.0019 -0.0026  0.0019  0.0000 -0.0000 -0.0001 -0.00039
  2  0.00271     0.0168 -0.0107 -0.0182  0.0002  0.0008 -0.0002 -0.00027
  3  0.00239     0.0059 -0.0062 -0.0115  0.0002  0.0004 -0.0001  0.00034
  4  0.00227    -0.0162 -0.0162  0.0151  0.0003 -0.0007 -0.0005  0.00023
  5  0.00205     0.0012 -0.0044 -0.0031  0.0001  0.0001 -0.0001  0.00015
  6  0.00192     0.0107  0.0085 -0.0119 -0.0001  0.0005  0.0003  0.00008
  7  0.00185     0.0131  0.0050 -0.0107 -0.0002  0.0005  0.0001 -0.00043
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00159      2023822      2.54          2052036      3          849      27368      0
  2  0.00155      2048847      2.40          2078259      3          852      28563      0
  3  0.00159      2020990      2.53          2049484      3          849      27648      0
  4  0.00150      1944835      2.26          1971297      3          804      25661      0
  5  0.00145      2031276      2.11          2059905      3          846      27786      0
  6  0.00148      2073925      2.20          2101590      3          864      26804      0
  7  0.00149      2065901      2.23          2092999      3          858      26243      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 20:194:00000 20:200:86370 LEICA GR50      -----
ALDA  A   1 P 20:194:00000 20:200:86370 LEICA GR10      -----
ALSA  A   1 P 20:194:00000 20:200:86370 LEICA GR50      -----
AMUR  A   1 P 20:194:00000 20:200:86370 LEICA GR10      -----
BIAZ  A   1 P 20:194:00000 20:200:79170 TRI SP90M     -----
BIDA  A   1 P 20:194:00000 20:200:86370 LEICA GR10      -----
BRZR  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
CACE  A   1 P 20:194:00000 20:200:86370 TRIMBLE NETR9  -----
CANT  A   1 P 20:194:00000 20:200:86370 LEICA GR10      -----
CREU  A   1 P 20:194:00000 20:200:86370 LEICA GR50      -----
EBRE  A   1 P 20:194:00000 20:200:86370 LEICA GR50      -----
ELGE  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
EMAZ  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
GERN  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
IGEL  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
ISPS  A   1 P 20:194:00000 20:200:86370 TRIMBLE NETR9  -----
KAST  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
LARE  A   1 P 20:194:00000 20:197:86370 LEICA GRX1200GGPRO -----
LAZK  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
LEIT  A   1 P 20:194:00000 20:200:86370 LEICA GR50      -----
ORON  A   1 P 20:194:00000 20:200:86370 LEICA GR50      -----
PASA  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
RIO1  A   1 P 20:194:00000 20:200:86370 LEICA GR25      -----
SALA  A   1 P 20:194:00000 20:200:86370 LEICA GRX1200+GNSS -----
SCOA  A   1 P 20:194:00000 20:200:86370 LEICA GR25      -----
SOPU  A   1 P 20:194:00000 20:200:86370 LEICA GR30      -----
TERU  A   1 P 20:194:00000 20:200:86370 LEICA GRX1200GGPRO -----
VITO  A   1 P 20:194:00000 20:200:86370 LEICA GR10      -----
YEBE  A   1 P 20:194:00000 20:200:86370 TRIMBLE NETR9  -----
ZARA  A   1 P 20:194:00000 20:200:86370 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 20:194:00000 20:200:86370 LEIAT504      LEIS -----
ALDA  A   1 P 20:194:00000 20:200:86370 LEIAS10       NONE -----
ALSA  A   1 P 20:194:00000 20:200:86370 LEIAS10       NONE -----
AMUR  A   1 P 20:194:00000 20:200:86370 LEIAS10       NONE -----
BIAZ  A   1 P 20:194:00000 20:200:79170 LEIAR25       LEIT -----
BIDA  A   1 P 20:194:00000 20:200:86370 LEIAS10       NONE -----
```

BRZR	A	1	P	20:194:00000	20:200:86370	LEIAS10	NONE	----
CACE	A	1	P	20:194:00000	20:200:86370	TRM29659.00	NONE	----
CANT	A	1	P	20:194:00000	20:200:86370	LEIAR25.R4	LEIT	25066
CREU	A	1	P	20:194:00000	20:200:86370	LEIAR25.R4	NONE	26357
EBRE	A	1	P	20:194:00000	20:200:86370	LEIAR25.R4	NONE	26359
ELGE	A	1	P	20:194:00000	20:200:86370	LEIAR25.R4	LEIT	----
EMAZ	A	1	P	20:194:00000	20:200:86370	LEIAS10	NONE	----
GERN	A	1	P	20:194:00000	20:200:86370	LEIAS10	NONE	----
IGEL	A	1	P	20:194:00000	20:200:86370	LEIAR20	LEIM	----
ISPS	A	1	P	20:194:00000	20:200:86370	TRM59900.00	SCIS	----
KAST	A	1	P	20:194:00000	20:200:86370	LEIAS10	NONE	----
LARE	A	1	P	20:194:00000	20:197:86370	LEIAT504	NONE	----
LAZK	A	1	P	20:194:00000	20:200:86370	LEIAR25.R4	LEIT	----
LEIT	A	1	P	20:194:00000	20:200:86370	LEIAR10	NONE	----
ORDN	A	1	P	20:194:00000	20:200:86370	LEIAR10	NONE	----
PASA	A	1	P	20:194:00000	20:200:86370	LEIAR20	LEIM	73034
RID1	A	1	P	20:194:00000	20:200:86370	LEIAR25.R4	LEIT	25138
SALA	A	1	P	20:194:00000	20:200:86370	LEIAR25	NONE	----
SCDA	A	1	P	20:194:00000	20:200:86370	TRM55971.00	NONE	----
SOPU	A	1	P	20:194:00000	20:200:86370	LEIAS10	NONE	----
TERU	A	1	P	20:194:00000	20:200:86370	LEIAT504GG	LEIS	----
VITO	A	1	P	20:194:00000	20:200:86370	LEIAS10	NONE	----
YEBE	A	1	P	20:194:00000	20:200:86370	TRM29659.00	NONE	----
ZARA	A	1	P	20:194:00000	20:200:86370	TRM29659.00	NONE	----

### 7.3 Eccentricities

*SITE	PT	SOLN	T	DATA_START_	DATA_END_	AXE	UP_	NORTH_	EAST_
							ARP->	BENCHMARK(M)	-----
ACOR	A	1	P	20:194:00000	20:200:86370	UNE	3.0460	0.0000	0.0000
ALDA	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
ALSA	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
AMUR	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
BIAZ	A	1	P	20:194:00000	20:200:79170	UNE	0.0000	0.0000	0.0000
BIDA	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	20:194:00000	20:200:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	20:194:00000	20:200:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	20:194:00000	20:200:86370	UNE	3.0490	0.0000	0.0000
CREU	A	1	P	20:194:00000	20:200:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	20:194:00000	20:200:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
EMAZ	A	1	P	20:194:00000	20:200:86370	UNE	0.0350	0.0000	0.0000
GERN	A	1	P	20:194:00000	20:200:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	20:194:00000	20:200:86370	UNE	0.0350	0.0000	0.0000
KAST	A	1	P	20:194:00000	20:200:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	20:194:00000	20:197:86370	UNE	0.0000	0.0000	0.0000
LAZK	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
ORDN	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
RID1	A	1	P	20:194:00000	20:200:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	20:194:00000	20:200:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	20:194:00000	20:200:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	20:194:00000	20:200:86370	UNE	0.0600	0.0000	0.0000
VITO	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
YEBE	A	1	P	20:194:00000	20:200:86370	UNE	0.0000	0.0000	0.0000
ZARA	A	1	P	20:194:00000	20:200:86370	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:

```
2020-07-26 22:57 UTC | LARE1940.200 | RECEIVER FIRM. VERS. | 8.71 -> 8.71/3.822
2020-07-27 22:56 UTC | LARE1950.200 | RECEIVER FIRM. VERS. | 8.71 -> 8.71/3.822
2020-07-28 22:54 UTC | LARE1960.200 | RECEIVER FIRM. VERS. | 8.71 -> 8.71/3.822
2020-07-29 22:47 UTC | LARE1970.200 | RECEIVER FIRM. VERS. | 8.71 -> 8.71/3.822
```

## 9 References

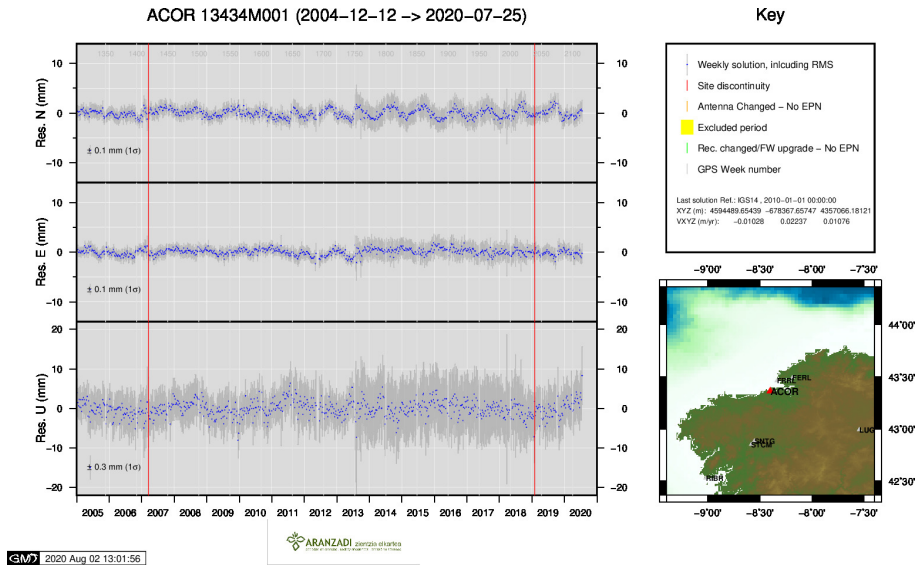
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](https://etrs89.ensg.ign.fr/memo-V8.pdf)

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

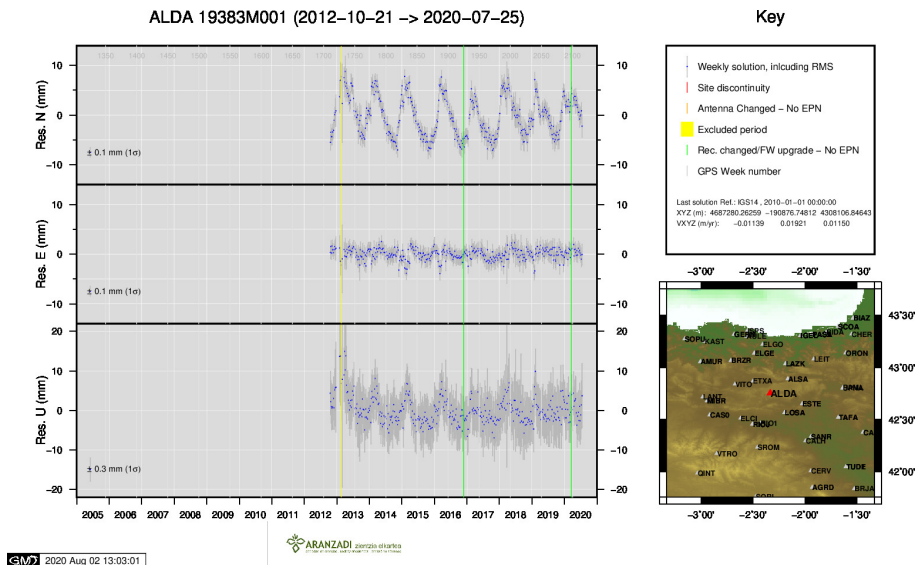
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](https://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

## 10 Cumulative Time Series

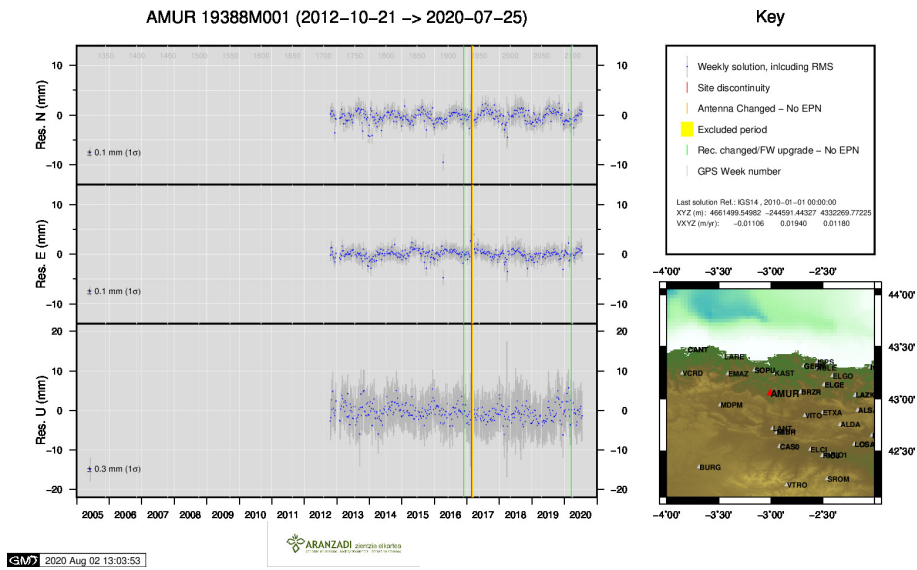
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



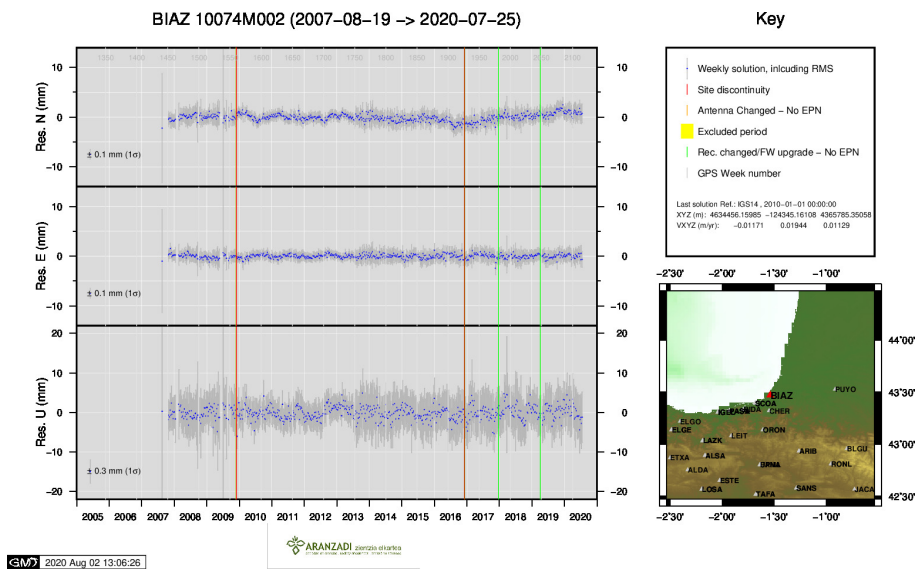
1 ) ACOR



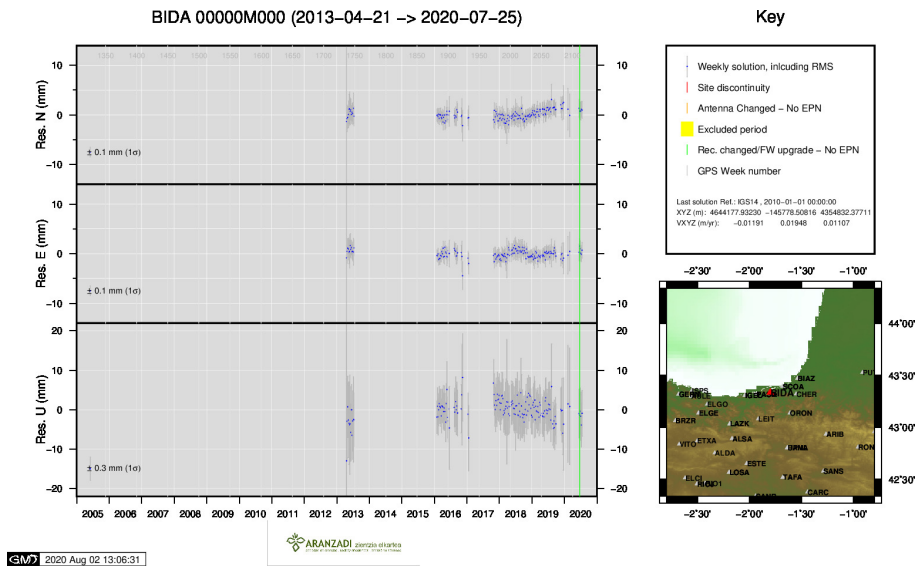
2 ) ALDA



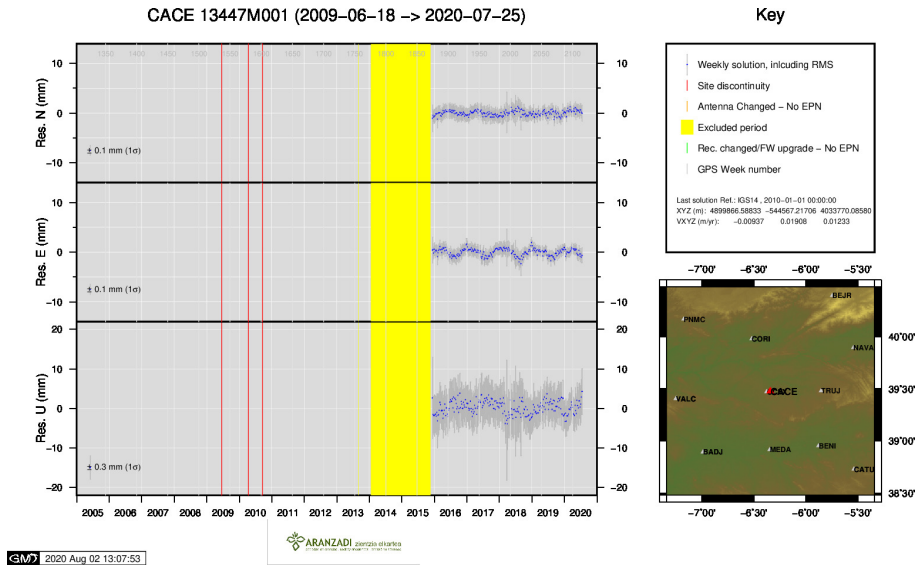
3 ) AMUR



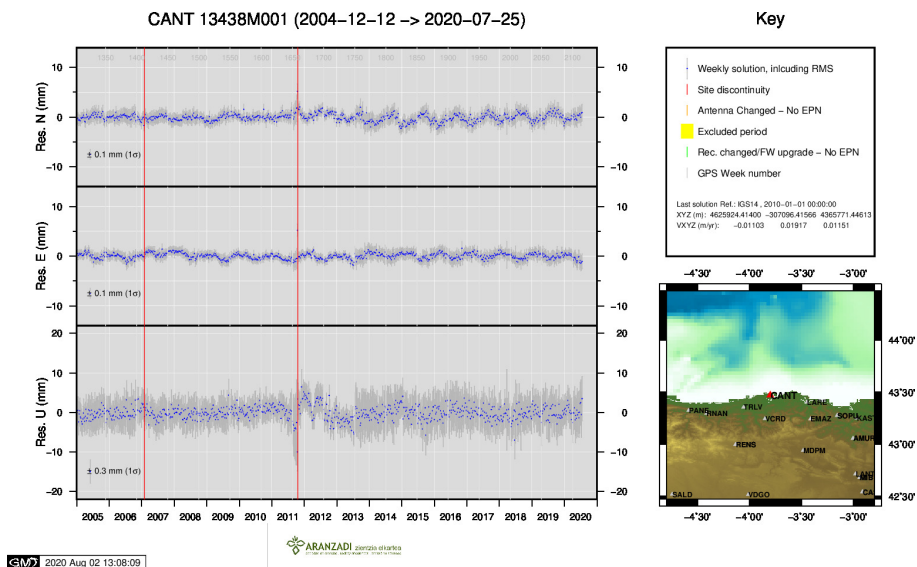
4 ) BIAZ



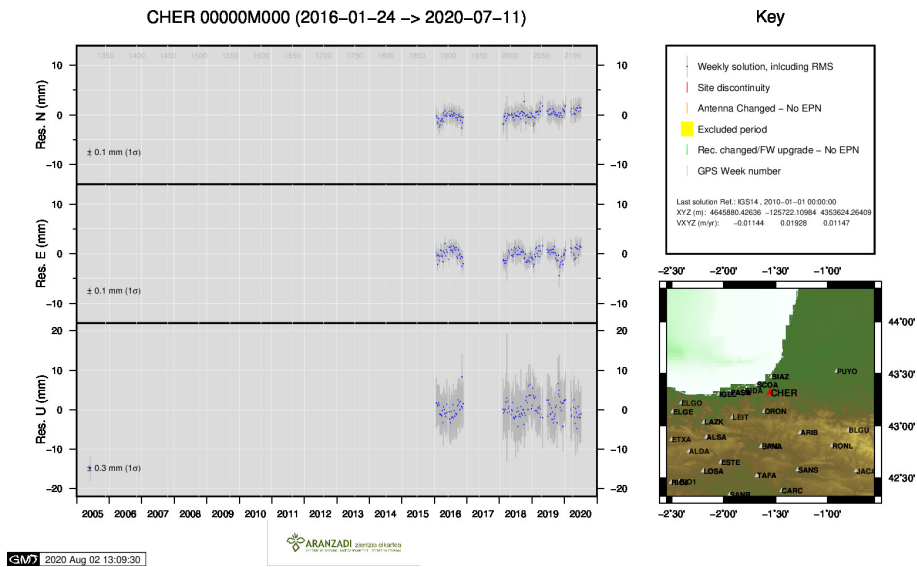
5 ) BIDA



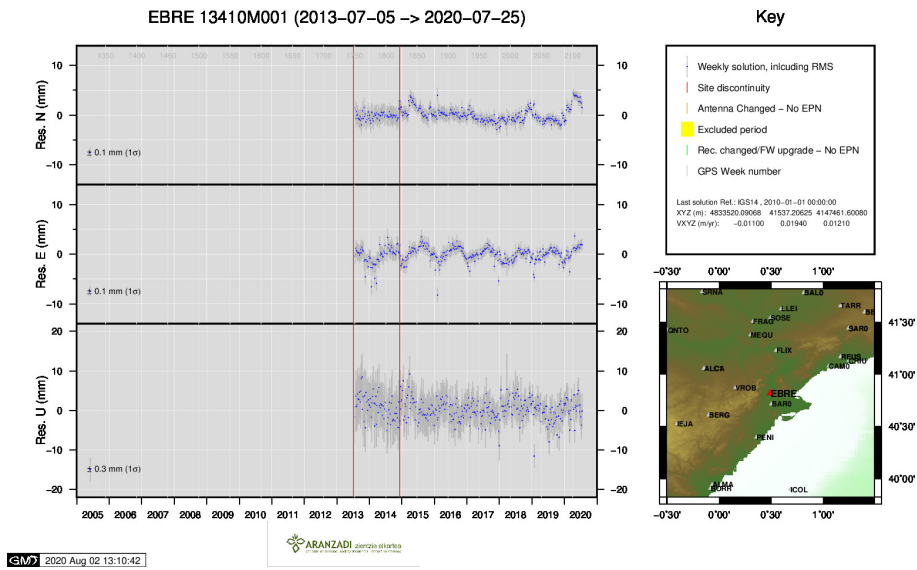
6 ) CACE



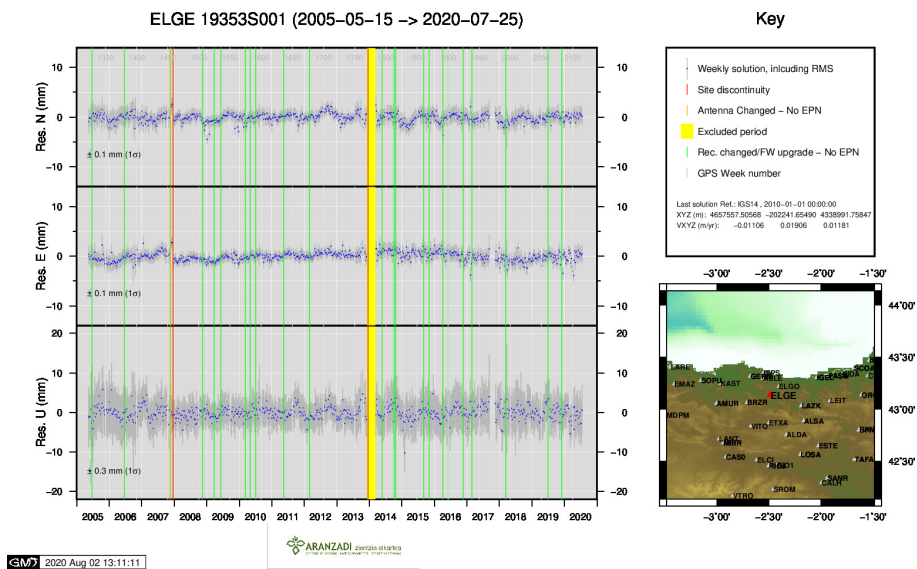
7 ) CANT



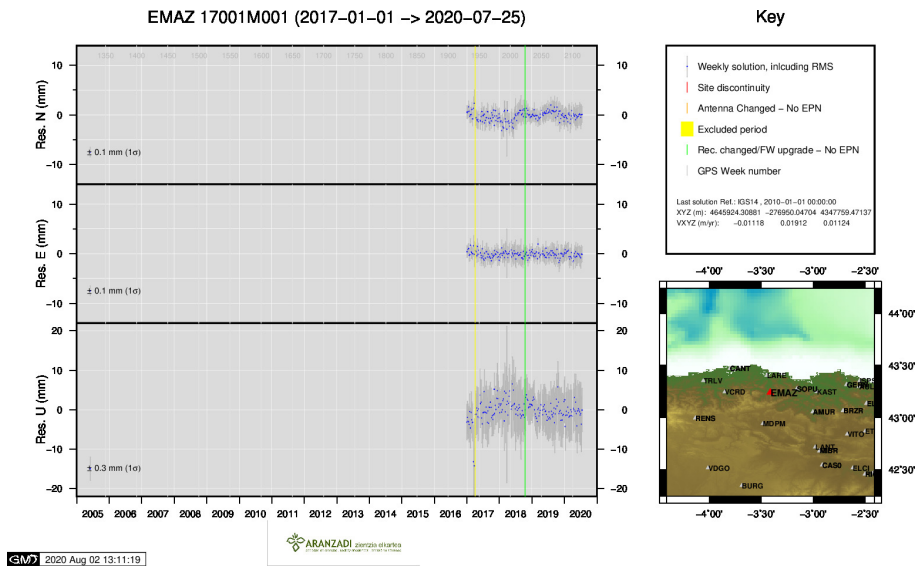
8 ) CHER



9 ) EBRE

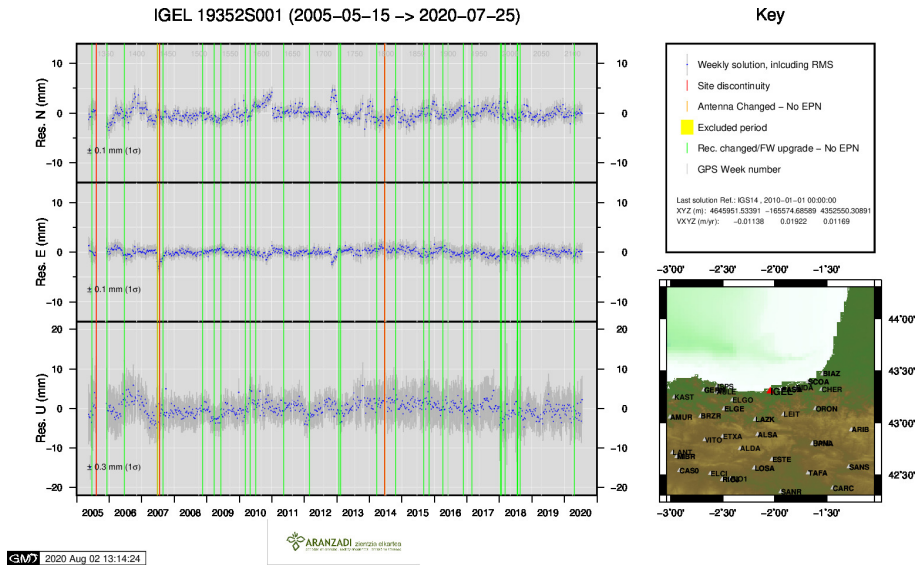


10 ) ELGE

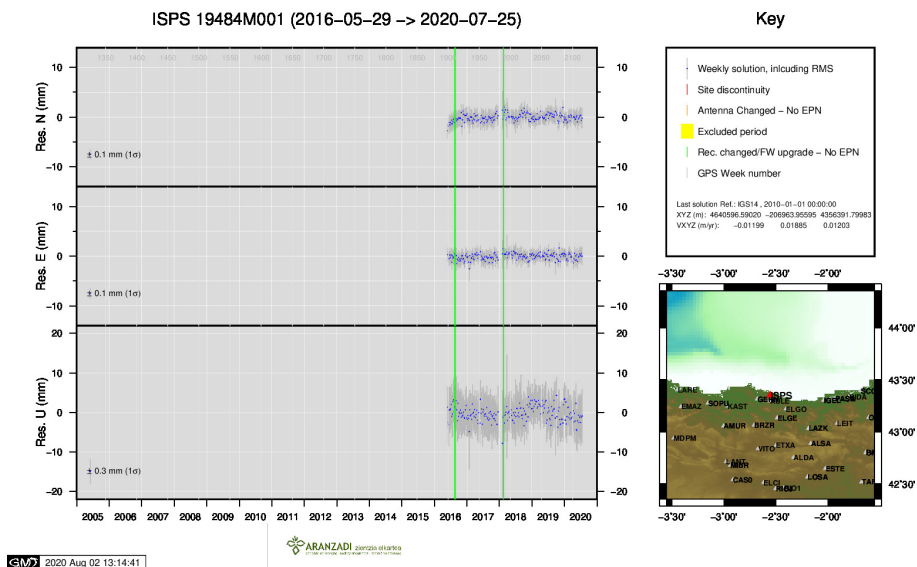


11 ) EMAZ

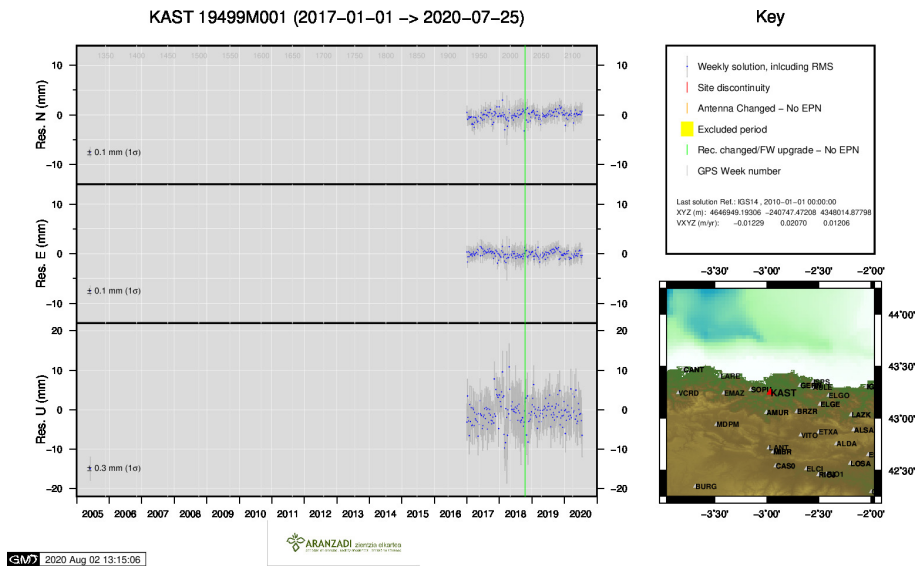




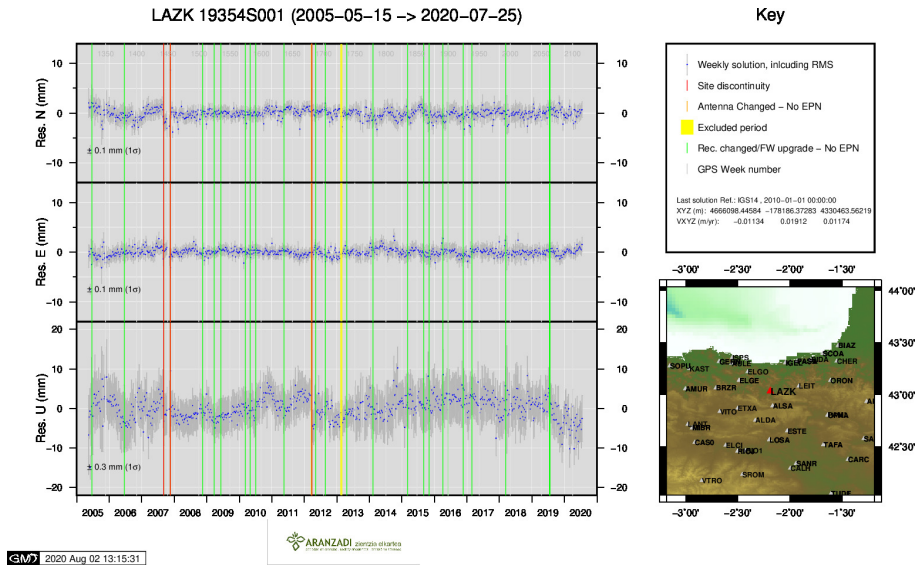
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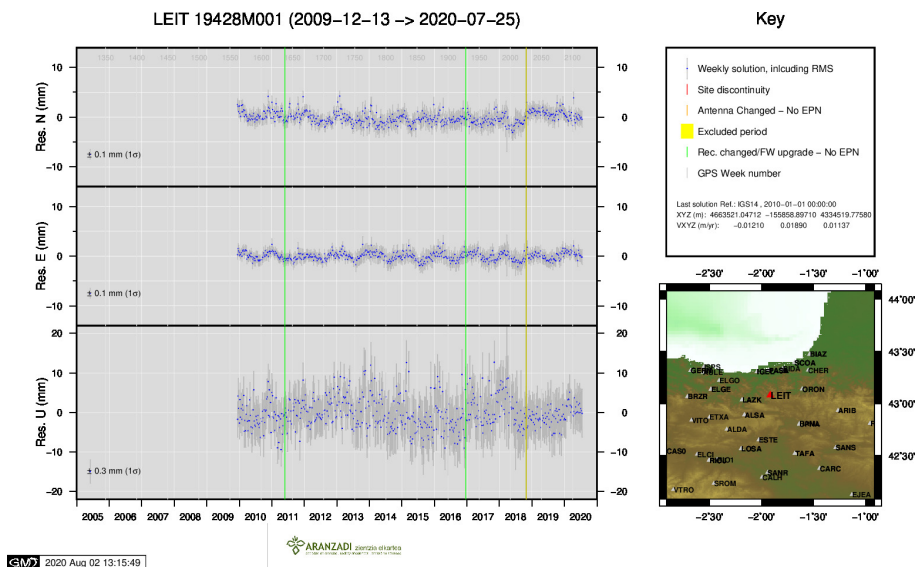
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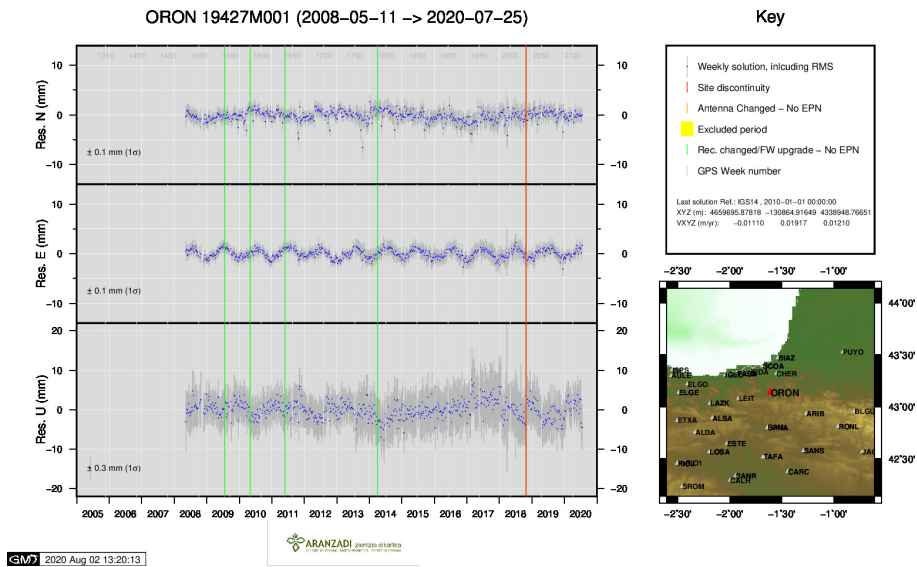
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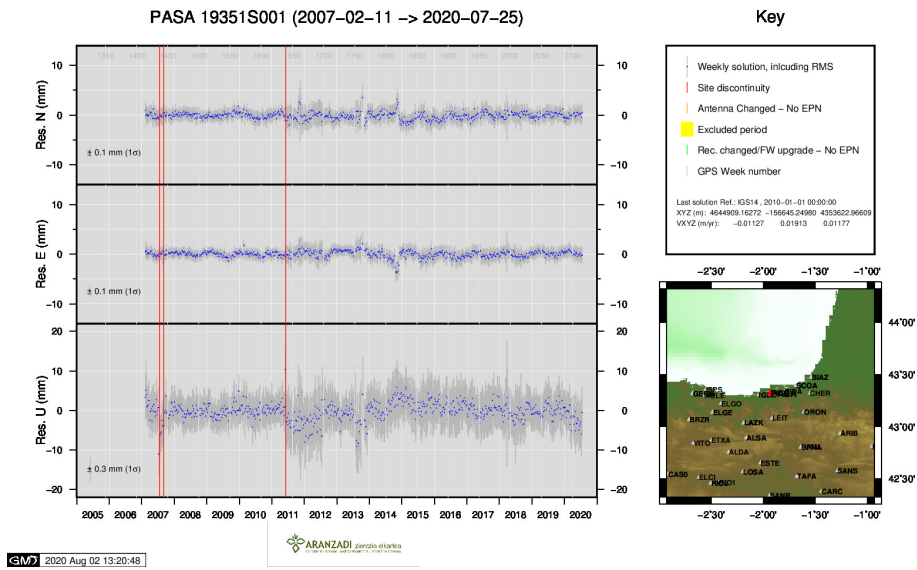
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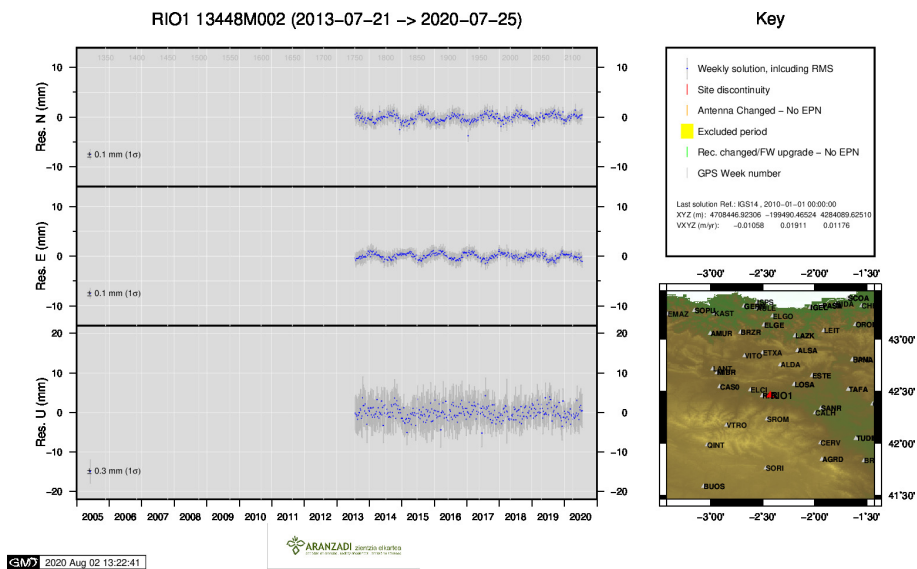
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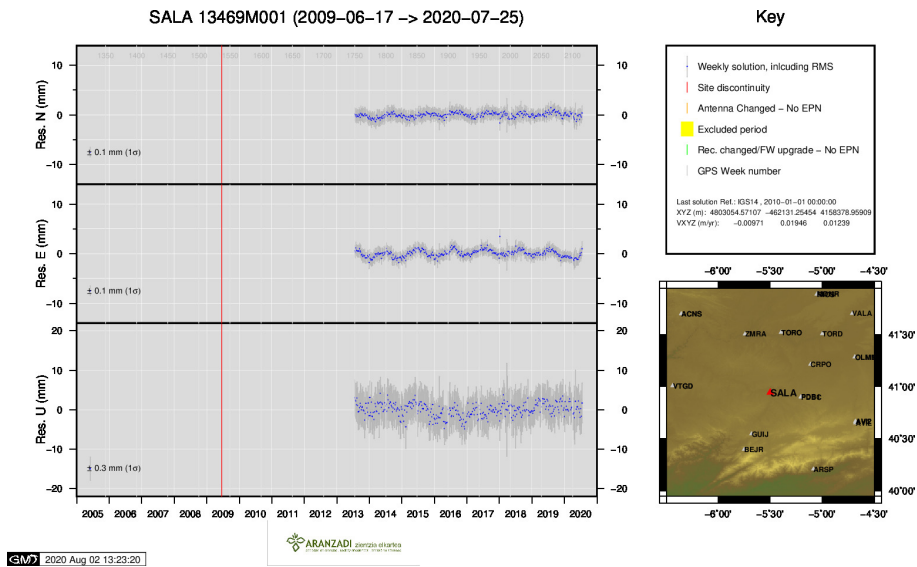
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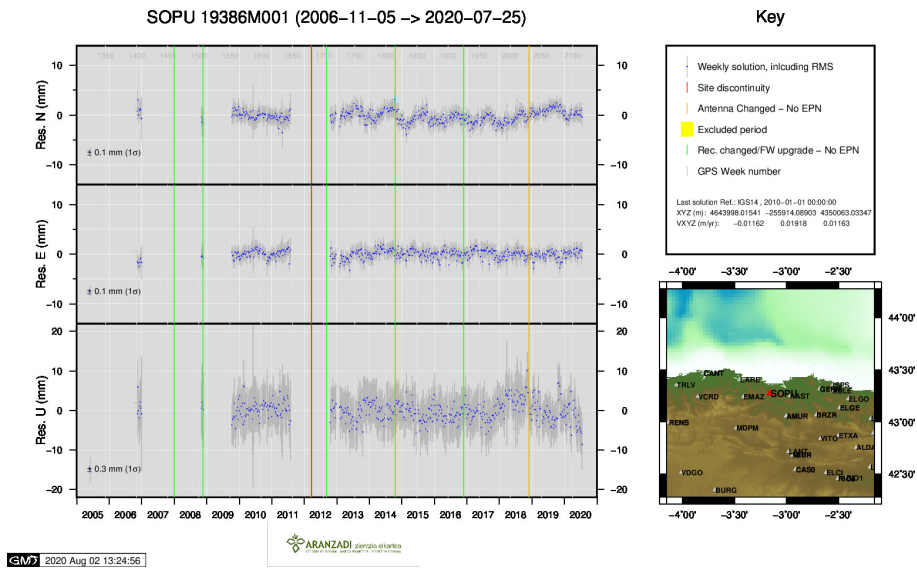
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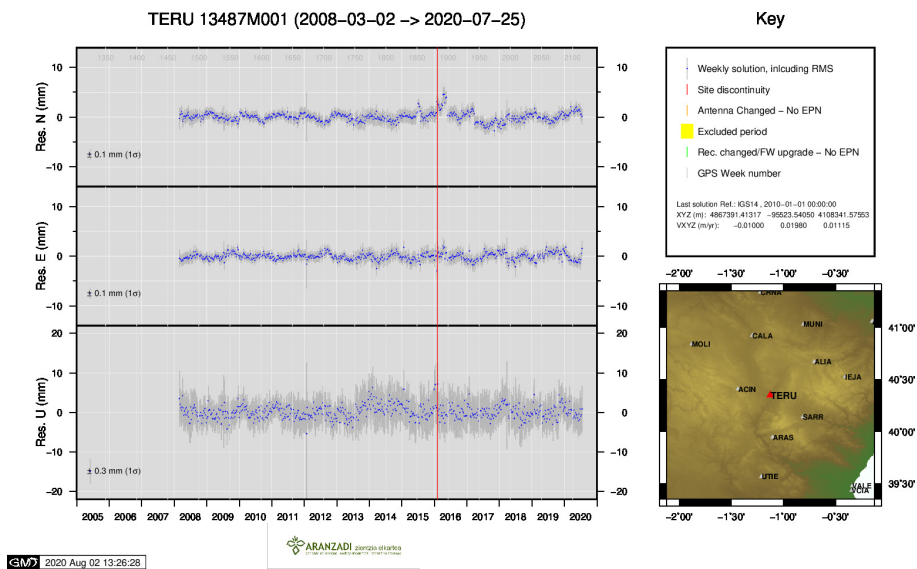
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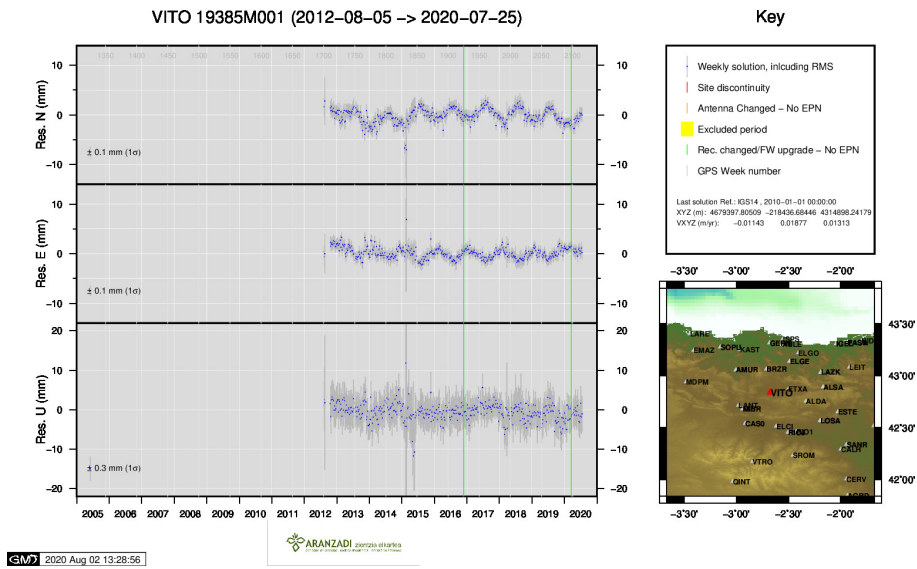
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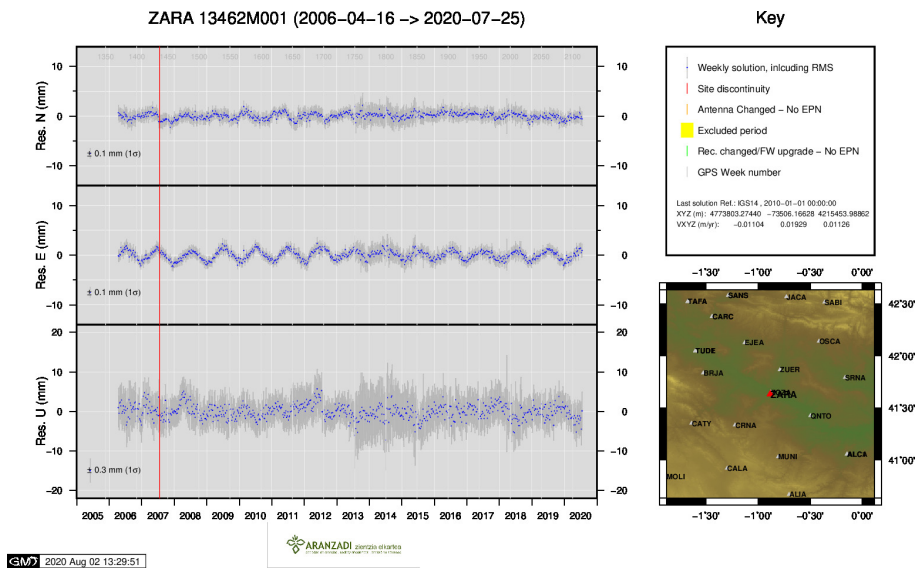
21 ) SOPU



22 ) TERU



23 ) VITO



24 ) ZARA