

# ARA-DAC Weekly Analysis Result: 2124 (GFA)

## Technical Report

**GPS Week: 2124 (GFA)**

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

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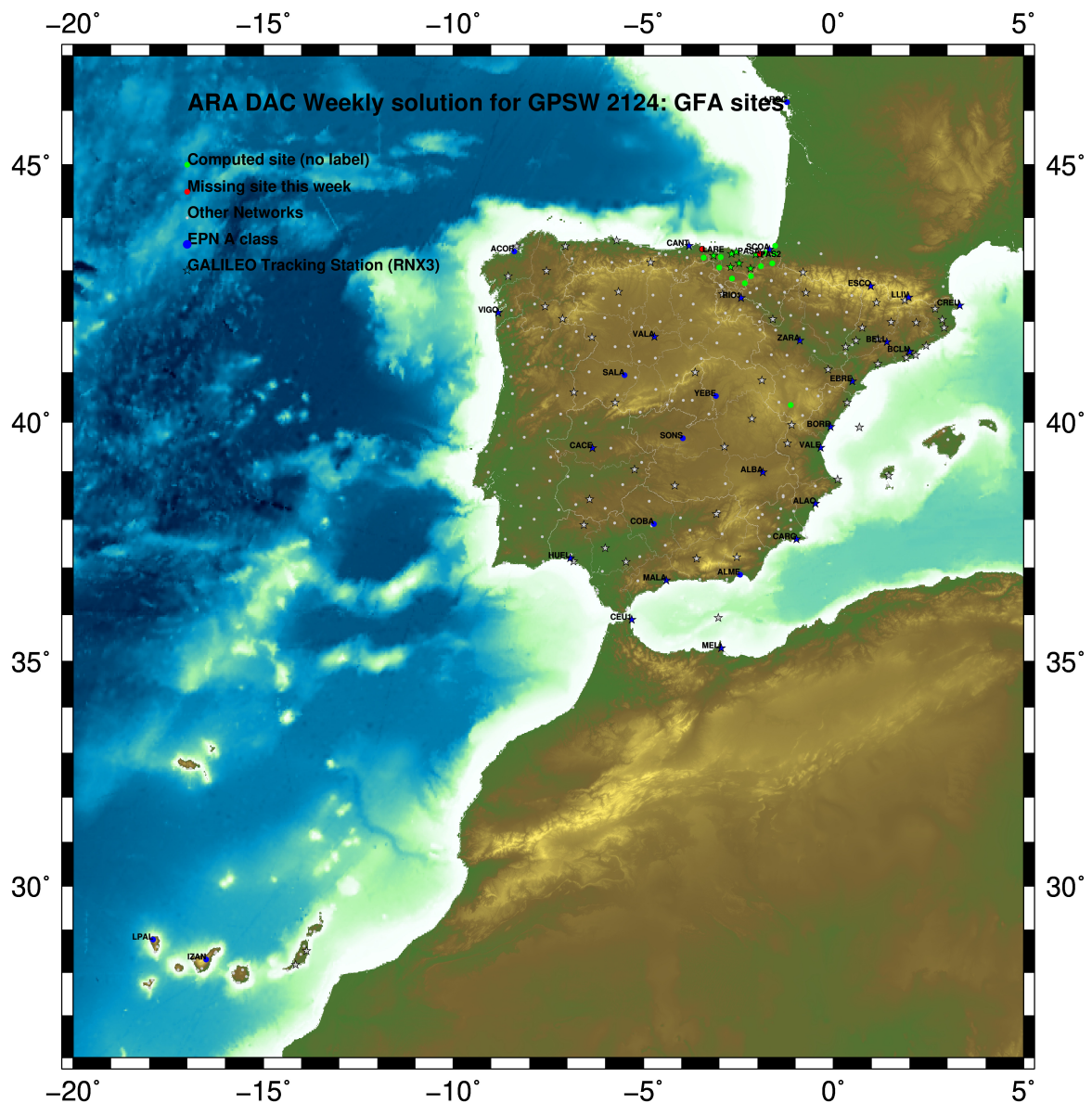
Report generated on 2020/10/11 at 13:22:36



# 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 Oct 11 13:22:27

Fig.1: Computed Sites for GPS Week2124 (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 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 IGS14

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

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ARA LAC 2124 WEEK FINAL COMBINATION: PRECISE ORBITS                11-OCT-20 10:19
-----
LOCAL GEODETIC DATUM: IGS14                EPOCH: 2020-09-23 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
 4 ACRD 13434M001         4594489.54291        -678367.41773        4357066.29833        W
39 ALDA 19383M001         4687280.14291        -190876.54234        4308106.96710        A
50 ALSA 19419M001         4677250.81875        -176770.36997        4319079.89271        A
53 AMUR 19388M001         4661499.43526        -244591.23444        4332269.90371        A
100 BIAZ 10074M002         4634456.03543        -124344.95098        4365785.47451        A
101 BIDA 00000M000         4644177.81101        -145778.29831        4354832.50295        A
113 BRZR 19387M001         4662220.97415        -220769.87552        4333309.45708        A
98 CACE 13447M001         4899866.48825        -544567.01188        4033770.21935        W
109 CANT 13438M001         4625924.29515        -307096.21067        4365771.57084        W
154 CHER 00000M000         4645880.00456        -125721.88620        4353624.10093        A
154 CREU 13432M001         4715420.11517         273178.08535        4271946.85674        W
190 EBRE 13410M001         4833519.96839         41537.41394        4147461.73121        W
180 ELGE 19353S001         4657557.38518        -202241.44936        4338991.88410        A
182 EMAZ 17001M001         4645924.19067        -276949.84188        4347759.59338        A
209 GERN 19389M001         4642811.30175        -217222.90217        4353278.89900        A
235 IGEL 19352S001         4645951.41385        -165574.48041        4352550.43673        A
240 ISPS 19484M001         4640596.46355        -206963.75266        4356391.93013        A
245 KAST 19499M001         4646949.06196        -240747.24942        4348015.00936        A
256 LAZK 19354S001         4666098.31507        -178186.16681        4330463.68117        A
261 LEIT 19428M001         4663520.92049        -155858.69408        4334519.90095        A
334 ORDN 19427M001         4659695.76278        -130864.71083        4338948.89989        A
456 PASA 19351S001         4644909.04370        -156645.04534        4353623.09501        W
513 RID1 13448M002         4708446.81215        -199490.26082        4284089.75399        W
518 SALA 13469M001         4803054.46694        -462131.04597        4158379.09345        W
526 SCDA 10088M002         4639940.48265        -136224.91899        4359552.43147        W
418 SOPU 19386M001         4643997.89892        -255913.88393        4350063.15920        A
443 TERU 13487M001         4867391.30776        -95523.32730        4108341.69746        A
493 VITO 19385M001         4679397.68564        -218436.48124        4314898.38440        A
698 YEBE 13420M001         4848724.55367        -261631.90516        4123094.34831        W
701 ZARA 13462M001         4773803.15061        -73505.96036        4215454.11190        W
    
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### 5.2 ETRF2000 (ETRS89) Coordinates

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

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ETRF2000 FINAL COORD. wk 2124                11-OCT-20 10:19
-----
LOCAL GEODETIC DATUM: ETRF2000            EPOCH: 2020-09-23 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
 4 ACRD 13434M001         4594489.85962        -678367.98076        4357065.86344        W
39 ALDA 19383M001         4687280.51563        -190877.11446        4308106.53113        A
50 ALSA 19419M001         4677251.19399        -176770.94095        4319079.45771        A
53 AMUR 19388M001         4661499.80318        -244591.80389        4332269.46910        A
100 BIAZ 10074M002         4634456.42043        -124345.51716        4365785.04354        A
101 BIDA 00000M000         4644178.19261        -145778.86561        4354832.07095        A
113 BRZR 19387M001         4662221.34505        -220770.44500        4333309.02271        A
98 CACE 13447M001         4899866.79791        -544567.60765        4033769.76205        W
109 CANT 13438M001         4625924.65736        -307096.77641        4365771.13824        W
154 CHER 00000M000         4645880.38852        -125722.45362        4353623.66905        A
154 CREU 13432M001         4715420.54180         273177.51179        4271946.42431        W
190 EBRE 13410M001         4833520.35780         41536.82678        4147461.28659        W
180 ELGE 19353S001         4657557.75875        -202242.01828        4338991.45033        A
182 EMAZ 17001M001         4645924.55576        -276950.40974        4347759.15959        A
209 GERN 19389M001         4642811.67452        -217223.46952        4353278.46621        A
235 IGEL 19352S001         4645951.79287        -165575.04796        4352550.00434        A
240 ISPS 19484M001         4640596.83780        -206964.31974        4356391.49764        A
245 KAST 19499M001         4646949.43148        -240747.81728        4348014.57594        A
256 LAZK 19354S001         4666098.69096        -178186.73658        4330463.24703        A
261 LEIT 19428M001         4663521.29939        -155859.26351        4334519.46730        A
334 ORDN 19427M001         4659696.14505        -130865.27977        4338948.46685        A
456 PASA 19351S001         4644909.42389        -156645.61275        4353622.66281        W
513 RID1 13448M002         4708447.18208        -199490.83524        4284089.31624        W
518 SALA 13469M001         4803054.79571        -462131.63122        4158378.64488        W
526 SCDA 10088M002         4639940.86575        -136225.48580        4359551.99992        W
418 SOPU 19386M001         4643998.25764        -255914.45151        4350062.72582        A
443 TERU 13487M001         4867391.67764        -95523.91856        4108341.24845        A
493 VITO 19385M001         4679398.05549        -218437.05257        4314897.94871        A
698 YEBE 13420M001         4848724.90436        -261632.49487        4123093.89868        W
701 ZARA 13462M001         4773803.53094        -73506.54148        4215453.67057        W
    
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### 5.3 ETRF2014 (ETRS89) Coordinates

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

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ETRF2014 FINAL COORD. wk 2124                                11-OCT-20 10:19
-----
LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2020-09-23 12:00:00
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
4  ACRD 13434M001         4594489.81846    -678368.01893   4357065.91416    W
39 ALDA 19383M001         4687280.47221    -190877.15389   4308106.58172    A
50 ALSA 19419M001         4677251.15062    -176770.98047   4319079.50834    A
53 AMUR 19388M001         4661499.76017    -244591.84325   4332269.51974    A
100 BIAZ 10074M002         4634456.37732    -124345.55702   4365785.09432    A
101 BIDA 00000M000         4644178.14947    -145778.90536   4354832.12168    A
113 BRZR 19387M001         4662221.30197    -220770.48443   4333309.07336    A
98 CACE 13447M001         4899866.75324    -544567.64502   4033769.81198    W
109 CANT 13438M001         4625924.61539    -307096.81570   4365771.18895    W
154 CHER 00000M000         4645880.34530    -125722.49344   4353623.71979    A
154 CREU 13432M001         4715420.49648    273177.47094    4271946.47513    W
190 EBRE 13410M001         4833520.31210     41536.78717    4147461.33693    W
180 ELGE 19353S001         4657557.71566    -202242.05779   4338991.50100    A
182 EMAZ 17001M001         4645924.51301    -276950.44905   4347759.21025    A
209 GERN 19389M001         4642811.63162    -217223.50904   4353278.51691    A
235 IGEL 19352S001         4645951.74978    -165575.08764   4352550.05506    A
240 ISPS 19484M001         4640596.79489    -206964.35931   4356391.54836    A
245 KAST 19499M001         4646949.38861    -240747.85671   4348014.62662    A
256 LAZK 19354S001         4666098.64770    -178186.77614   4330463.29769    A
261 LEIT 19428M001         4663521.25609    -155859.30316   4334519.51797    A
334 ORON 19427M001         4659696.10171    -130865.31951   4338948.51755    A
456 PASA 19351S001         4644909.38077    -156645.65246   4353622.71354    W
513 RIO1 13448M002         4708447.13847    -199490.87456   4284089.36677    W
518 SALA 13469M001         4803054.75188    -462131.66927   4158378.69507    W
526 SOCA 10088M002         4639940.82263    -136225.52560   4359552.05067    W
418 SOPU 19386M001         4643998.21484    -255914.49090   4350062.77651    A
443 TERU 13487M001         4867391.63204    -95523.95757   4108341.29862    A
493 VITO 19385M001         4679398.01223    -218437.09194   4314897.99931    A
698 YEBE 13420M001         4848724.85948    -261632.53341   4123093.94882    W
701 ZARA 13462M001         4773803.48624    -73506.58094    4215453.72099    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 IGS14 solution and are given with respect the Local frame (North-East-Up).

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ARA LAC 2124 WEEK FINAL COMBINATION: PRECISE ORBITS                                11-OCT-20 10:19
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Station	#Days	Weekday O123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	1.01	1.25	3.52
ALDA 19383M001	7	XXXXXX	1.66	1.35	3.86
ALSA 19419M001	7	XXXXXX	1.67	1.84	5.62
AMUR 19388M001	7	XXXXXX	1.12	0.59	4.30
BLAZ 10074M002	7	XXXXXX	1.35	0.96	5.92
BIDA 00000M000	7	XXXXXX	1.19	1.51	7.91
BRZR 19387M001	7	XXXXXX	1.88	1.72	4.98
CACE 13447M001	7	XXXXXX	0.87	0.85	1.82
CANT 13438M001	7	XXXXXX	1.04	0.96	3.57
CHER 00000M000	6	XXXXX	1.37	1.03	6.60
CREU 13432M001	7	XXXXXX	1.96	1.16	4.33
EBRE 13410M001	7	XXXXXX	4.97	10.36	10.09
ELGE 19353S001	7	XXXXXX	1.37	1.33	4.59
EMAZ 17001M001	6	XXXXX	1.39	1.08	3.39
GERN 19389M001	7	XXXXXX	0.81	1.30	7.18
IGEL 19352S001	7	XXXXXX	1.47	0.89	2.13
ISPS 19484M001	7	XXXXXX	0.78	1.30	3.46
KAST 19499M001	7	XXXXXX	1.27	1.08	4.51
LAZK 19354S001	7	XXXXXX	1.82	0.35	9.97
LEIT 19428M001	7	XXXXXX	0.97	0.97	2.27
ORDN 19427M001	7	XXXXXX	1.03	0.61	2.07
PASA 19351S001	7	XXXXXX	0.90	0.91	2.43
RI01 13448M002	7	XXXXXX	0.86	0.79	3.11
SALA 13469M001	7	XXXXXX	1.37	0.94	2.36
SCDA 10088M002	7	XXXXXX	1.38	0.92	6.97
SOPU 19386M001	7	XXXXXX	1.55	1.33	7.33
TERU 13487M001	7	XXXXXX	0.79	1.23	4.77
VITD 19385M001	7	XXXXXX	1.08	1.88	3.41
YEBE 13420M001	7	XXXXXX	1.56	0.70	4.00
ZARA 13462M001	7	XXXXXX	1.10	1.28	3.69

Comparison of individual solutions:

ACOR 13434M001	N	1.01	1.66	-0.15	1.02	-0.18	-0.01	-1.12	-0.99
ACOR 13434M001	E	1.25	-0.55	1.96	-1.09	-0.63	-0.08	1.75	0.79
ACOR 13434M001	U	3.52	1.05	0.96	-0.29	-5.82	0.96	2.78	5.46
ALDA 19383M001	N	1.66	-2.78	1.54	-1.50	-0.39	0.22	-1.92	0.64
ALDA 19383M001	E	1.35	0.32	-0.96	-0.43	0.06	-2.27	1.78	1.16
ALDA 19383M001	U	3.86	8.22	-1.06	3.31	-2.69	1.12	0.16	-1.12
ALSA 19419M001	N	1.67	-2.83	0.77	-0.26	-1.07	0.93	2.27	0.97
ALSA 19419M001	E	1.84	0.80	-0.76	0.90	-1.01	-3.66	1.67	1.07
ALSA 19419M001	U	5.62	10.60	-6.75	-0.33	0.05	-5.62	0.37	0.44
AMUR 19388M001	N	1.12	0.41	0.50	0.58	1.89	1.01	-1.32	0.66
AMUR 19388M001	E	0.59	-0.17	-0.83	-0.48	-0.05	0.07	-0.78	0.73
AMUR 19388M001	U	4.30	2.68	-9.04	-2.82	2.51	-2.09	-0.24	1.86
BLAZ 10074M002	N	1.35	-1.05	0.34	0.04	1.00	2.55	-0.12	1.52
BLAZ 10074M002	E	0.96	-1.21	0.72	-0.20	-1.80	0.29	0.18	0.30
BLAZ 10074M002	U	5.92	-0.79	12.26	5.97	-0.40	-2.62	3.44	-2.13
BIDA 00000M000	N	1.19	0.79	2.53	-0.29	0.41	1.05	-0.41	0.03
BIDA 00000M000	E	1.51	-2.44	1.88	-0.81	-0.74	0.15	1.69	0.03
BIDA 00000M000	U	7.91	-10.55	14.02	-0.29	4.34	-3.51	2.09	5.63
BRZR 19387M001	N	1.88	2.27	1.39	1.57	-1.10	1.42	-2.84	-0.69
BRZR 19387M001	E	1.72	1.13	0.58	1.58	-2.63	-2.33	1.15	0.11
BRZR 19387M001	U	4.98	3.23	-3.94	1.08	-9.53	-0.86	5.41	-0.93
CACE 13447M001	N	0.87	0.24	0.91	-0.13	-1.39	-1.29	0.04	0.19
CACE 13447M001	E	0.85	-0.61	0.01	-0.26	-1.25	-0.65	0.57	1.26
CACE 13447M001	U	1.82	-1.05	2.87	-0.23	-0.35	0.23	-2.62	-1.88
CANT 13438M001	N	1.04	1.49	0.01	1.16	-0.60	-0.17	-0.70	-1.45
CANT 13438M001	E	0.96	-0.62	-0.96	-0.40	-1.10	-0.27	0.90	1.39
CANT 13438M001	U	3.57	1.90	-1.05	-3.21	1.91	-0.52	-2.41	7.20
CHER 00000M000	N	1.37	1.97	0.00	-1.06	0.59	1.43		1.41
CHER 00000M000	E	1.03	-0.29	0.73	0.13	-1.14	0.97		-1.58
CHER 00000M000	U	5.60	-1.18	7.44	7.51	4.42	-4.89		0.41
CREU 13432M001	N	1.96	2.79	0.96	-1.60	0.83	0.16	-3.20	-0.86
CREU 13432M001	E	1.16	-0.53	-0.66	-1.06	-0.22	-1.21	2.16	-0.36
CREU 13432M001	U	4.33	4.04	0.10	-1.50	-3.25	-2.16	8.08	-3.65
EBRE 13410M001	N	4.97	-0.80	-2.04	1.03	-3.07	-2.34	10.66	-3.72
EBRE 13410M001	E	10.36	2.29	2.40	2.20	2.56	1.53	-22.45	10.72
EBRE 13410M001	U	10.09	11.29	5.64	1.00	3.24	5.20	2.16	-20.22
ELGE 19353S001	N	1.37	-0.70	0.07	0.92	1.09	2.32	-1.79	-0.34
ELGE 19353S001	E	1.33	0.02	-1.71	-0.20	-1.80	1.25	0.48	1.63
ELGE 19353S001	U	4.59	1.94	-6.43	6.04	2.97	-0.41	-0.37	-5.96
EMAZ 17001M001	N	1.39	-2.37	-0.23	0.07	-0.85		1.70	0.64
EMAZ 17001M001	E	1.08	0.28	-0.39	1.89	-1.02		-1.00	-0.24
EMAZ 17001M001	U	3.39	-0.03	-3.82	2.47	4.07		-0.52	4.48
GERN 19389M001	N	0.81	0.01	0.48	0.22	1.39	0.76	0.27	-1.04
GERN 19389M001	E	1.30	0.27	0.45	1.34	-0.22	-1.42	1.49	-1.95
GERN 19389M001	U	7.18	-5.94	-9.04	-4.23	-2.67	10.49	7.53	-0.46
IGEL 19352S001	N	1.47	-0.96	-1.78	1.01	2.63	0.54	-0.11	0.84
IGEL 19352S001	E	0.89	0.05	0.26	0.98	-1.46	-0.70	1.01	-0.28
IGEL 19352S001	U	2.13	-3.62	0.99	0.07	-1.82	-2.09	1.74	-1.58
ISPS 19484M001	N	0.78	-1.03	1.00	-0.24	0.78	0.39	0.30	0.83
ISPS 19484M001	E	1.30	1.20	-1.66	1.32	-1.74	-0.57	0.71	0.64
ISPS 19484M001	U	3.46	-4.18	0.42	6.40	-1.91	-1.05	-1.63	-2.37
KAST 19499M001	N	1.27	0.46	0.71	1.76	-1.50	1.66	-0.88	-0.08
KAST 19499M001	E	1.08	0.69	1.26	1.00	-0.71	0.21	-1.45	-1.12
KAST 19499M001	U	4.51	-2.44	-4.08	1.41	-5.29	6.70	-4.32	2.45
LAZK 19354S001	N	1.82	-0.96	-0.03	-2.48	-1.12	0.60	2.30	2.45
LAZK 19354S001	E	0.35	0.53	-0.33	-0.33	0.18	0.07	-0.28	-0.33
LAZK 19354S001	U	9.97	12.05	-1.63	7.67	7.58	0.08	-14.06	-11.60
LEIT 19428M001	N	0.97	-0.37	0.80	-0.52	-0.76	0.66	-0.81	1.71
LEIT 19428M001	E	0.97	-0.42	0.36	-0.98	-0.61	-1.06	1.64	0.50
LEIT 19428M001	U	2.27	3.60	-3.47	-0.96	-0.66	-0.46	1.99	-0.62
ORDN 19427M001	N	1.03	-0.53	-0.98	-0.65	1.39	-0.37	0.10	1.61

ORDN 19427M001	E	0.61	0.47	-1.09	0.57	0.06	-0.66	0.17	0.08
ORDN 19427M001	U	2.07	1.59	0.81	2.40	0.80	-2.89	-2.75	0.44
PASA 19351S001	N	0.90	0.55	-1.09	-0.02	0.44	1.73	0.00	0.41
PASA 19351S001	E	0.91	-0.44	-0.06	0.20	-1.31	-0.36	1.68	0.09
PASA 19351S001	U	2.43	-4.12	1.09	-3.58	1.35	-0.72	-0.60	-1.34
RID1 13448M002	N	0.86	0.15	1.50	-0.61	0.11	0.55	-0.00	-1.22
RID1 13448M002	E	0.79	-0.06	-0.16	-0.13	0.10	-1.78	0.25	0.65
RID1 13448M002	U	3.11	1.08	-5.58	0.49	-0.91	-0.20	2.45	4.33
SALA 13469M001	N	1.37	1.97	0.59	-0.09	0.43	-0.03	-1.85	-1.85
SALA 13469M001	E	0.94	1.00	-0.33	0.71	-0.33	-0.83	-0.00	1.71
SALA 13469M001	U	2.36	-2.98	0.01	-1.55	3.19	2.93	0.09	1.80
SCDA 10088M002	N	1.38	2.81	0.76	1.39	0.34	-0.25	-0.89	-0.22
SCDA 10088M002	E	0.92	1.04	-0.62	-0.22	-1.28	0.05	1.35	-0.27
SCDA 10088M002	U	6.97	1.11	11.41	7.08	3.30	-6.35	-7.59	1.02
SOPU 19386M001	N	1.55	0.68	1.41	1.33	0.46	0.59	-3.01	0.72
SOPU 19386M001	E	1.33	-0.20	1.29	1.03	-1.94	0.90	0.68	-1.70
SOPU 19386M001	U	7.33	-10.42	-7.54	-2.58	0.81	-1.95	6.16	10.40
TERU 13487M001	N	0.79	-0.09	-0.25	-0.01	-0.45	1.71	0.37	-0.65
TERU 13487M001	E	1.23	0.21	0.19	-0.98	0.75	1.60	-0.18	-2.22
TERU 13487M001	U	4.77	-0.05	-2.89	3.94	-5.15	8.70	1.71	2.73
VITO 19385M001	N	1.08	-0.47	0.57	0.15	-0.59	-1.16	1.52	1.56
VITO 19385M001	E	1.88	-0.06	0.22	-0.93	-2.70	-2.02	1.05	2.78
VITO 19385M001	U	3.41	4.21	-2.74	-0.14	-5.26	-0.81	-1.26	3.84
YEBE 13420M001	N	1.56	0.46	0.72	-0.05	-2.11	-1.86	1.66	-1.78
YEBE 13420M001	E	0.70	-0.15	-1.20	0.17	0.82	-0.02	-0.82	0.36
YEBE 13420M001	U	4.00	-0.02	-1.07	-2.46	3.05	2.90	-5.92	-6.01
ZARA 13462M001	N	1.10	0.37	-0.55	0.63	-0.72	0.59	-1.78	1.56
ZARA 13462M001	E	1.28	0.03	-0.32	0.41	0.65	1.82	0.14	-2.41
ZARA 13462M001	U	3.69	-1.59	-3.41	1.16	-0.90	-6.66	4.00	-2.20



## 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	-2.26	0.39	1.83
10	ALAC 13433M001	I W	0.17	0.36	-2.12
13	ALBA 13452M001	I W	0.23	-1.28	-0.20
19	ALME 13437M001	I W	-0.47	1.56	-0.82
41	BCLN 13412M001	I W	0.24	0.50	-1.06
46	BELL 13431M001	I W	-1.41	-3.02	5.14
65	BORR 13480M001	I W	1.20	-2.83	-2.84
70	BRST 10004M004	I W	-0.61	1.40	-3.80
98	CACE 13447M001	I W	1.01	1.23	3.63
109	CANT 13438M001	I W	-0.72	0.80	2.12
110	CARG 19412M001	I W	1.49	-1.25	0.79
121	CEU1 13449M002	I W	0.11	0.09	-3.15
135	COBA 13453M001	I W	0.51	0.20	-5.70
154	CREU 13432M001	I W	1.16	-0.21	-1.60
190	EBRE 13410M001	I W	-2.49	1.80	3.87
208	ESCO 13435M001	I W	-0.48	1.55	-1.65
286	HUEL 13451M001	I W	3.20	-2.40	-7.68
300	IZAN 31309M002	I W	0.60	-1.35	7.94
359	LLIV 13436M001	I W	-0.71	1.71	0.69
364	LPAL 81701M001	I W	-2.59	-0.71	6.29
366	LROC 10023M001	I W	1.30	1.16	-2.95
400	MELI 19379M001	I W	1.40	-0.58	0.97
456	PASA 19351S001	I W	-1.26	1.25	-2.59
513	RIO1 13448M002	I W	-0.63	1.69	-2.85
518	SALA 13469M001	I W	-0.05	1.37	0.95
526	SCOA 10088M002	I W	-2.57	1.81	-3.98
557	SONS 13446M001	I W	-1.28	-1.08	-0.88
588	TERC 31909M001	I W	5.38	-4.38	1.10
654	VALA 13463M002	I W	0.68	0.03	1.35
658	VALE 13439M001	I W	0.39	0.45	-0.92
669	VIGO 13450M001	I W	-0.43	0.89	6.21
698	YEBE 13420M001	I W	-0.19	0.45	1.56
701	ZARA 13462M001	I W	-0.34	0.51	1.48
710	ZIMM 14001M004	I W	-1.78	-1.69	-4.47
84	MALA 13443M001	I W	1.22	-0.41	3.33
RMS / COMPONENT			1.60	1.54	3.52
MEAN			0.00	0.00	-0.00
MIN			-2.59	-4.38	-7.68
MAX			5.38	1.81	7.94

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 105  
RMS OF TRANSFORMATION : 2.40 MM

BARYCENTER COORDINATES:

LATITUDE : 40 19 0.07  
LONGITUDE : - 3 55 28.24  
HEIGHT : -38.454 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.41 MM  
TRANSLATION IN E : -0.00 +- 0.41 MM  
TRANSLATION IN U : 0.00 +- 0.41 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          14822176
NUMBER OF UNKNOWN               193872
NUMBER OF DEGREES OF FREEDOM    14628204
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  2.327070425425895

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")
      X          Y          Z          X          Y          Z      Scale (ppm)
-----
 1  0.00220      0.0017 -0.0004 -0.0005 -0.0001 0.0001 -0.0001 -0.00013
 2  0.00245     -0.0060 -0.0070  0.0084  0.0001 -0.0003 -0.0002 -0.00010
 3  0.00220      0.0252 -0.0059 -0.0210  0.0002 0.0011 -0.0001 -0.00091
 4  0.00254      0.0094 -0.0050 -0.0113  0.0001 0.0005 -0.0001 -0.00018
 5  0.01540      0.0343  0.0208 -0.0433 -0.0001 0.0018  0.0008  0.00063
 6  0.00310      0.0032  0.0063 -0.0060 -0.0000 0.0002  0.0003  0.00030
 7  0.00265     -0.0103 -0.0144  0.0187  0.0004 -0.0007 -0.0003 -0.00086
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00147      2108414      2.17                2135808      3      867      26530      0
 2  0.00146      2098807      2.14                2125989      3      864      26321      0
 3  0.00147      2102509      2.17                2130930      3      876      27548      0
 4  0.00153      2050361      2.35                2079052      3      870      27824      0
 5  0.00159      2055841      2.53                2085264      3      864      28562      0
 6  0.00160      2087721      2.56                2117608      3      870      29020      0
 7  0.00150      2119379      2.24                2147525      3      870      27279      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 20:264:00000 20:270:86370 LEICA GR50 -----
ALDA  A  1 P 20:264:00000 20:270:86370 LEICA GR10 -----
ALSA  A  1 P 20:264:00000 20:270:86370 LEICA GR50 -----
AMUR  A  1 P 20:264:25200 20:270:86370 LEICA GR10 -----
BIAZ  A  1 P 20:264:00000 20:270:86370 TRI SP90M -----
BIDA  A  1 P 20:264:00000 20:270:86370 LEICA GR10 -----
BRZR  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
CACE  A  1 P 20:264:00000 20:270:86370 TRIMBLE NETR9 -----
CANT  A  1 P 20:264:00000 20:270:86370 LEICA GR10 -----
CHER  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
CREU  A  1 P 20:264:00000 20:270:86370 LEICA GR50 -----
EBRE  A  1 P 20:264:00000 20:270:86370 LEICA GR50 -----
ELGE  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
EMAZ  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
GERN  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
IGEL  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
ISPS  A  1 P 20:264:00000 20:270:86370 TRIMBLE NETR9 -----
KAST  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
LAZK  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
LEIT  A  1 P 20:264:00000 20:270:86370 LEICA GR50 -----
ORON  A  1 P 20:264:00000 20:270:86370 LEICA GR50 -----
PASA  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
RIO1  A  1 P 20:264:00000 20:270:86370 LEICA GR25 -----
SALA  A  1 P 20:264:00000 20:270:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 20:264:00000 20:270:86370 LEICA GR25 -----
SOPU  A  1 P 20:264:00000 20:270:86370 LEICA GR30 -----
TERU  A  1 P 20:264:00000 20:270:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 20:264:00000 20:270:86370 LEICA GR10 -----
YEBE  A  1 P 20:264:00000 20:270:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 20:264:00000 20:270:86370 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 20:264:00000 20:270:86370 LEIAT504      LEIS -----
ALDA  A  1 P 20:264:00000 20:270:86370 LEIAS10       NONE -----
ALSA  A  1 P 20:264:00000 20:270:86370 LEIAS10       NONE -----
AMUR  A  1 P 20:264:25200 20:270:86370 LEIAS10       NONE -----
BIAZ  A  1 P 20:264:00000 20:270:86370 LEIAR25      LEIT -----
BIDA  A  1 P 20:264:00000 20:270:86370 LEIAS10       NONE -----
```

BRZR	A	1	P	20:264:00000	20:270:86370	LEIAS10	NONE	----
CACE	A	1	P	20:264:00000	20:270:86370	TRM29659.00	NONE	----
CANT	A	1	P	20:264:00000	20:270:86370	LEIAR25.R4	LEIT	25066
CHER	A	1	P	20:264:00000	20:270:86370	LEIAR10	NONE	----
CREU	A	1	P	20:264:00000	20:270:86370	LEIAR25.R4	NONE	26357
EBRE	A	1	P	20:264:00000	20:270:86370	LEIAR25.R4	NONE	26359
ELGE	A	1	P	20:264:00000	20:270:86370	LEIAR25.R4	LEIT	----
EMAZ	A	1	P	20:264:00000	20:270:86370	LEIAS10	NONE	----
GERN	A	1	P	20:264:00000	20:270:86370	LEIAS10	NONE	----
IGEL	A	1	P	20:264:00000	20:270:86370	LEIAR20	LEIM	----
ISPS	A	1	P	20:264:00000	20:270:86370	TRM59900.00	SCIS	----
KAST	A	1	P	20:264:00000	20:270:86370	LEIAS10	NONE	----
LAZK	A	1	P	20:264:00000	20:270:86370	LEIAR25.R4	LEIT	----
LEIT	A	1	P	20:264:00000	20:270:86370	LEIAR10	NONE	----
ORDN	A	1	P	20:264:00000	20:270:86370	LEIAR10	NONE	----
PASA	A	1	P	20:264:00000	20:270:86370	LEIAR20	LEIM	73034
RIO1	A	1	P	20:264:00000	20:270:86370	LEIAR25.R4	LEIT	25138
SALA	A	1	P	20:264:00000	20:270:86370	LEIAR25	NONE	----
SCDA	A	1	P	20:264:00000	20:270:86370	TRM55971.00	NONE	----
SOPU	A	1	P	20:264:00000	20:270:86370	LEIAS10	NONE	----
TERU	A	1	P	20:264:00000	20:270:86370	LEIAT504GG	LEIS	----
VITO	A	1	P	20:264:00000	20:270:86370	LEIAS10	NONE	----
YEBE	A	1	P	20:264:00000	20:270:86370	TRM29659.00	NONE	----
ZARA	A	1	P	20:264:00000	20:270:86370	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	20:264:00000	20:270:86370	UNE	3.0460	0.0000	0.0000
ALDA	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
ALSA	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
AMUR	A	1	P	20:264:25200	20:270:86370	UNE	0.0000	0.0000	0.0000
BIAZ	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
BIDA	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	20:264:00000	20:270:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	20:264:00000	20:270:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	20:264:00000	20:270:86370	UNE	3.0490	0.0000	0.0000
CHER	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
CREU	A	1	P	20:264:00000	20:270:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	20:264:00000	20:270:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
EMAZ	A	1	P	20:264:00000	20:270:86370	UNE	0.0350	0.0000	0.0000
GERN	A	1	P	20:264:00000	20:270:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	20:264:00000	20:270:86370	UNE	0.0350	0.0000	0.0000
KAST	A	1	P	20:264:00000	20:270:86370	UNE	0.0350	0.0000	0.0000
LAZK	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
ORDN	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
RIO1	A	1	P	20:264:00000	20:270:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	20:264:00000	20:270:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	20:264:00000	20:270:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	20:264:00000	20:270:86370	UNE	0.0600	0.0000	0.0000
VITO	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
YEBE	A	1	P	20:264:00000	20:270:86370	UNE	0.0000	0.0000	0.0000
ZARA	A	1	P	20:264:00000	20:270:86370	UNE	3.2590	0.0000	0.0000

## 8 References

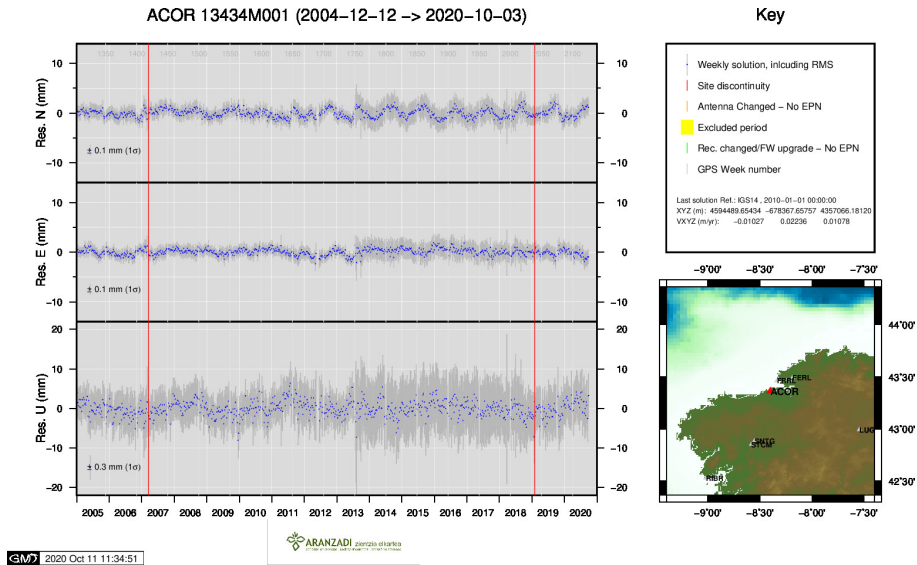
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](https://etrs89.ensg.ign.fr/memo-V8.pdf)

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)

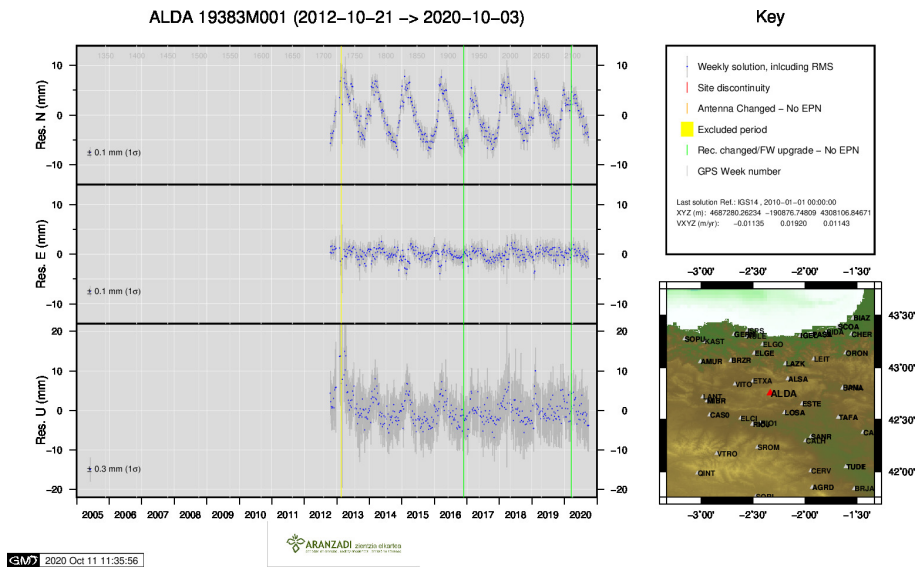
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](https://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

## 9 Cumulative Time Series

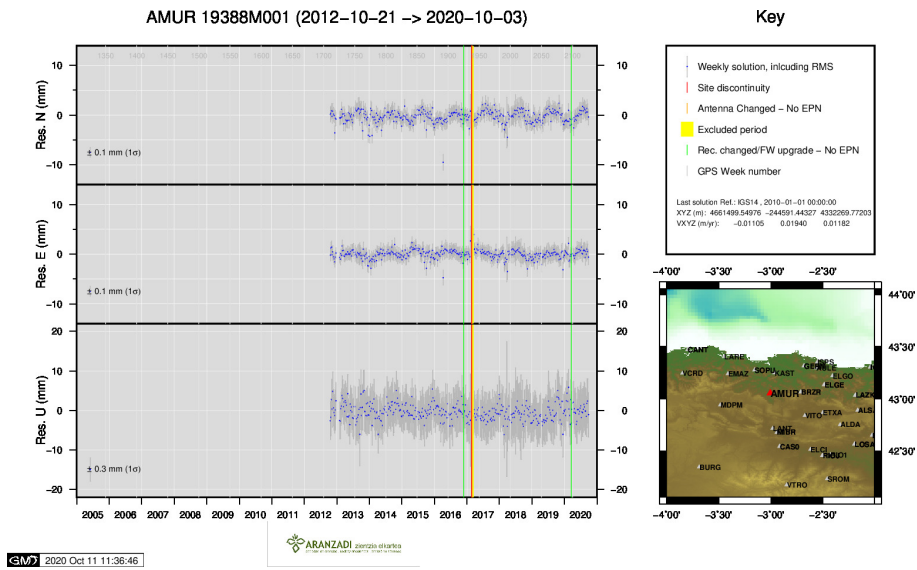
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



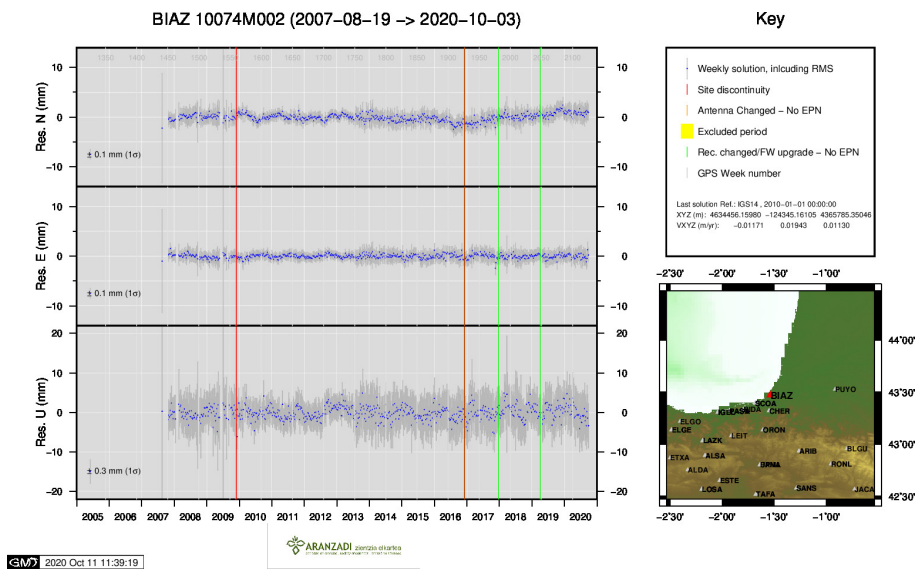
1 ) ACOR



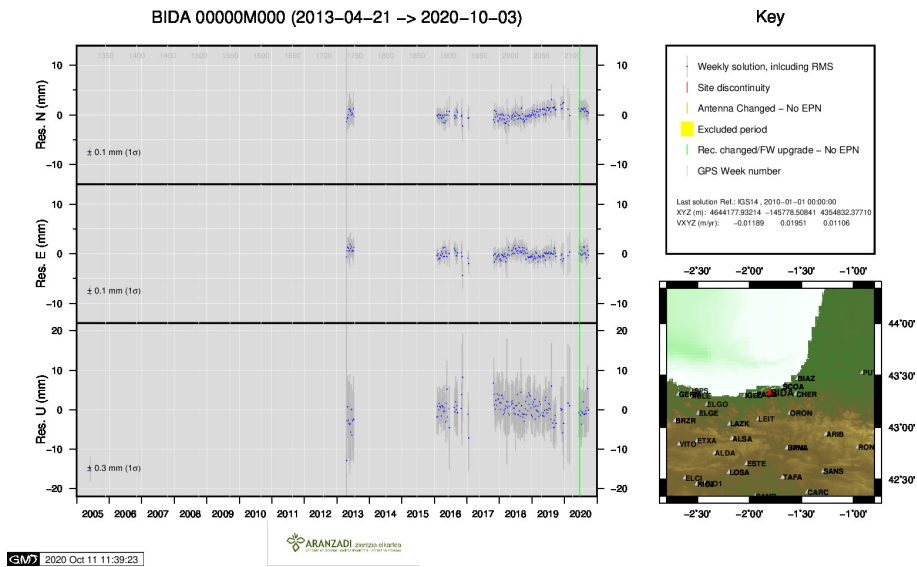
2 ) ALDA



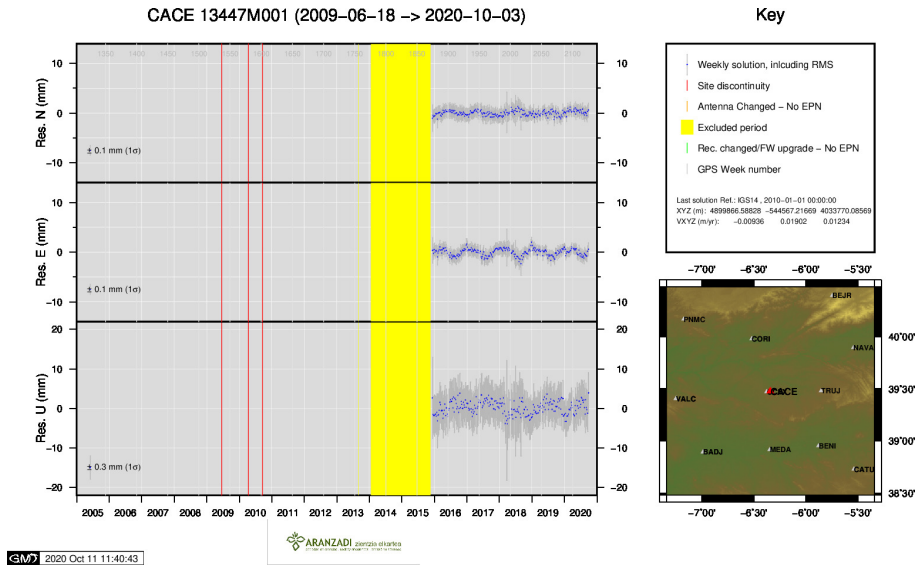
3 ) AMUR



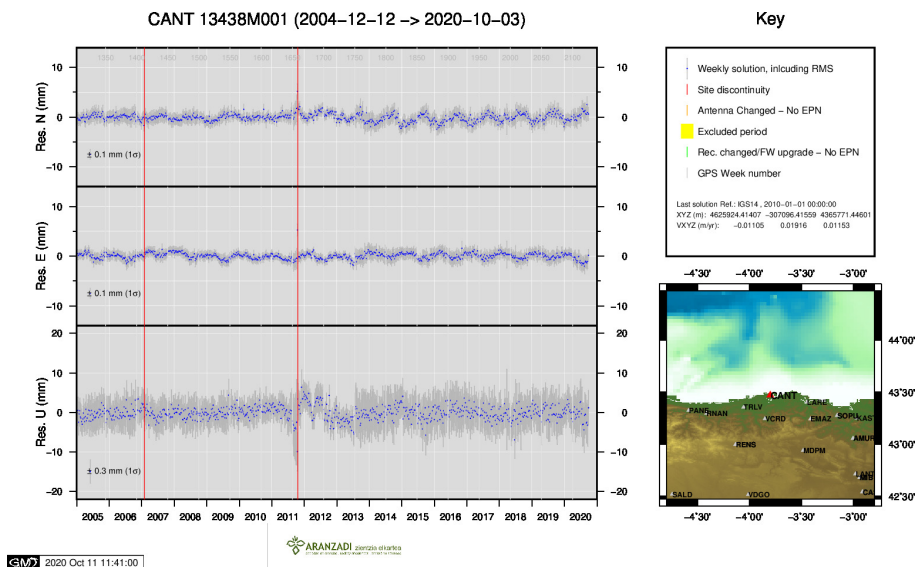
4 ) BIAZ



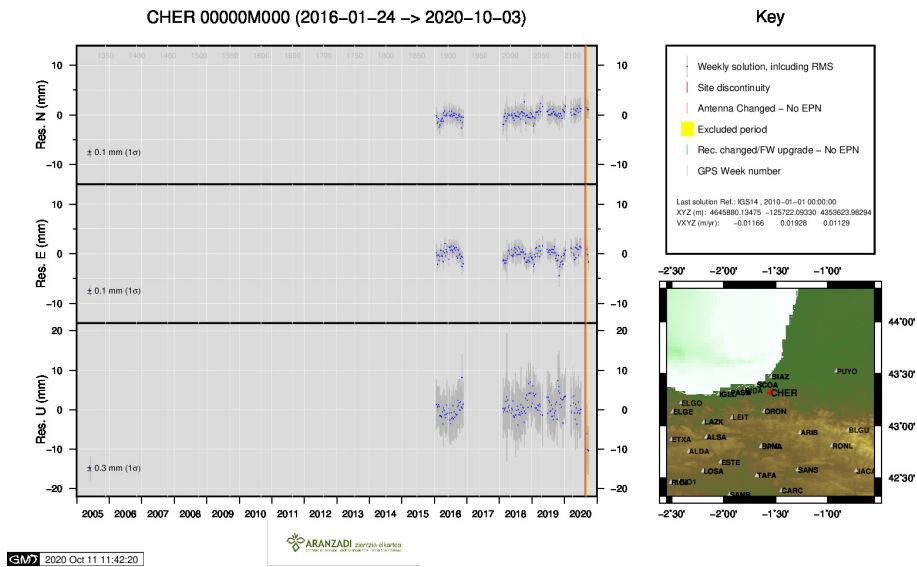
5 ) BIDA



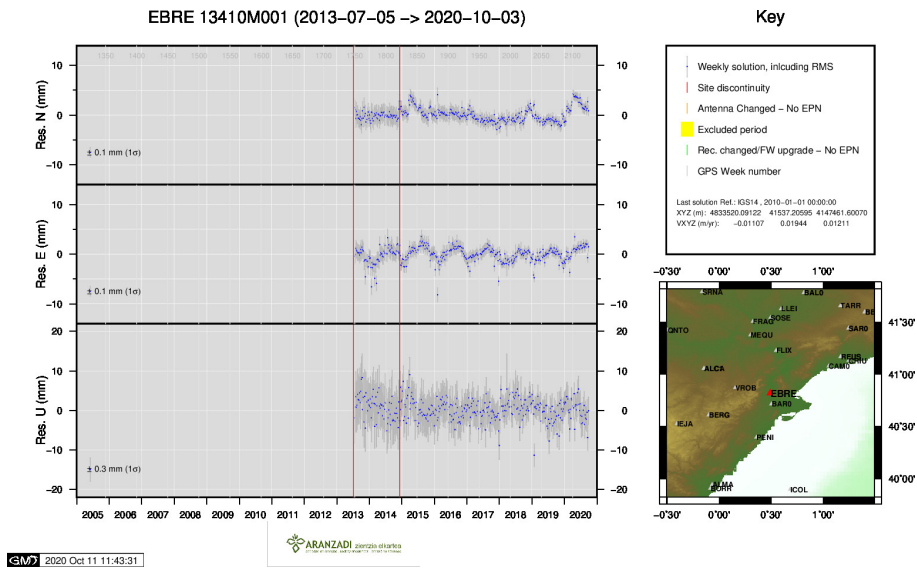
6 ) CACE



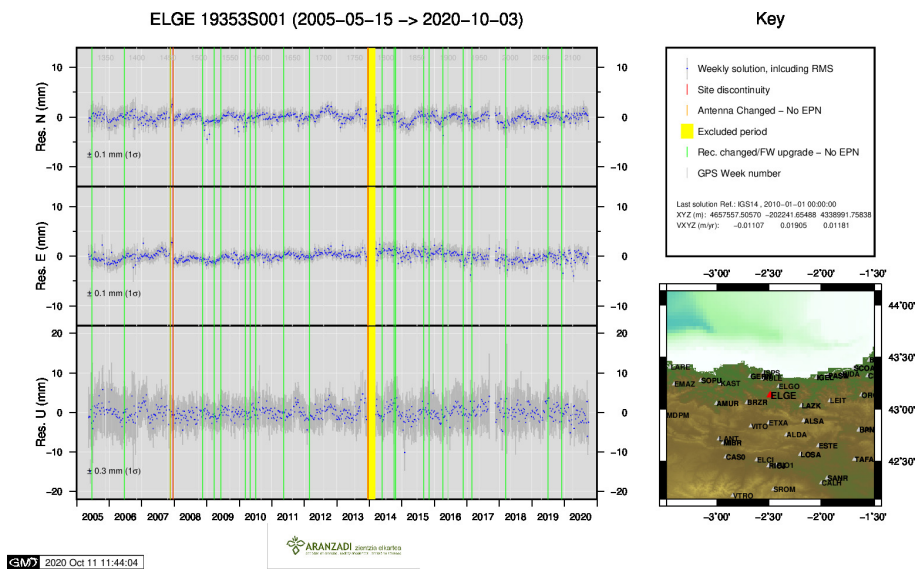
7 ) CANT



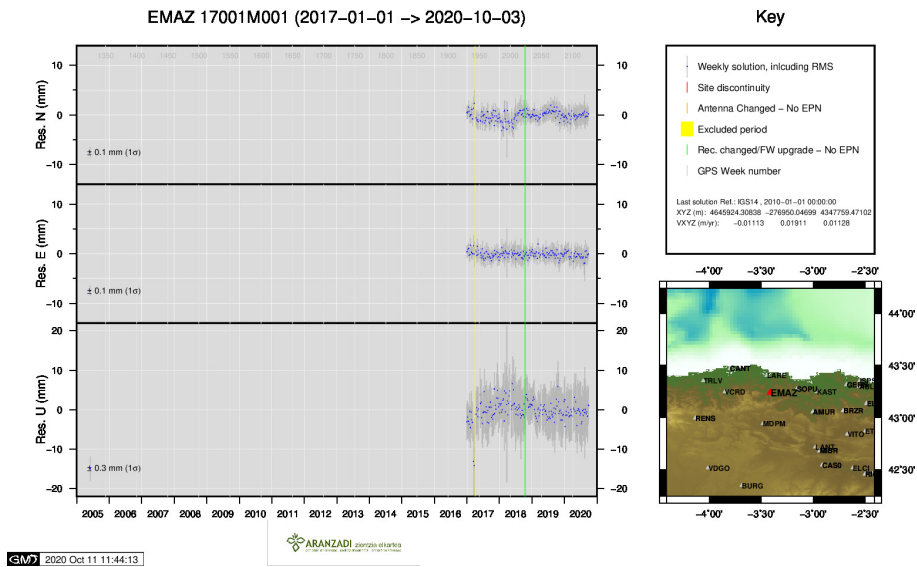
8 ) CHER



9 ) EBRE

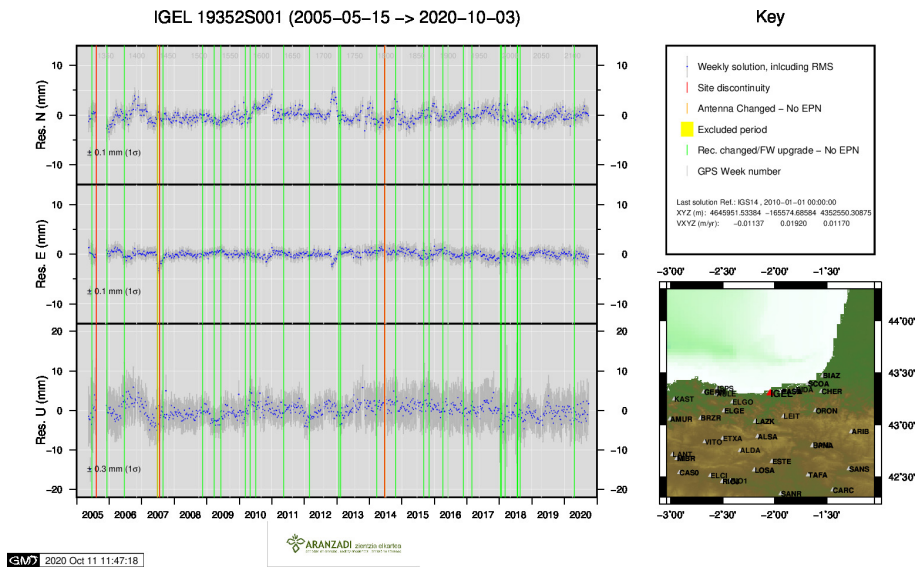


10 ) ELGE

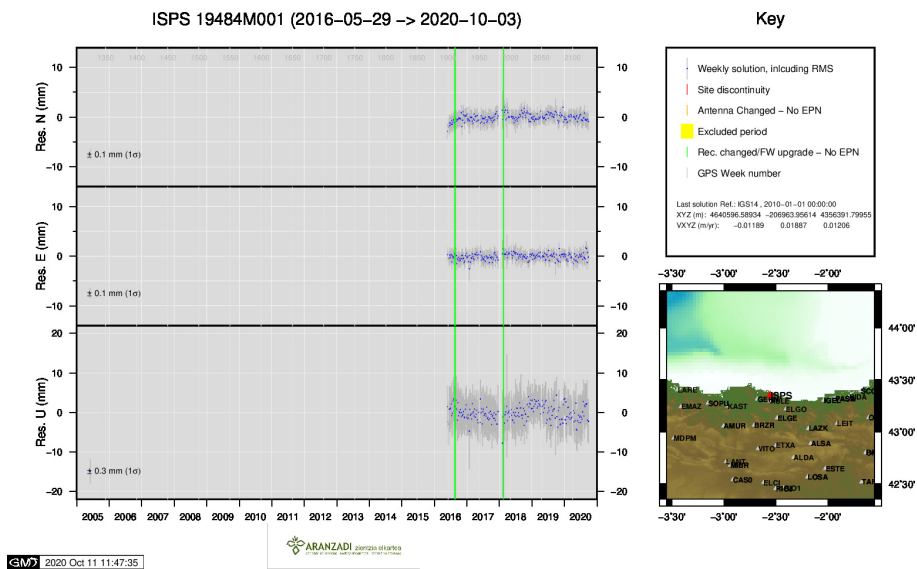


11 ) EMAZ

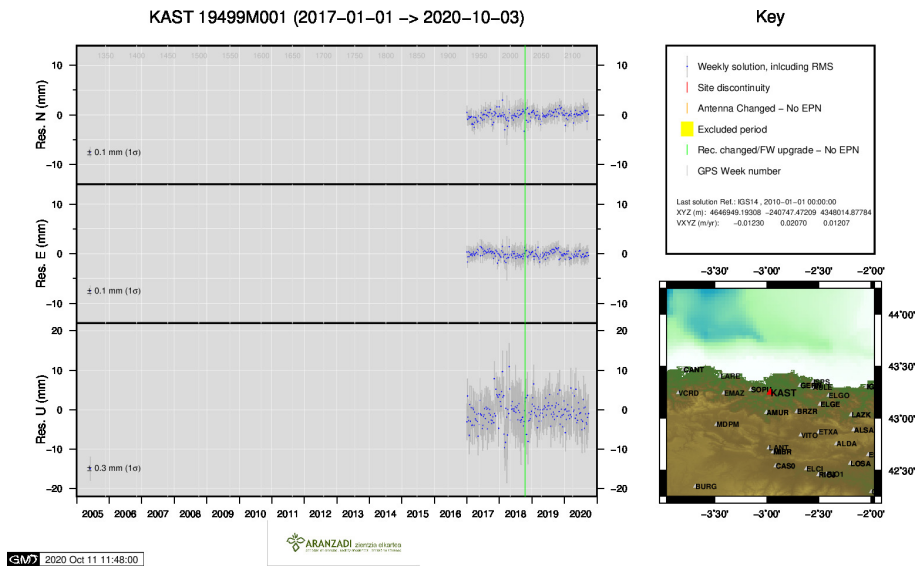




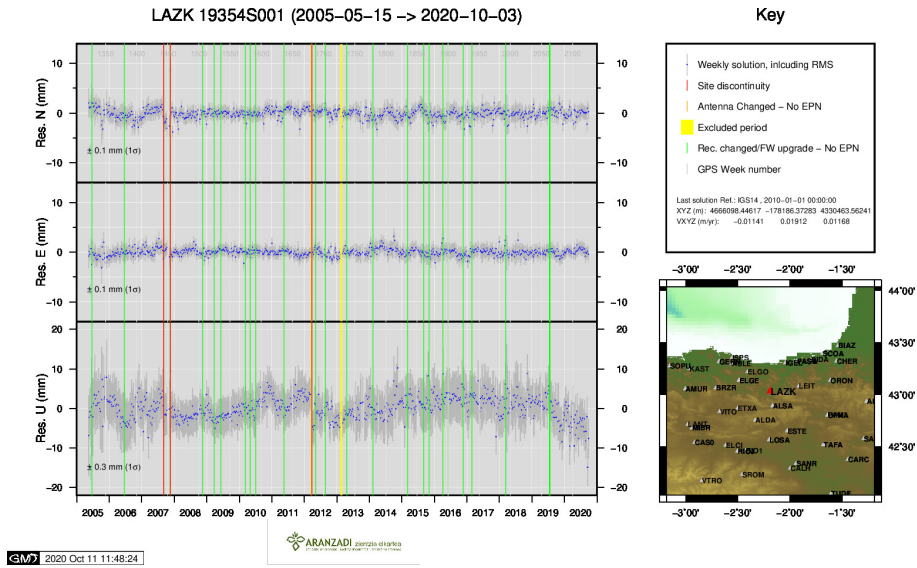
12 ) IGEL



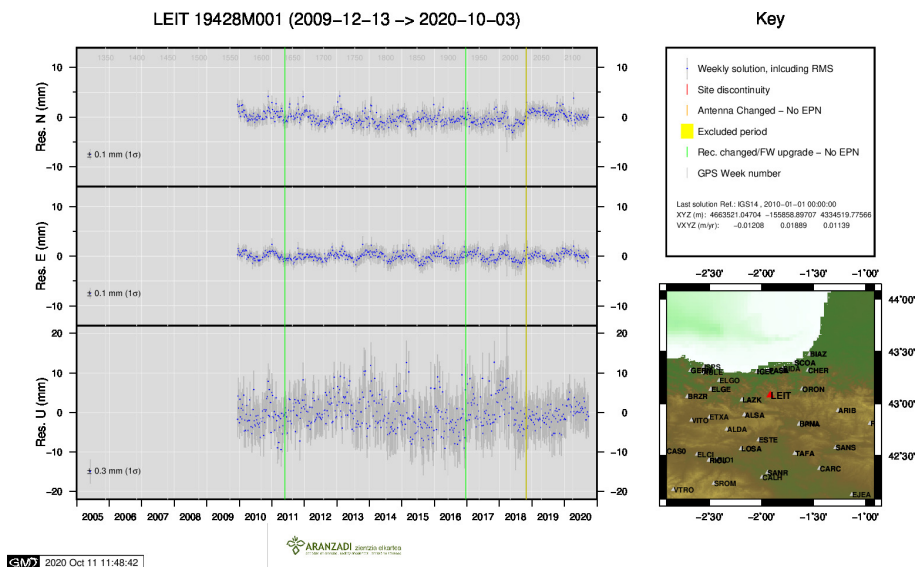
13 ) ISPS



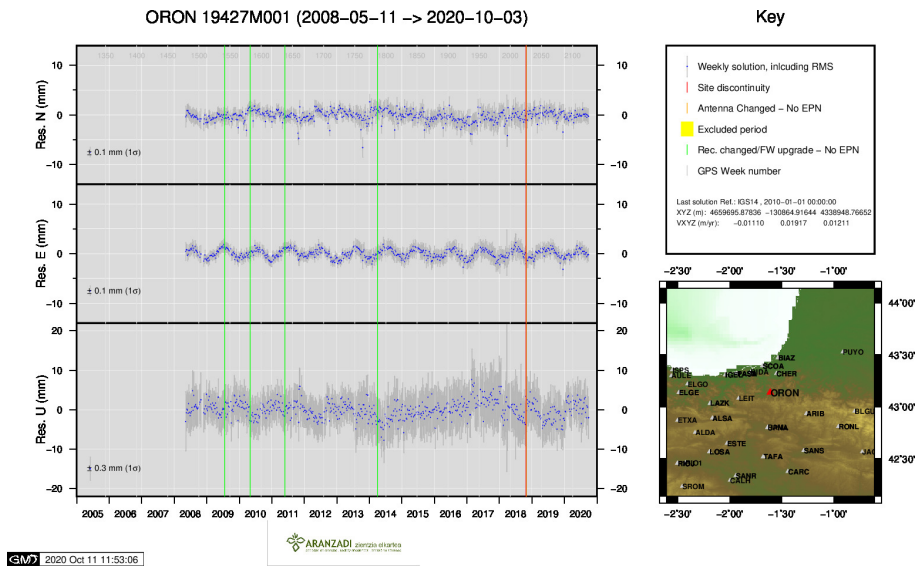
14 ) KAST



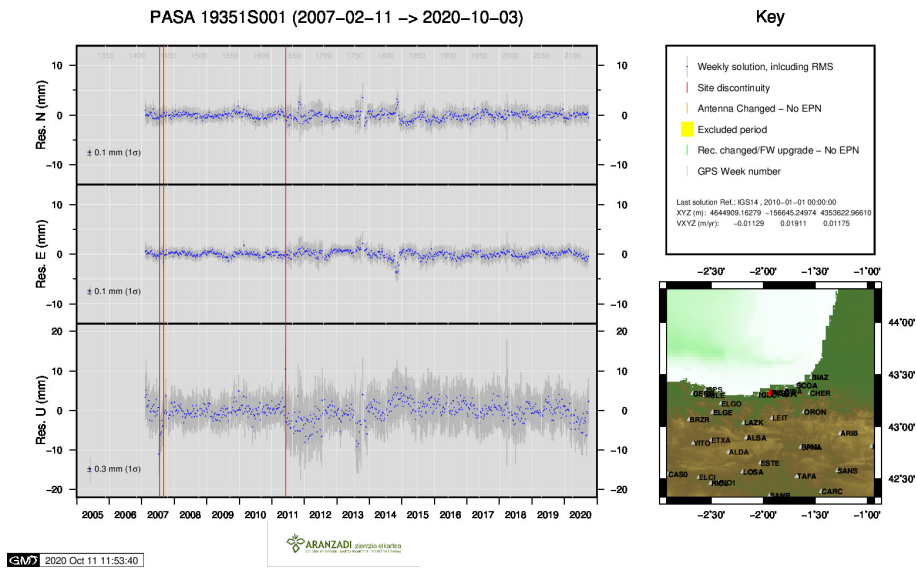
15 ) LAZK



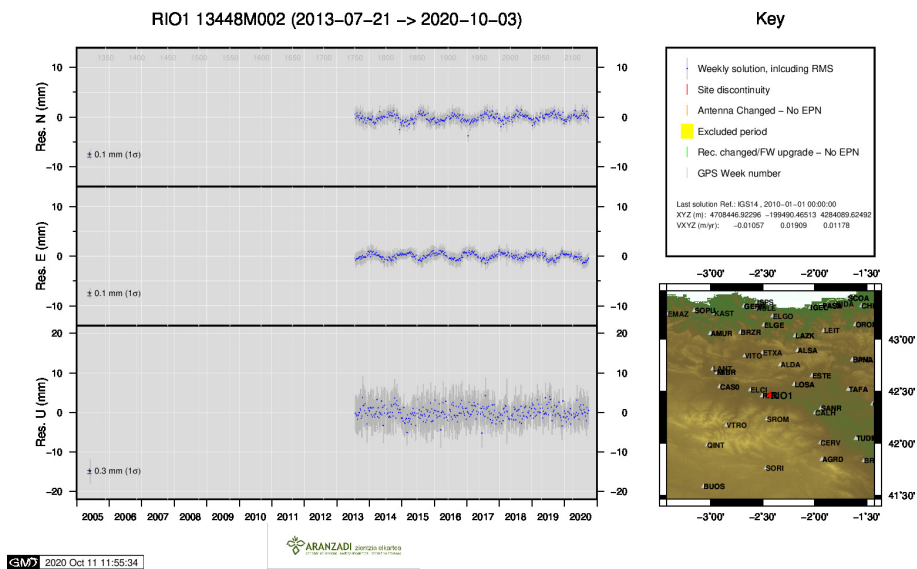
16 ) LEIT



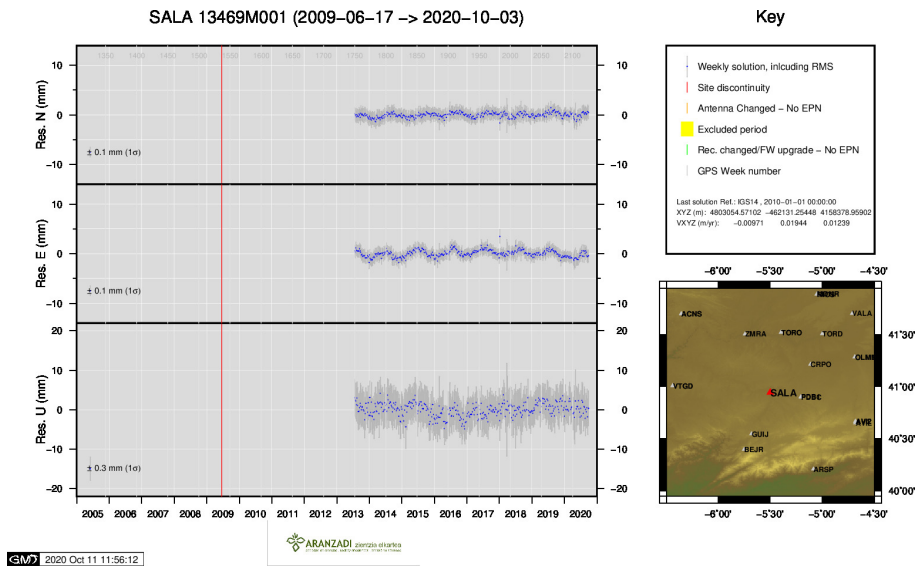
17 ) ORON



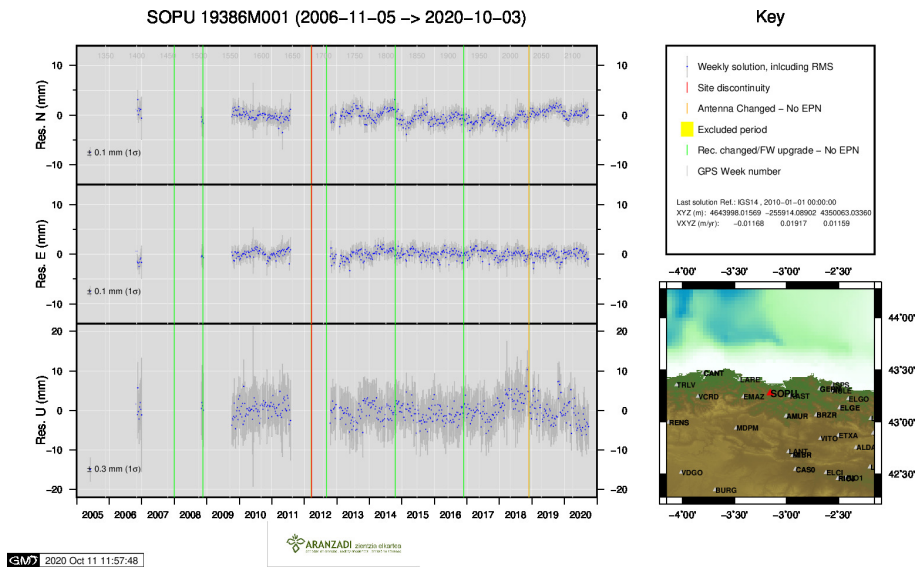
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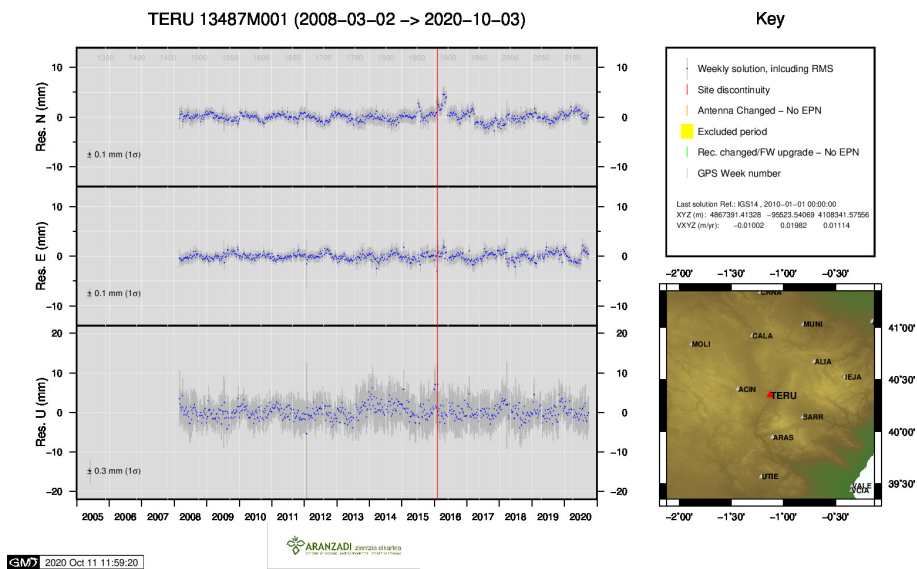
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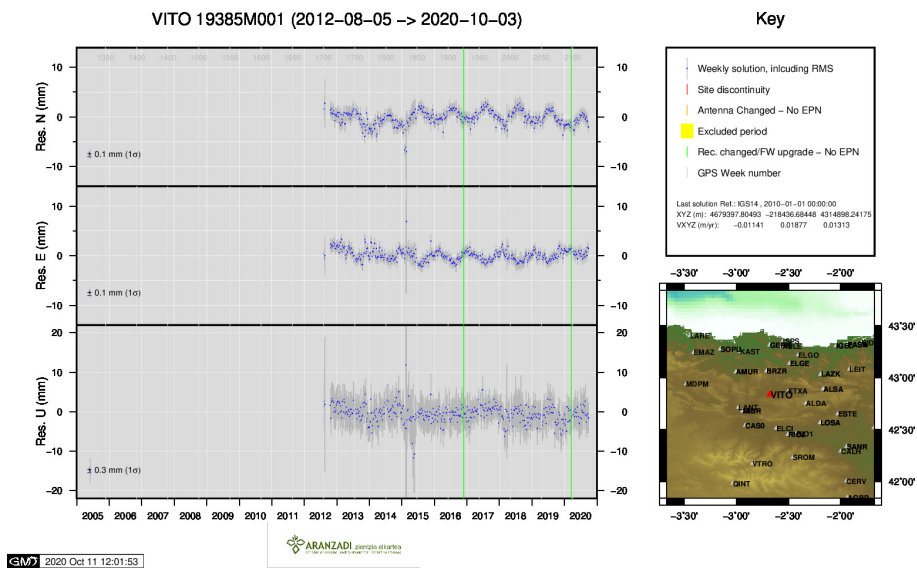
20 ) SALA



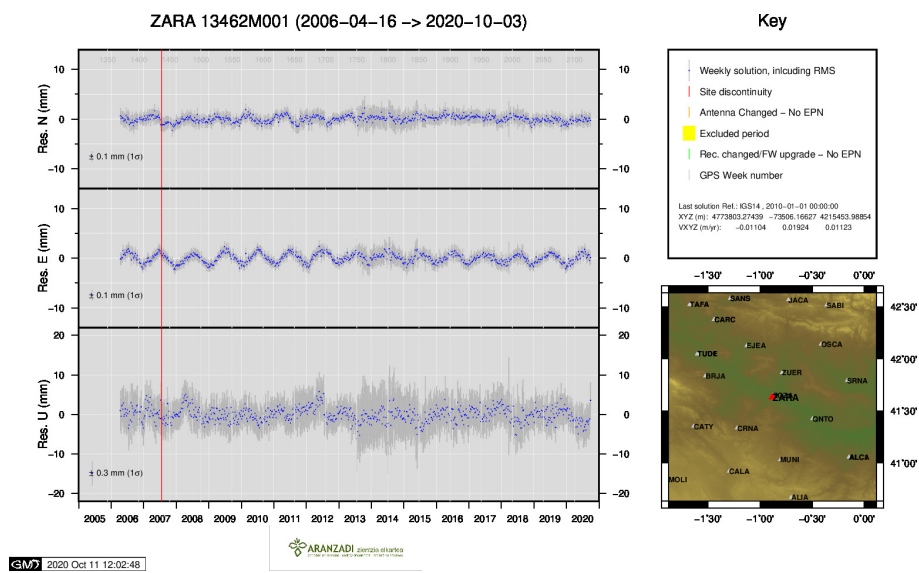
21 ) SOPU



22 ) TERU



23 ) VITO



24 ) ZARA