

# ARA-DAC Weekly Analysis Result: 2138 (GFA)

## Technical Report

**GPS Week: 2138 (GFA)**

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

**ARA-DAC details:**

Contact person: J. Zurutuza

Contact mail: [geodesia@aranzadi.eus](mailto:geodesia@aranzadi.eus)

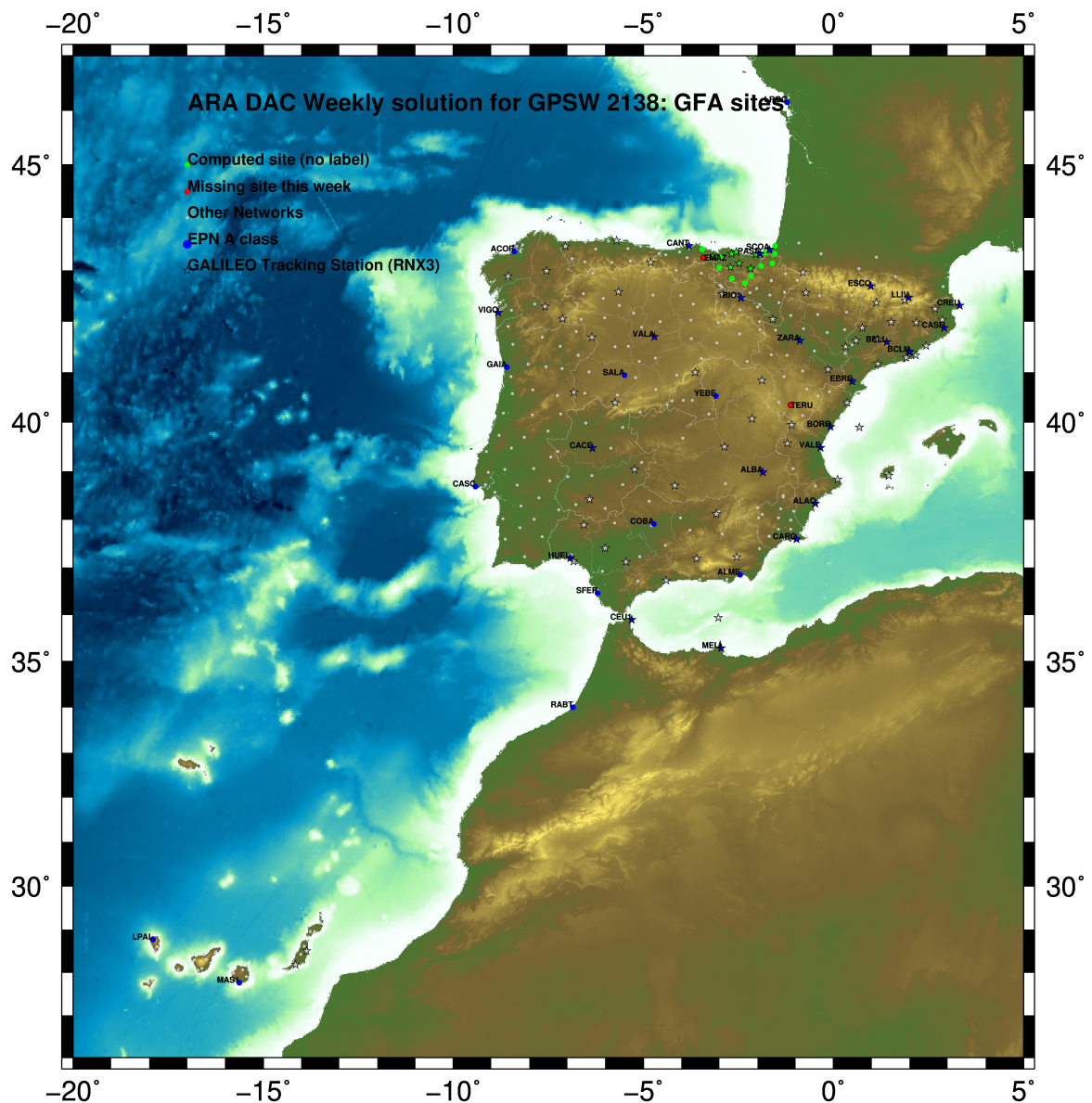
Report generated on 2021/01/17 at 13:44:23



# 1 Introduction

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

# 2 Map of Computed Sites



2021 Jan 17 13:44:13

Fig.1: Computed Sites for GPS Week2138 (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 C2115.

ARA LAC 2138 WEEK FINAL COMBINATION: PRECISE ORBITS 17-JAN-21 10:42

---

LOCAL GEODETIC DATUM: IGB14 EPOCH: 2020-12-30 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.54244	-678367.41097	4357066.30073	W
39	ALDA 19383M001	4687280.13891	-190876.53663	4308106.97747	A
50	ALSA 19419M001	4677250.80934	-176770.36577	4319079.88850	A
53	AMUR 19388M001	4661499.43087	-244591.22965	4332269.90231	A
100	BIAZ 10074M002	4634456.02863	-124344.94563	4365785.47708	A
101	BIDA 00000M000	4644177.80215	-145778.29320	4354832.50198	A
113	BRZR 19387M001	4662220.97139	-220769.86858	4333309.46126	A
100	CACE 13447M001	4899866.48539	-544567.00595	4033770.22223	W
111	CANT 13438M001	4625924.29495	-307096.20419	4365771.57393	W
154	CHER 00000M000	4645879.99784	-125721.88081	4353624.10279	A
156	CREU 13432M001	4715420.10929	273178.08952	4271946.86035	W
194	EBRE 13410M001	4833519.97106	41537.41771	4147461.73682	W
180	ELGE 19353S001	4657557.38340	-202241.44373	4338991.88858	A
209	GERN 19389M001	4642811.30499	-217222.89540	4353278.90136	A
235	IGEL 19352S001	4645951.40867	-165574.47424	4352550.43906	A
240	ISPS 19484M001	4640596.45851	-206963.74766	4356391.93300	A
245	KAST 19499M001	4646949.05908	-240747.24473	4348015.01250	A
252	LARE 19440M001	4632831.93597	-279026.11192	4360314.45143	A
256	LAZK 19354S001	4666098.30257	-178186.16114	4330463.67631	A
261	LEIT 19428M001	4663520.91407	-155858.68827	4334519.90238	A
334	ORDN 19427M001	4659695.75573	-130864.70726	4338948.89901	A
345	PAS2 19351S001	4644909.04085	-156645.03849	4353623.09875	A
464	PASA 19351S001	4644909.04096	-156645.03850	4353623.09890	W
522	RID1 13448M002	4708446.80908	-199490.25468	4284089.75643	W
527	SALA 13469M001	4803054.46555	-462131.04165	4158379.09766	W
535	SCDA 10088M002	4639940.47585	-136224.91229	4359552.42788	W
418	SOPU 19386M001	4643997.89234	-255913.87816	4350063.16670	A
493	VITO 19385M001	4679397.68406	-218436.47400	4314898.38651	A
708	YEBE 13420M001	4848724.54871	-261631.90182	4123094.34906	W
711	ZARA 13462M001	4773803.14809	-73505.95575	4215454.11481	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 2138 17-JAN-21 10:42

---

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2020-12-30 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.86140	-678367.97919	4357065.86246	W
39	ALDA 19383M001	4687280.51435	-190877.11401	4308106.53811	A
50	ALSA 19419M001	4677251.18731	-176770.94201	4319079.45012	A
53	AMUR 19388M001	4661499.80146	-244591.80434	4332269.46432	A
100	BIAZ 10074M002	4634456.41665	-124345.51702	4365785.04277	A
101	BIDA 00000M000	4644178.18654	-145778.86572	4354832.06662	A
113	BRZR 19387M001	4662221.34499	-220770.44329	4333309.02352	A
100	CACE 13447M001	4899866.79723	-544567.60718	4033769.76135	W
111	CANT 13438M001	4625924.66029	-307096.77514	4365771.13797	W
154	CHER 00000M000	4645880.38461	-125722.45346	4353623.66755	A
156	CREU 13432M001	4715420.53909	273177.51068	4271946.42456	W
194	EBRE 13410M001	4833520.36333	41536.82516	4147461.28873	W
180	ELGE 19353S001	4657557.75969	-202242.01788	4338991.45144	A
209	GERN 19389M001	4642811.68048	-217223.46797	4353278.46520	A
235	IGEL 19352S001	4645951.79046	-165575.04701	4352550.00331	A
240	ISPS 19484M001	4640596.83549	-206964.31996	4356391.49715	A
245	KAST 19499M001	4646949.43129	-240747.81782	4348014.57571	A
252	LARE 19440M001	4632832.30437	-279026.68356	4360314.01528	A
256	LAZK 19354S001	4666098.68120	-178186.73615	4330463.23880	A
261	LEIT 19428M001	4663521.29574	-155859.26294	4334519.46536	A
334	ORDN 19427M001	4659696.14080	-130865.28143	4338948.46261	A
345	PAS2 19351S001	4644909.42381	-156645.61112	4353622.66319	A
464	PASA 19351S001	4644909.42392	-156645.61113	4353622.66334	W
522	RID1 13448M002	4708447.18071	-199490.83439	4284089.31528	W
527	SALA 13469M001	4803054.79666	-462131.63227	4158378.64559	W
535	SCDA 10088M002	4639940.86176	-136225.48432	4359551.99298	W
418	SOPU 19386M001	4643998.26283	-255914.45096	4350062.72995	A
493	VITO 19385M001	4679398.05660	-218437.05059	4314897.94743	A
708	YEBE 13420M001	4848724.90193	-261632.49694	4123093.89592	W
711	ZARA 13462M001	4773803.53119	-73506.54220	4215453.67004	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 2138                                17-JAN-21 10:42
-----
LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2020-12-30 12:00:00
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
4  ACRD 13434M001         4594489.82032    -678368.01725    4357065.91331    W
39 ALDA 19383M001         4687280.47099    -190877.15335    4308106.58883    A
50 ALSA 19419M001         4677251.14401    -176770.98143    4319079.50088    A
53 AMUR 19388M001         4661499.75853    -244591.84361    4332269.51509    A
100 BIAZ 10074M002         4634456.37361    -124345.55680    4365785.09367    A
101 BIDA 00000M000         4644178.14347    -145778.90539    4354832.11749    A
113 BRZR 19387M001         4662221.30198    -220770.48264    4333309.07429    A
100 CACE 13447M001         4899866.75263    -544567.64444    4033769.81142    W
111 CANT 13438M001         4625924.61790    -307096.81434    4365771.18882    W
154 CHER 00000M000         4645880.34146    -125722.49318    4353623.71842    A
156 CREU 13432M001         4715420.49383    273177.46992    4271946.47551    W
194 EBRE 13410M001         4833520.31767    41536.78564    4147461.33920    W
180 ELGE 19353S001         4657557.71667    -202242.05730    4338991.50224    A
209 GERN 19389M001         4642811.63765    -217223.50740    4353278.51604    A
235 IGEL 19352S001         4645951.74744    -165575.08661    4352550.05416    A
240 ISPS 19484M001         4640596.79265    -206964.35944    4356391.54800    A
245 KAST 19499M001         4646949.38849    -240747.85716    4348014.62653    A
252 LARE 19440M001         4632832.26182    -279026.72282    4360314.06612    A
256 LAZK 19354S001         4666098.63801    -178186.77562    4330463.28959    A
261 LEIT 19428M001         4663521.25251    -155859.30250    4334519.51616    A
334 ORON 19427M001         4659696.09752    -130865.32108    4338948.51344    A
345 PAS2 19351S001         4644909.38077    -156645.65075    4353622.71406    A
464 PASA 19351S001         4644909.38088    -156645.65076    4353622.71421    W
522 RIO1 13448M002         4708447.13716    -199490.87361    4284089.36594    W
527 SALA 13469M001         4803054.75290    -462131.67022    4158378.69591    W
535 SOA 10088M002         4639940.81870    -136225.52403    4359552.04386    W
418 SOPU 19386M001         4643998.22011    -255914.49026    4350062.78077    A
493 VITO 19385M001         4679398.01341    -218437.08987    4314897.99816    A
708 YEBE 13420M001         4848724.85710    -261632.53538    4123093.94619    W
711 ZARA 13462M001         4773803.48656    -73506.58158    4215453.72059    W

```

## 6 Quality Control

### 6.1 Mean and Daily Repeatabilities

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

ARA LAC 2138 WEEK FINAL COMBINATION: PRECISE ORBITS 17-JAN-21 10:42

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.93	0.53	1.32
ALDA 19383M001	7	XXXXXX	1.34	1.03	4.12
ALSA 19419M001	1	X	0.06	0.06	3.16
AMUR 19388M001	7	XXXXXX	3.74	1.23	2.66
BIAZ 10074M002	7	XXXXXX	1.51	1.30	4.26
BIDA 00000M000	7	XXXXXX	1.16	1.42	3.10
BRZR 19387M001	7	XXXXXX	1.77	2.58	3.31
CACE 13447M001	7	XXXXXX	0.47	0.69	1.14
CANT 13438M001	7	XXXXXX	0.99	0.88	3.36
CHER 00000M000	6	XX XXX	2.18	2.00	4.99
CREU 13432M001	7	XXXXXX	0.79	0.94	3.43
EBRE 13410M001	7	XXXXXX	2.04	5.69	6.66
ELGE 19353S001	7	XXXXXX	1.14	3.05	6.33
GERN 19389M001	7	XXXXXX	0.83	1.77	3.85
IGEL 19352S001	7	XXXXXX	0.55	0.71	2.59
ISPS 19484M001	7	XXXXXX	0.76	1.23	5.88
KAST 19499M001	7	XXXXXX	1.56	1.58	5.75
LARE 19440M001	7	XXXXXX	0.49	1.24	3.82
LAZK 19354S001	7	XXXXXX	1.49	0.96	9.74
LEIT 19428M001	1	X	0.05	0.07	2.99
ORDN 19427M001	1	X	0.01	0.02	2.33
PAS2 19351S001	7	XXXXXX	0.83	0.83	2.23
PASA 19351S001	7	XXXXXX	0.73	0.79	2.21
RI01 13448M002	7	XXXXXX	1.01	0.97	2.28
SALA 13469M001	7	XXXXXX	0.65	0.67	1.38
SCOA 10088M002	7	XXXXXX	1.75	0.96	4.19
SOPU 19386M001	7	XXXXXX	0.96	1.17	3.07
VITO 19385M001	7	XXXXXX	2.05	0.95	4.09
YEBE 13420M001	7	XXXXXX	0.64	1.19	2.20
ZARA 13462M001	7	XXXXXX	0.88	0.71	1.85

Comparison of individual solutions:

ACOR 13434M001	N	0.93	0.20	0.18	0.51	-0.59	-1.40	-1.55	0.29
ACOR 13434M001	E	0.53	0.20	-0.06	0.92	-0.09	-0.07	0.69	0.53
ACOR 13434M001	U	1.32	-1.24	1.50	1.20	1.10	-1.00	0.90	-1.50
ALDA 19383M001	N	1.34	-1.54	-1.01	0.04	1.11	0.79	2.24	0.75
ALDA 19383M001	E	1.03	0.22	0.27	1.91	0.52	-1.25	0.74	-0.47
ALDA 19383M001	U	4.12	5.93	4.52	-0.57	0.78	2.08	-1.66	-6.18
ALSA 19419M001	N	0.06	-0.06						
ALSA 19419M001	E	0.06	0.06						
ALSA 19419M001	U	3.16	3.16						
AMUR 19388M001	N	3.74	-0.60	2.49	2.61	2.49	1.72	2.74	-7.34
AMUR 19388M001	E	1.23	1.43	-1.20	-0.67	0.98	1.64	0.93	0.76
AMUR 19388M001	U	2.66	-0.85	0.93	2.45	-1.09	-2.18	3.31	-4.22
BIAZ 10074M002	N	1.51	-1.70	1.31	1.32	1.12	0.33	2.17	1.10
BIAZ 10074M002	E	1.30	-2.07	1.23	0.29	0.76	-1.22	1.04	-1.02
BIAZ 10074M002	U	4.26	8.81	-0.93	-0.57	-0.92	1.63	5.14	-0.25
BIDA 00000M000	N	1.16	-0.02	1.08	0.89	1.20	0.03	1.84	1.13
BIDA 00000M000	E	1.42	0.78	1.10	0.08	1.08	-2.38	-1.87	-0.12
BIDA 00000M000	U	3.10	4.29	1.86	0.49	2.02	1.81	5.28	-0.67
BRZR 19387M001	N	1.77	-0.55	-1.52	-0.61	2.73	1.12	1.86	-1.89
BRZR 19387M001	E	2.58	-3.38	-4.58	1.13	0.53	-0.23	2.23	0.94
BRZR 19387M001	U	3.31	-0.88	-6.32	-4.20	2.65	-0.32	0.01	0.47
CACE 13447M001	N	0.47	-0.37	-0.26	0.19	-0.24	-0.97	-0.24	0.10
CACE 13447M001	E	0.69	-0.06	0.14	0.94	0.12	0.14	1.33	0.34
CACE 13447M001	U	1.14	0.11	-0.40	-1.20	0.60	-0.73	-2.29	0.04
CANT 13438M001	N	0.99	1.81	0.60	-1.35	0.04	-0.09	-0.45	0.41
CANT 13438M001	E	0.88	-0.48	-1.61	-0.53	0.80	-0.95	-0.24	-0.06
CANT 13438M001	U	3.36	-3.86	-4.10	-2.43	1.05	0.33	2.71	-4.66
CHER 00000M000	N	2.18	-0.70	3.94		1.51	-0.79	2.10	0.57
CHER 00000M000	E	2.00	-0.19	-3.95		-1.39	-0.97	1.21	0.20
CHER 00000M000	U	4.99	4.62	-2.01		-0.91	-1.46	9.46	2.65
CREU 13432M001	N	0.79	0.96	0.43	-0.20	-1.34	0.49	-0.71	-0.03
CREU 13432M001	E	0.94	-0.02	1.86	-1.01	-0.16	-0.60	0.35	-0.53
CREU 13432M001	U	3.43	-4.19	-4.41	1.97	3.73	-2.21	-0.02	3.30
EBRE 13410M001	N	2.04	0.53	3.39	-3.47	1.01	0.10	-0.22	-0.36
EBRE 13410M001	E	5.69	2.14	-9.67	8.43	-3.21	3.29	0.72	-1.88
EBRE 13410M001	U	6.66	-0.38	-9.99	4.78	-10.09	4.56	2.78	3.65
ELGE 19353S001	N	1.14	2.46	0.57	-0.46	-0.86	-0.17	0.18	0.63
ELGE 19353S001	E	3.05	-5.51	0.18	-1.12	-0.57	-1.76	-1.11	4.39
ELGE 19353S001	U	6.33	2.22	-4.17	-11.22	-5.00	3.95	-1.76	6.95
GERN 19389M001	N	0.83	1.28	-0.48	-0.81	-0.24	0.70	0.46	0.93
GERN 19389M001	E	1.77	-0.63	1.49	-2.06	-2.29	-1.80	-0.13	1.88
GERN 19389M001	U	3.85	-2.19	2.54	0.61	-3.22	-3.21	2.65	-7.04
IGEL 19352S001	N	0.55	0.99	0.10	0.35	-0.08	-0.26	0.72	0.38
IGEL 19352S001	E	0.71	-0.08	-0.85	-0.11	-0.17	-1.39	0.22	0.50
IGEL 19352S001	U	2.59	2.38	-4.82	-2.80	-1.15	0.26	-0.43	-1.42
ISPS 19484M001	N	0.76	0.17	1.55	-0.56	0.55	-0.45	0.43	0.24
ISPS 19484M001	E	1.23	-0.74	0.30	-0.36	-0.63	-2.73	-0.02	0.67
ISPS 19484M001	U	5.88	-2.68	-3.48	-8.67	-2.20	-0.81	-1.92	10.20
KAST 19499M001	N	1.56	-1.75	-1.98	1.08	0.90	0.04	2.03	1.18
KAST 19499M001	E	1.58	0.51	-2.86	-1.88	0.53	-1.00	1.34	0.00
KAST 19499M001	U	5.75	1.73	-9.46	-6.90	0.06	-4.13	2.60	5.85
LARE 19440M001	N	0.49	0.05	-0.17	-0.14	0.78	-0.52	0.17	0.70
LARE 19440M001	E	1.24	-0.99	-2.13	-1.69	-0.21	-0.01	0.35	0.84
LARE 19440M001	U	3.82	-2.86	-5.83	-5.97	-0.70	-0.77	2.29	1.80
LAZK 19354S001	N	1.49	-2.09	2.38	0.89	-0.01	-1.02	0.96	0.74
LAZK 19354S001	E	0.96	0.03	-1.81	0.75	0.38	-0.93	-0.63	0.53
LAZK 19354S001	U	9.74	15.13	-15.66	-2.00	-3.33	4.52	3.24	-7.05
LEIT 19428M001	N	0.05	-0.05						
LEIT 19428M001	E	0.07	0.07						
LEIT 19428M001	U	2.99	2.99						
ORDN 19427M001	N	0.01	0.01						

ORDN 19427M001	E	0.02	0.02							
ORDN 19427M001	U	2.33	2.33							
PAS2 19351S001	N	0.83	0.12	0.69	1.54	0.15	-0.69	0.80	-0.36	
PAS2 19351S001	E	0.83	-0.17	-1.78	-0.40	0.84	-0.02	-0.04	-0.25	
PAS2 19351S001	U	2.23	-2.27	-2.33	-1.58	0.55	-0.88	1.60	-3.62	
PASA 19351S001	N	0.73	0.10	0.66	1.45	0.20	-0.50	0.55	-0.20	
PASA 19351S001	E	0.79	-0.07	-1.67	-0.18	0.83	-0.06	-0.09	-0.47	
PASA 19351S001	U	2.21	-2.12	-2.43	-2.14	0.18	-1.04	2.10	-2.96	
RID1 13448M002	N	1.01	1.38	-0.60	0.60	-0.05	-0.76	1.71	0.19	
RID1 13448M002	E	0.97	-0.86	-0.27	-0.40	-0.03	0.42	-0.43	2.08	
RID1 13448M002	U	2.28	1.94	-2.45	-2.08	2.69	-1.79	1.35	2.20	
SALA 13469M001	N	0.65	0.84	-0.24	-0.34	-0.19	-1.14	-0.44	0.39	
SALA 13469M001	E	0.67	-0.63	-0.43	0.44	0.29	-0.14	1.14	-0.74	
SALA 13469M001	U	1.38	0.72	-1.81	0.98	-0.91	-1.41	1.86	0.69	
SCDA 10088M002	N	1.75	0.93	2.04	2.10	-1.51	0.38	2.52	-0.23	
SCDA 10088M002	E	0.96	-0.84	1.21	0.17	0.05	-0.31	0.22	-1.79	
SCDA 10088M002	U	4.19	5.27	0.34	-3.31	-1.65	4.78	6.15	1.75	
SOPU 19386M001	N	0.96	-1.03	0.09	1.33	-0.51	0.41	0.98	1.15	
SOPU 19386M001	E	1.17	-0.19	-0.13	-2.44	-0.96	0.37	-1.02	0.21	
SOPU 19386M001	U	3.07	-2.75	-3.95	-4.47	-1.25	0.66	1.83	-2.83	
VITO 19385M001	N	2.05	0.12	1.65	1.39	1.53	1.21	-0.92	-3.99	
VITO 19385M001	E	0.95	0.02	-0.32	1.02	0.21	0.06	2.06	0.22	
VITO 19385M001	U	4.09	-2.85	3.84	0.55	2.48	-1.64	2.30	-7.95	
YEBE 13420M001	N	0.64	0.52	-0.92	-0.34	-0.04	0.10	-0.88	0.63	
YEBE 13420M001	E	1.19	0.67	1.98	-0.93	0.35	-0.73	-1.61	0.24	
YEBE 13420M001	U	2.20	2.95	-0.57	-0.14	-0.36	3.01	-2.36	-2.29	
ZARA 13462M001	N	0.88	0.34	1.23	-0.77	-0.86	-0.76	0.96	-0.46	
ZARA 13462M001	E	0.71	-0.80	-0.66	0.40	0.26	-1.28	-0.16	0.20	
ZARA 13462M001	U	1.85	-0.13	-1.45	0.54	2.81	-1.00	2.84	1.04	



## 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	0.19	-0.53	-0.33
11	ALAC 13433M001	I W	0.83	-0.50	0.16
14	ALBA 13452M001	I W	-0.09	-1.24	-0.42
20	ALME 13437M001	I W	-0.89	-1.05	2.04
43	BCLN 13412M001	I W	0.16	-0.11	1.07
48	BELL 13431M001	I W	-0.41	-2.83	1.85
67	BORR 13480M001	I W	-0.99	-3.83	-4.30
72	BRST 10004M004	I W	-0.44	-1.09	3.62
100	CACE 13447M001	I W	1.83	-0.62	3.61
111	CANT 13438M001	I W	0.88	-0.77	-1.31
112	CARG 19412M001	I W	1.43	-2.80	-1.30
116	CASC 13909S001	I W	-0.01	1.10	3.17
117	CASE 13494M001	I W	-2.00	-1.01	-1.52
123	CEU1 13449M002	I W	-0.38	0.84	3.79
137	COBA 13453M001	I W	0.65	0.70	-2.44
156	CREU 13432M001	I W	-0.17	-0.11	-0.72
194	EBRE 13410M001	I W	-1.41	2.96	-2.77
212	ESCO 13435M001	I W	0.50	0.69	-1.17
229	GAIA 13902M001	I W	-0.86	0.68	2.61
291	HUEL 13451M001	I W	-1.96	6.10	0.22
365	LLIV 13436M001	I W	1.38	-0.97	0.14
370	LPAL 81701M001	I W	-1.36	-0.07	3.78
372	LROC 10023M001	I W	-0.39	0.59	-0.86
395	MAS1 31303M002	I W	1.21	-0.75	3.16
406	MELI 19379M001	I W	1.47	1.34	0.21
464	PASA 19351S001	I W	-1.24	-0.49	-5.88
505	RABT 35001M002	I W	0.27	0.24	-9.67
522	RID1 13448M002	I W	-0.41	-0.44	-3.65
527	SALA 13469M001	I W	0.59	1.03	-2.88
535	SCOA 10088M002	I W	0.66	-0.69	2.30
543	SFER 13402M004	I W	1.04	-1.19	5.07
664	VALA 13463M002	I W	0.15	1.81	1.05
668	VALE 13439M001	I W	1.22	0.84	-1.56
679	VIGO 13450M001	I W	-1.37	2.12	2.31
708	YEBE 13420M001	I W	-0.57	1.31	2.85
711	ZARA 13462M001	I W	0.67	0.91	-1.02
720	ZIMM 14001M004	I W	-0.17	-2.16	-1.22
RMS / COMPONENT			1.00	1.74	3.03
MEAN			0.00	-0.00	-0.00
MIN			-2.00	-3.83	-9.67
MAX			1.83	6.10	5.07

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 111  
RMS OF TRANSFORMATION : 2.10 MM

BARYCENTER COORDINATES:

LATITUDE : 40 9 2.16  
LONGITUDE : - 3 30 24.76  
HEIGHT : -30.874 KM

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.35 MM  
TRANSLATION IN E : -0.00 +- 0.35 MM  
TRANSLATION IN U : -0.00 +- 0.35 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          16338339
NUMBER OF UNKNOWN               191404
NUMBER OF DEGREES OF FREEDOM    16146935
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  1.739633366785295

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")
      X          Y          Z          X          Y          Z      Scale (ppm)
-----
  1  0.00188      0.0046 -0.0035 -0.0059  0.0001  0.0003 -0.0000  0.00003
  2  0.00262      0.0032 -0.0243 -0.0011  0.0004  0.0001 -0.0007  -0.00054
  3  0.00183      0.0041 -0.0010 -0.0011  0.0000  0.0001 -0.0000  -0.00047
  4  0.00170     -0.0090  0.0037  0.0085 -0.0000 -0.0004  0.0001  0.00020
  5  0.00158      0.0067  0.0019 -0.0066 -0.0000  0.0003  0.0000  -0.00010
  6  0.00174     -0.0081 -0.0162  0.0138  0.0003 -0.0005 -0.0004  -0.00053
  7  0.00202     -0.0057  0.0180 -0.0001 -0.0004 -0.0001  0.0005  0.00088
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00128      2549196  1.64  2579614  3  939  29482  0
  2  0.00140      2401073  1.97  2431237  3  909  29258  0
  3  0.00131      2399053  1.72  2427839  3  882  27907  0
  4  0.00130      2213565  1.69  2241784  3  840  27382  0
  5  0.00130      2183904  1.70  2210929  3  825  26203  0
  6  0.00132      2232517  1.73  2258525  3  837  25174  0
  7  0.00129      2162548  1.65  2188411  3  837  25029  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 20:362:00000 21:002:86370 LEICA GR50 -----
ALDA  A  1 P 20:362:00000 21:002:86370 LEICA GR10 -----
ALSA  A  1 P 20:362:00000 20:362:86370 LEICA GR50 -----
AMUR  A  1 P 20:362:00000 21:002:86370 LEICA GR10 -----
BIAZ  A  1 P 20:362:00000 21:002:86370 SPECTRA SP90M -----
BIDA  A  1 P 20:362:00000 21:002:86370 LEICA GR10 -----
BRZR  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
CACE  A  1 P 20:362:00000 21:002:86370 TRIMBLE NETR9 -----
CANT  A  1 P 20:362:00000 21:002:86370 LEICA GR10 -----
CHER  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
CREU  A  1 P 20:362:00000 21:002:86370 LEICA GR50 -----
EBRE  A  1 P 20:362:00000 21:002:86370 LEICA GR50 -----
ELGE  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
GERN  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
IGEL  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
ISPS  A  1 P 20:362:00000 21:002:86370 TRIMBLE NETR9 -----
KAST  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
LARE  A  1 P 20:362:00000 21:002:86370 LEICA GR50 -----
LAZK  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
LEIT  A  1 P 20:362:00000 20:362:86370 LEICA GR50 -----
ORON  A  1 P 20:362:00000 20:362:86370 LEICA GR50 -----
PAS2  A  1 P 20:362:00030 21:002:86370 STONEX SC2200 -----
PASA  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
RIO1  A  1 P 20:362:00000 21:002:86370 LEICA GR25 -----
SALA  A  1 P 20:362:00000 21:002:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 20:362:00000 21:002:86370 LEICA GR25 -----
SOPU  A  1 P 20:362:00000 21:002:86370 LEICA GR30 -----
VITO  A  1 P 20:362:00000 21:002:86370 LEICA GR10 -----
YEBE  A  1 P 20:362:00000 21:002:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 20:362:00000 21:002:86370 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 20:362:00000 21:002:86370 LEIAT504  LEIS -----
ALDA  A  1 P 20:362:00000 21:002:86370 LEIAS10   NONE -----
ALSA  A  1 P 20:362:00000 20:362:86370 LEIAR10   NONE -----
AMUR  A  1 P 20:362:00000 21:002:86370 LEIAS10   NONE -----
BIAZ  A  1 P 20:362:00000 21:002:86370 LEIAR25   LEIT -----
BIDA  A  1 P 20:362:00000 21:002:86370 LEIAS10   NONE -----
```

```

BRZR A 1 P 20:362:00000 21:002:86370 LEIAS10 NONE -----
CACE A 1 P 20:362:00000 21:002:86370 TRM29659.00 NONE -----
CANT A 1 P 20:362:00000 21:002:86370 LEIAR25.R4 LEIT 25066
CHER A 1 P 20:362:00000 21:002:86370 LEIAR10 NONE -----
CREU A 1 P 20:362:00000 21:002:86370 LEIAR25.R4 NONE 26357
EBRE A 1 P 20:362:00000 21:002:86370 LEIAR25.R4 NONE 26359
ELGE A 1 P 20:362:00000 21:002:86370 LEIAR25.R4 LEIT -----
GERN A 1 P 20:362:00000 21:002:86370 LEIAS10 NONE -----
IGEL A 1 P 20:362:00000 21:002:86370 LEIAR20 LEIM -----
ISPS A 1 P 20:362:00000 21:002:86370 TRM59900.00 SCIS -----
KAST A 1 P 20:362:00000 21:002:86370 LEIAS10 NONE -----
LARE A 1 P 20:362:00000 21:002:86370 LEIAR20 LEIM -----
LAZK A 1 P 20:362:00000 21:002:86370 LEIAR25.R4 LEIT -----
LEIT A 1 P 20:362:00000 20:362:86370 LEIAR10 NONE -----
ORDN A 1 P 20:362:00000 20:362:86370 LEIAR10 NONE -----
PAS2 A 1 P 20:362:00030 21:002:86370 LEIAR20 LEIM 73034
PASA A 1 P 20:362:00000 21:002:86370 LEIAR20 LEIM 73034
RIO1 A 1 P 20:362:00000 21:002:86370 LEIAR25.R4 LEIT 25138
SALA A 1 P 20:362:00000 21:002:86370 LEIAR25 NONE -----
SCDA A 1 P 20:362:00000 21:002:86370 TRM55971.00 NONE -----
SOPU A 1 P 20:362:00000 21:002:86370 LEIAS10 NONE -----
VITO A 1 P 20:362:00000 21:002:86370 LEIAS10 NONE -----
YEBE A 1 P 20:362:00000 21:002:86370 TRM29659.00 NONE -----
ZARA A 1 P 20:362:00000 21:002:86370 TRM29659.00 NONE -----

```

### 7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START_ DATA_END_ AXE ARP->BENCHMARK(M)
UP_ NORTH_ EAST_
-----
ACOR A 1 P 20:362:00000 21:002:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 20:362:00000 20:362:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 20:362:00000 21:002:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 20:362:00000 21:002:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 20:362:00000 21:002:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 20:362:00000 21:002:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 20:362:00000 21:002:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
GERN A 1 P 20:362:00000 21:002:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 20:362:00000 21:002:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 20:362:00000 21:002:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 20:362:00000 20:362:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 20:362:00000 20:362:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 20:362:00030 21:002:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
RIO1 A 1 P 20:362:00000 21:002:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 20:362:00000 21:002:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 20:362:00000 21:002:86370 UNE 0.0771 0.0000 0.0000
VITO A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 20:362:00000 21:002:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 20:362:00000 21:002:86370 UNE 3.2590 0.0000 0.0000

```

## 8 References

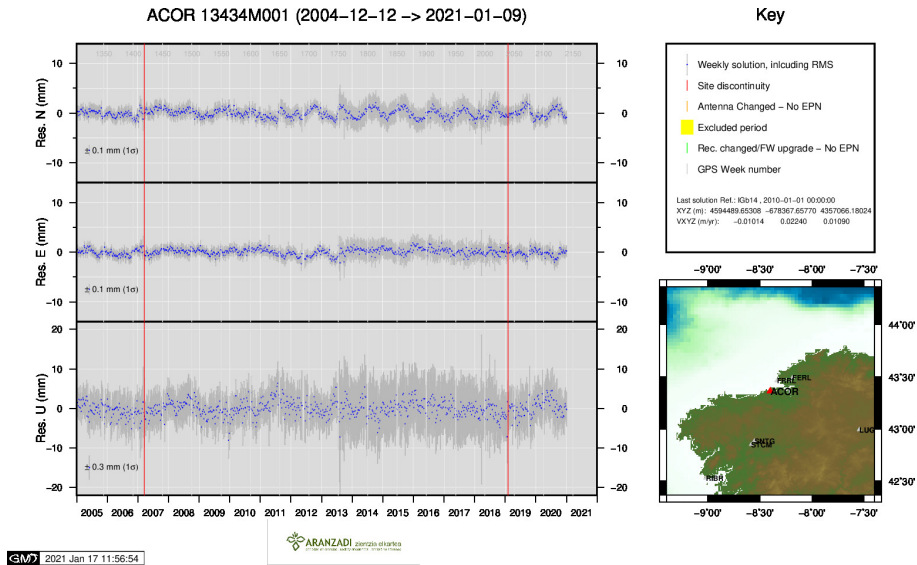
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](http://etrs89.ensg.ign.fr/memo-V8.pdf)

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

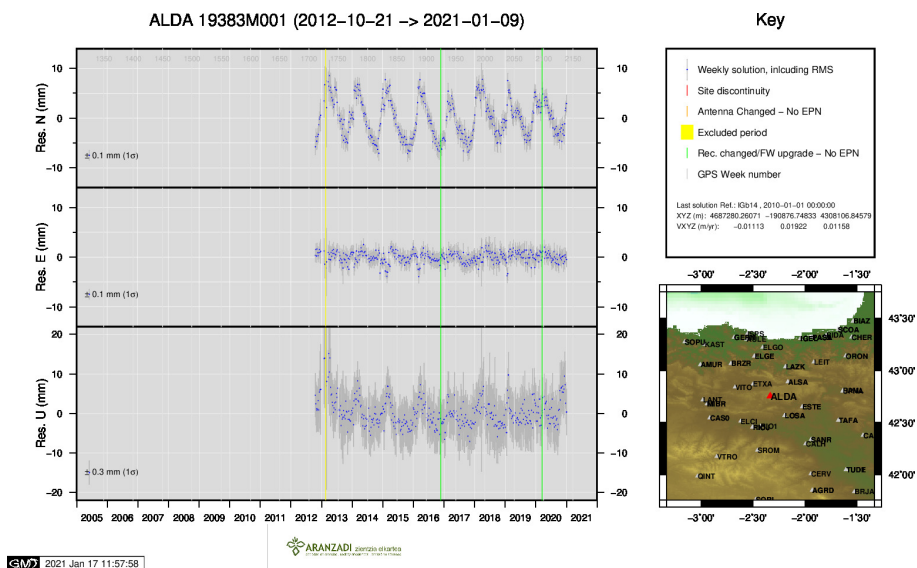
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

## 9 Cumulative Time Series

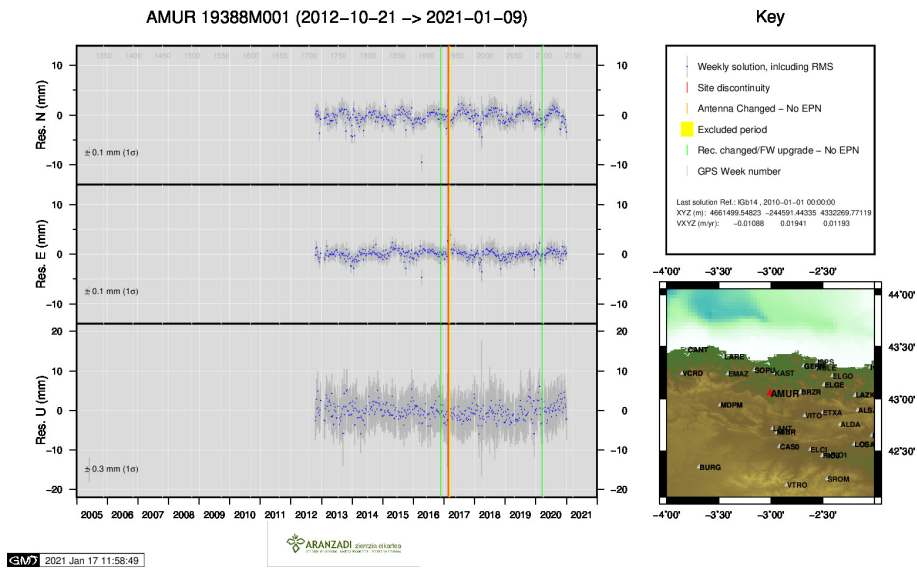
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



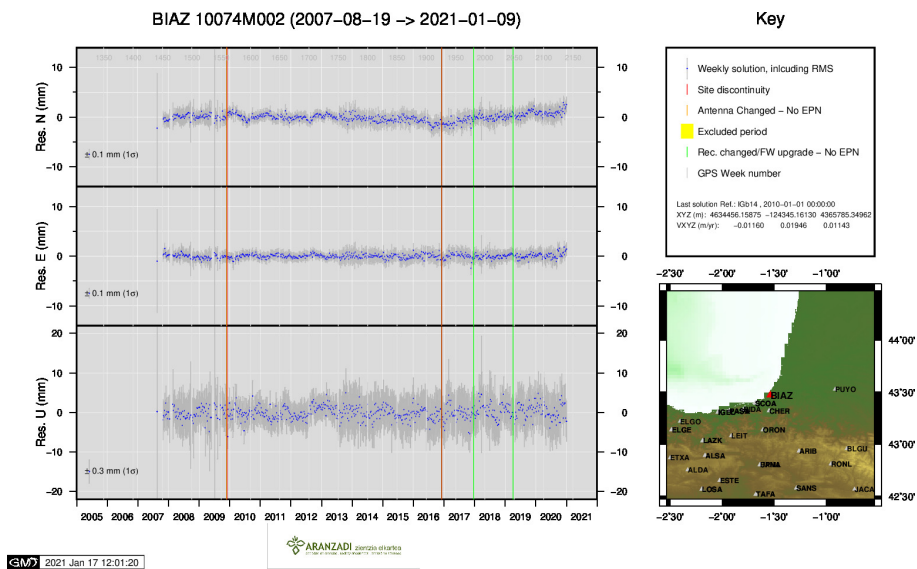
1 ) ACOR



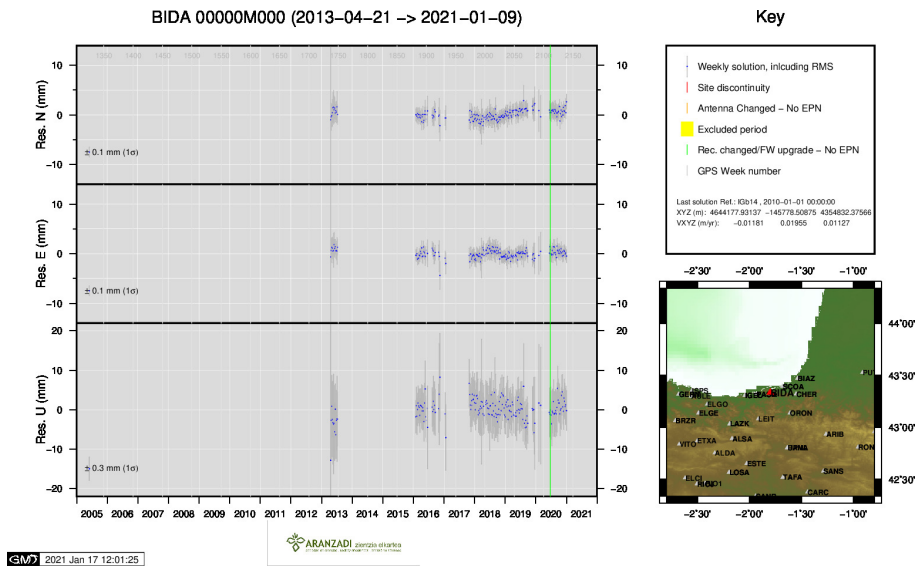
2 ) ALDA



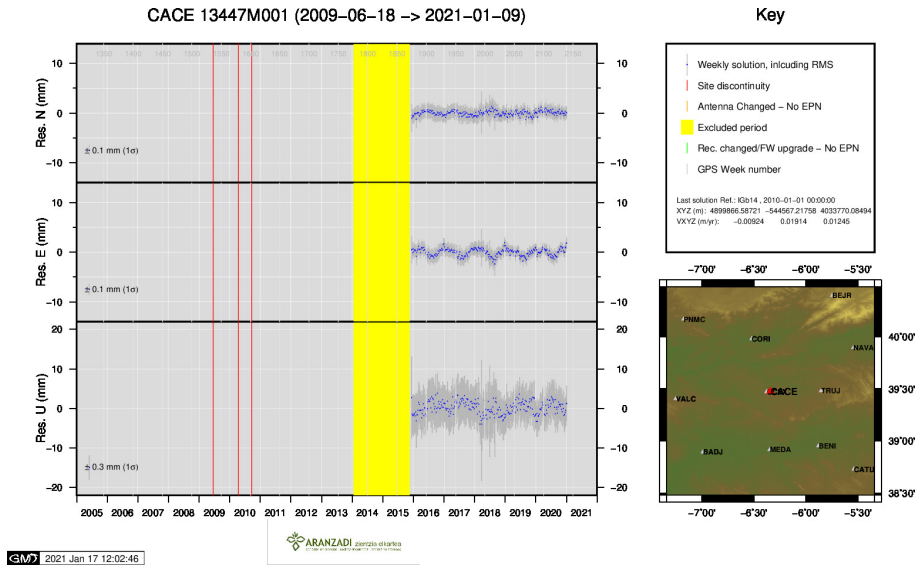
3 ) AMUR



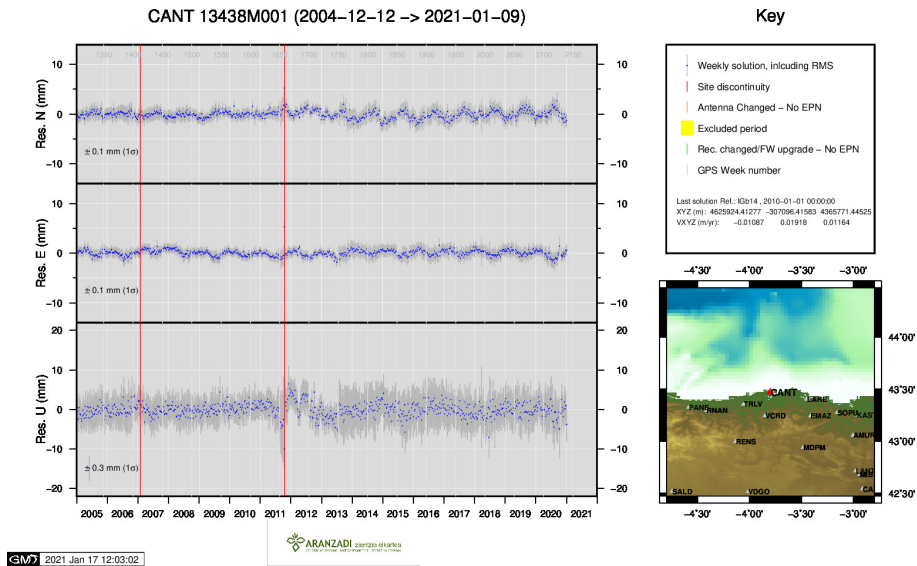
4 ) BIAZ



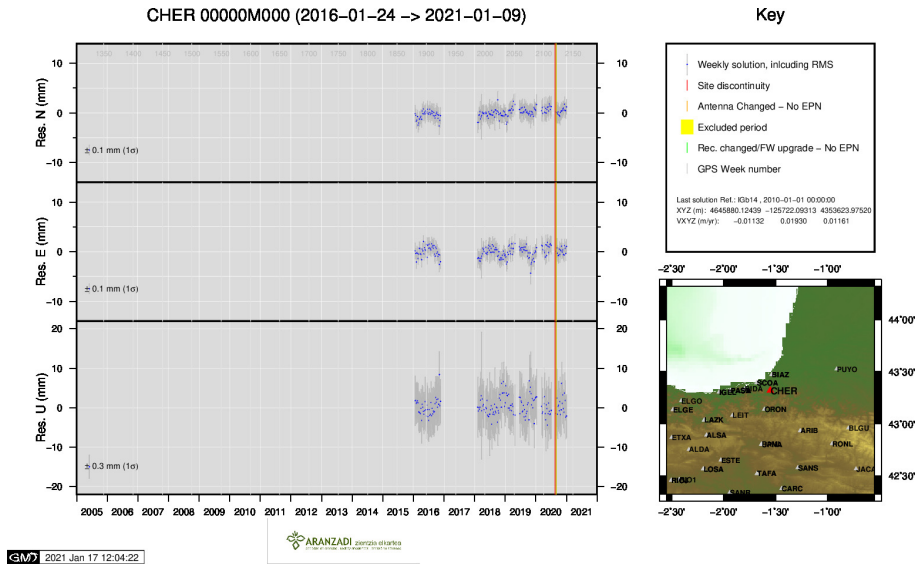
5 ) BIDA



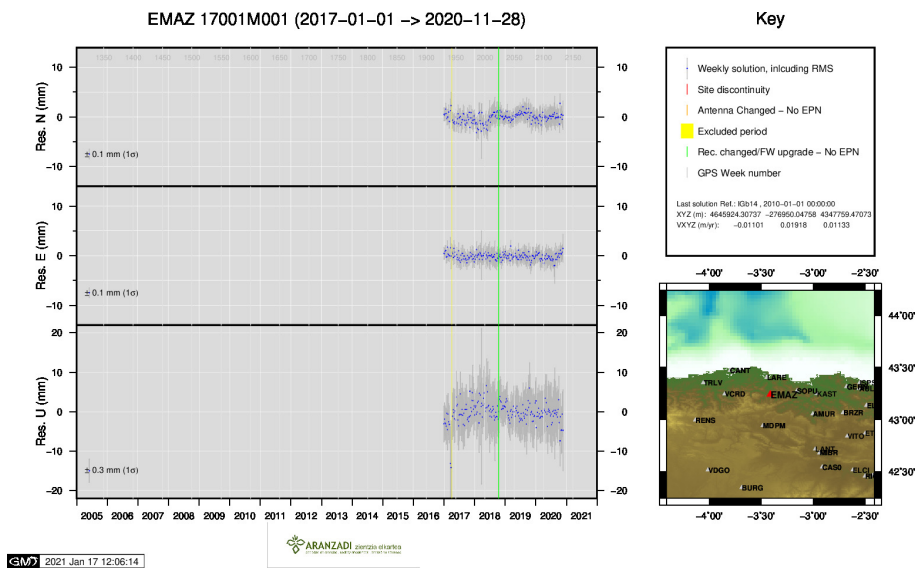
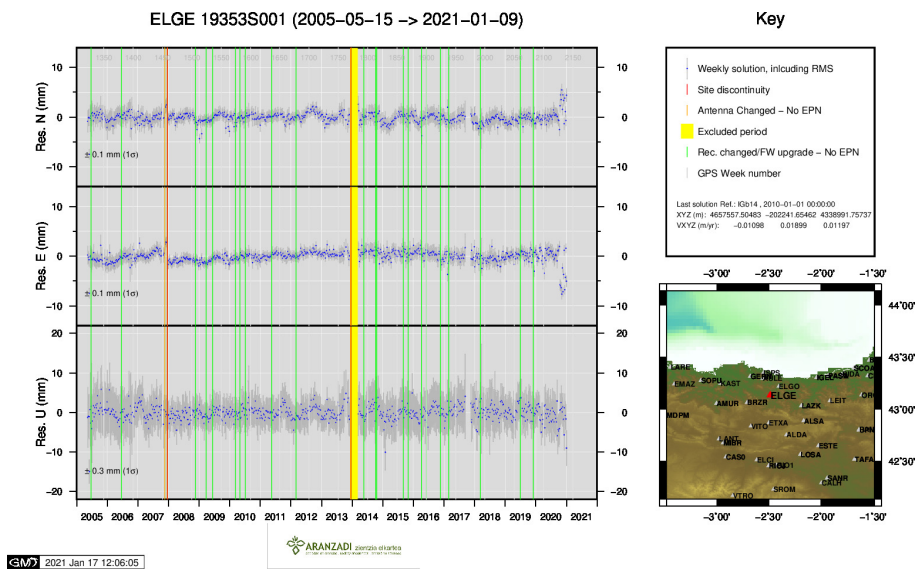
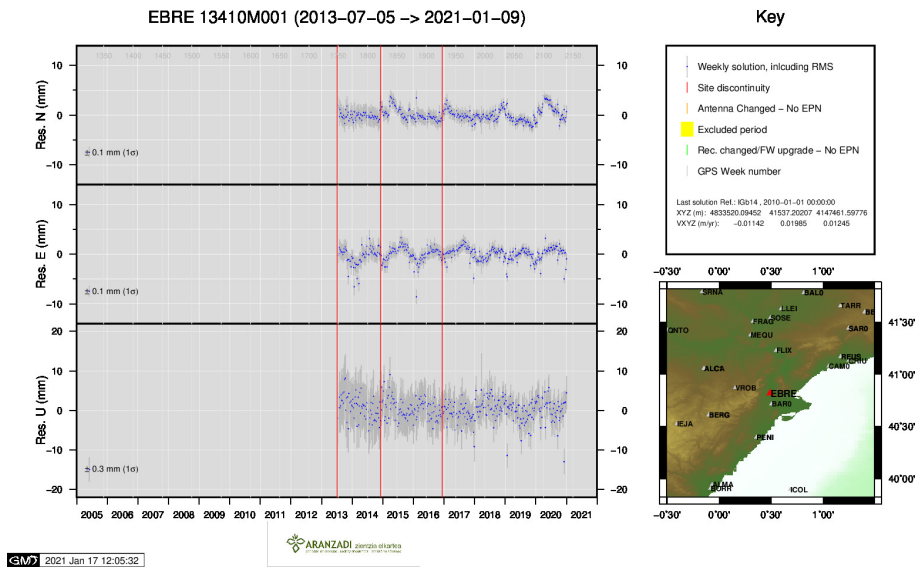
6 ) CACE



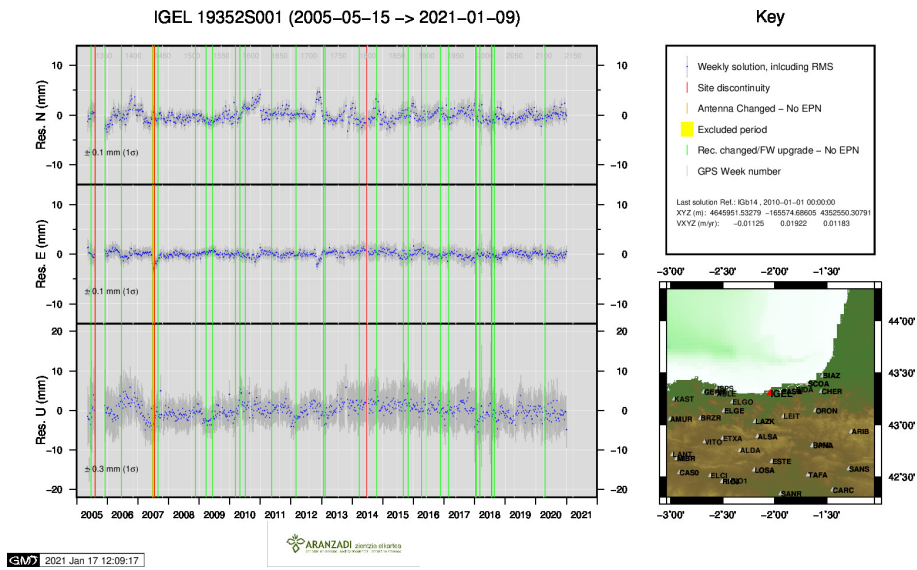
7 ) CANT



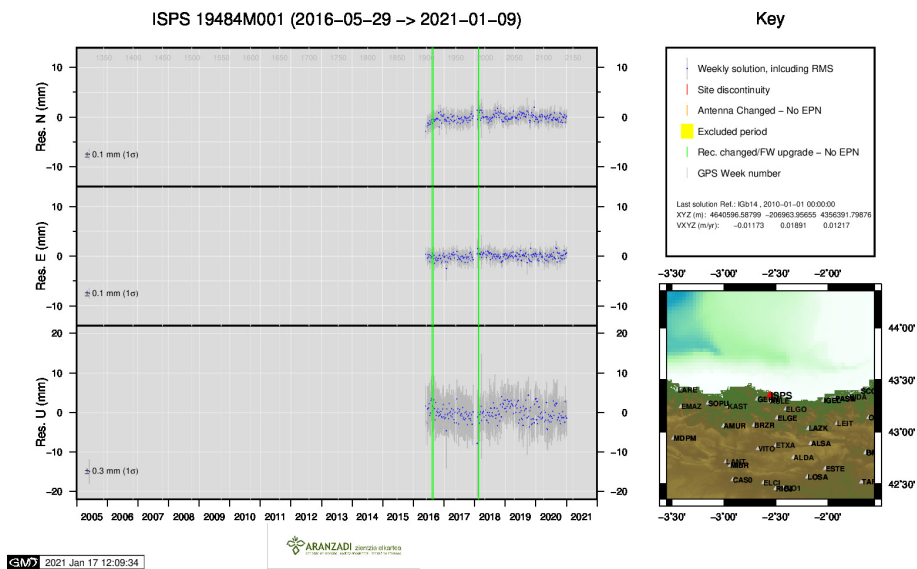
8 ) CHER



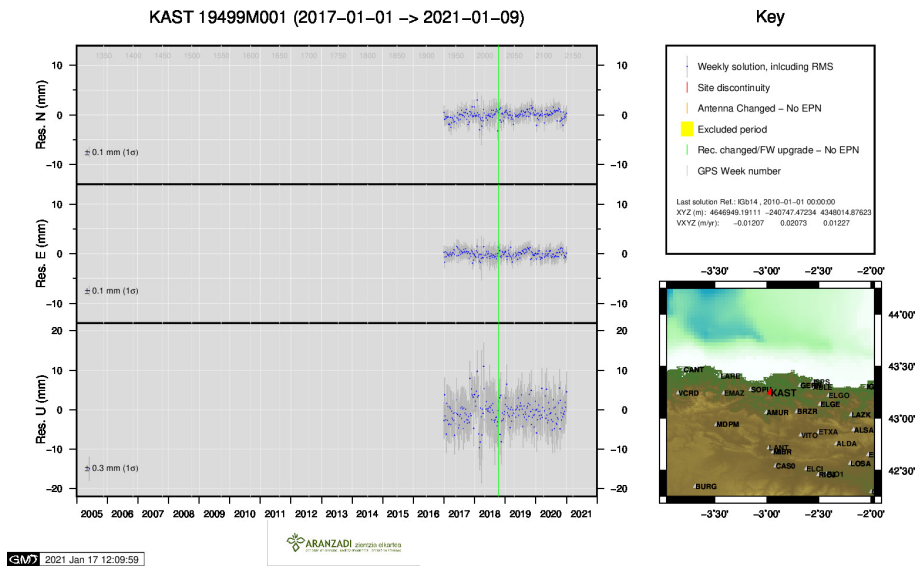




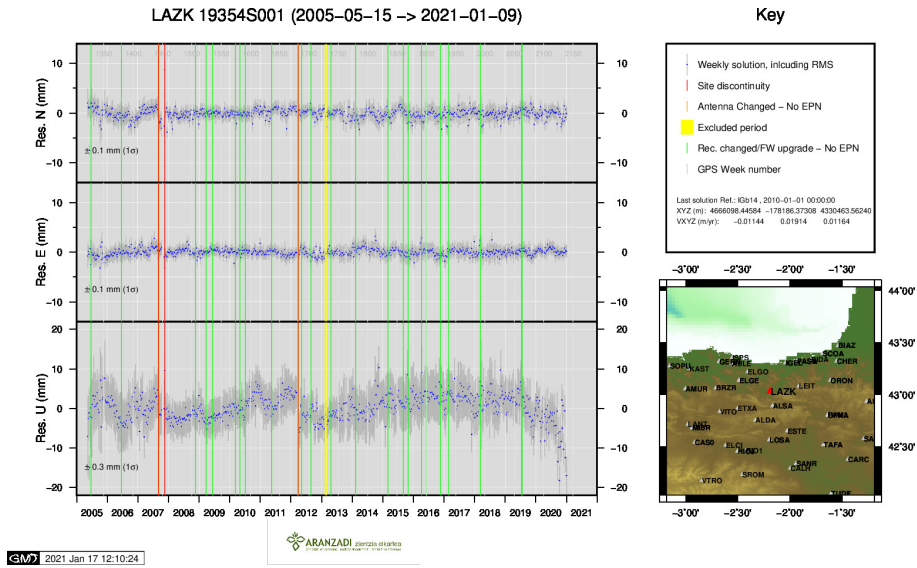
12 ) IGEL



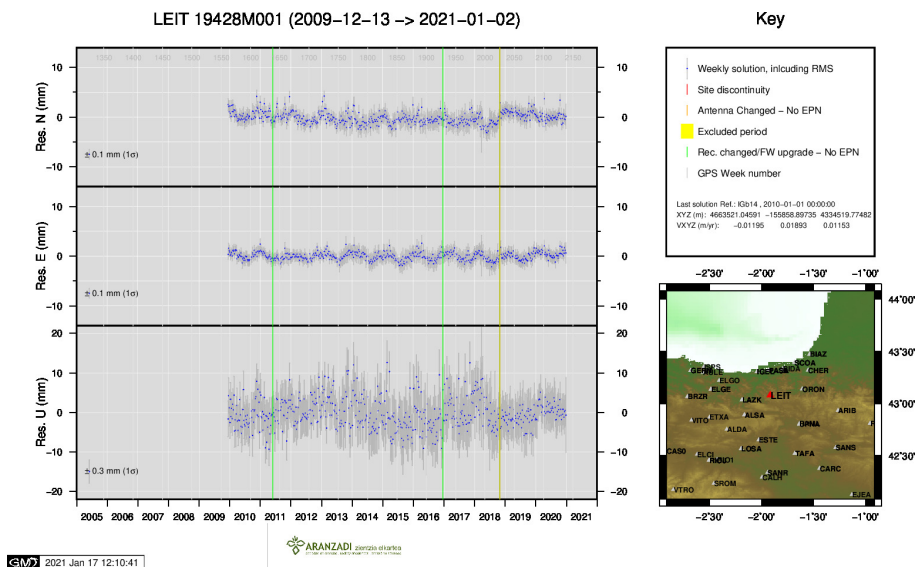
13 ) ISPS



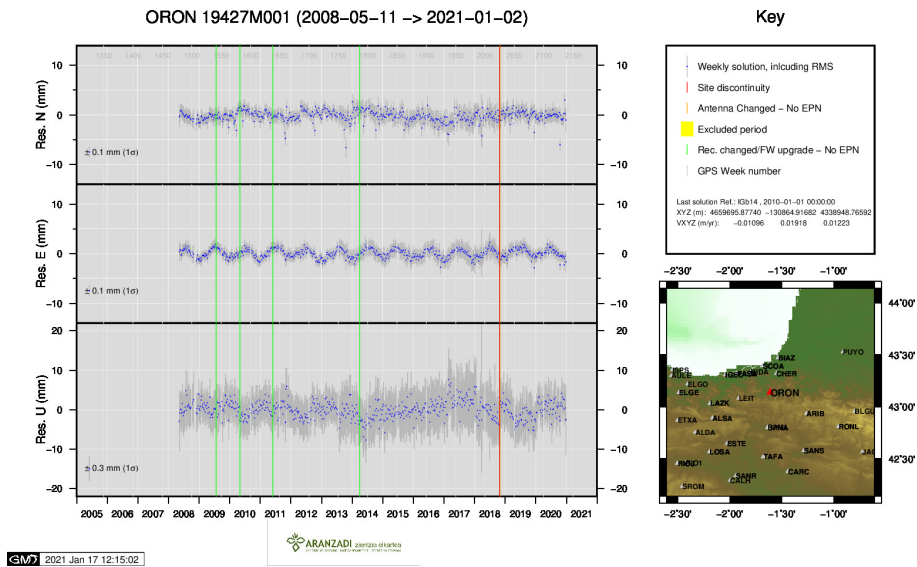
14 ) KAST



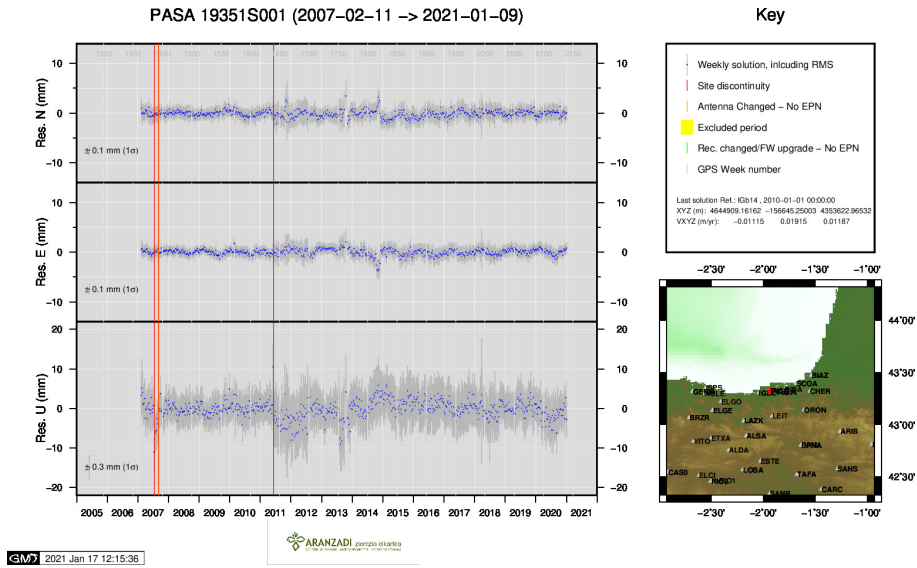
15 ) LAZK



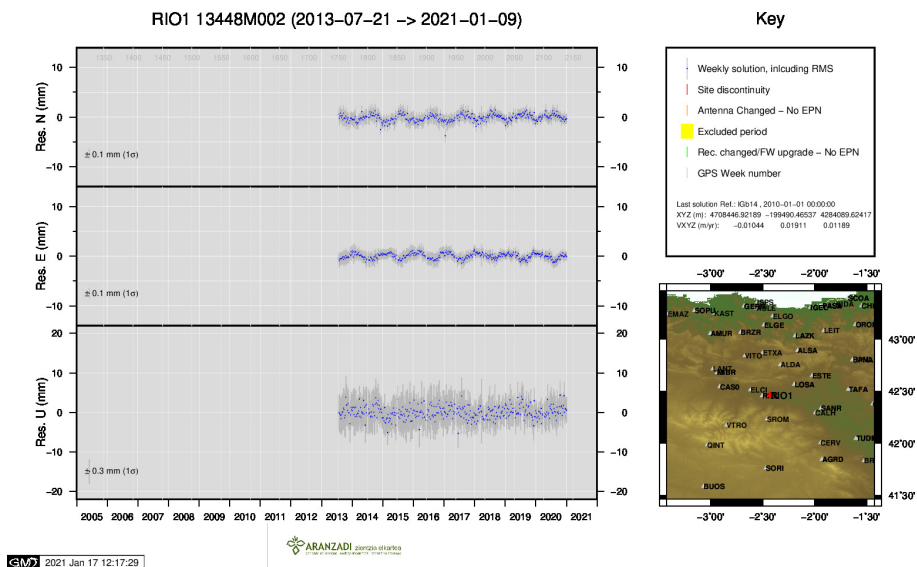
16 ) LEIT



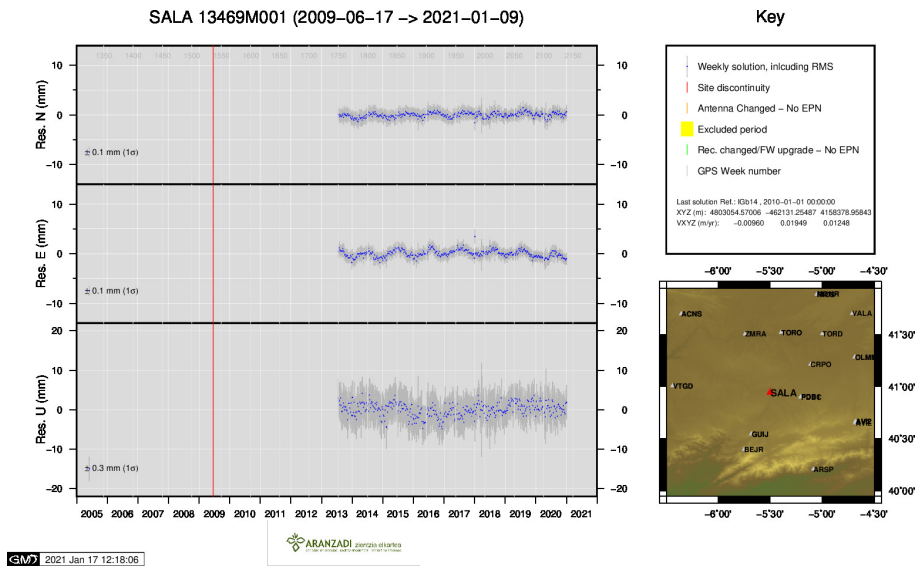
17 ) ORON



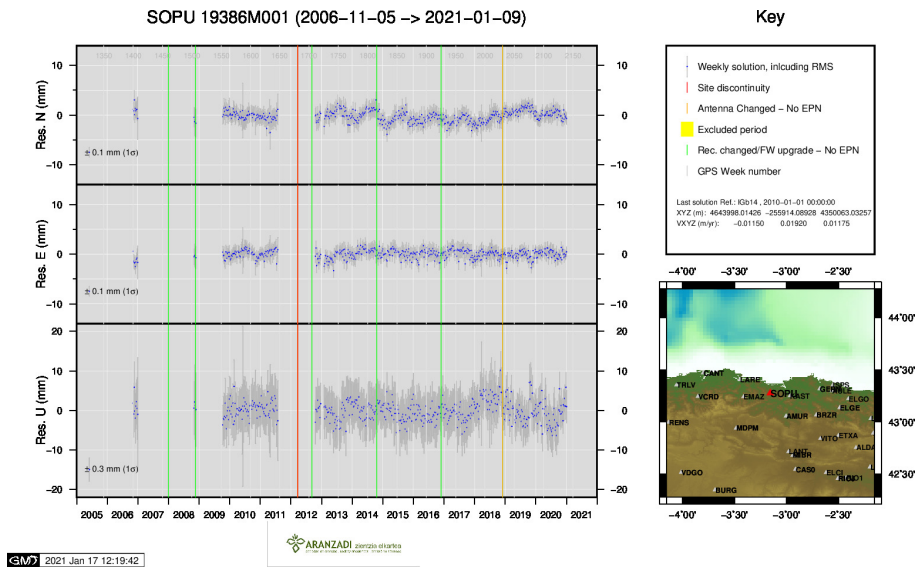
18 ) PASA



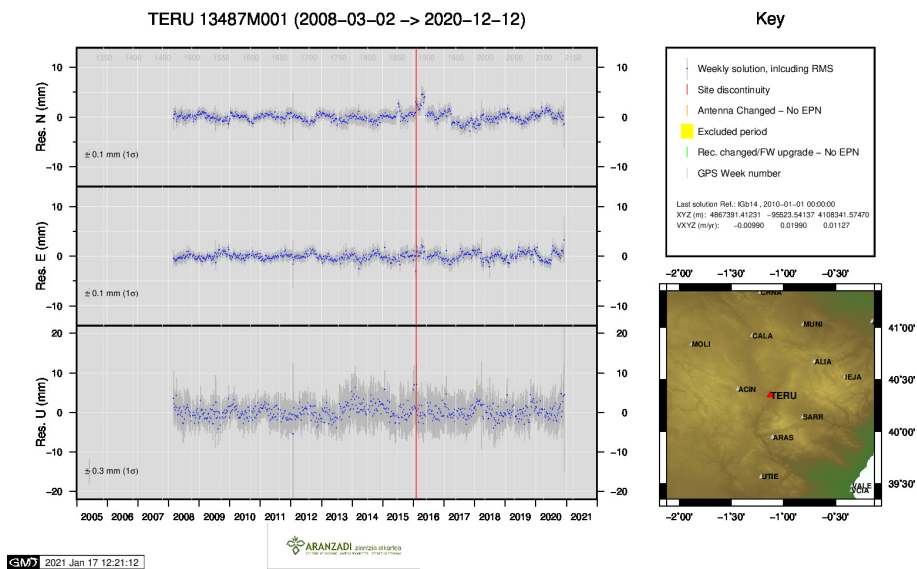
19 ) RIO1



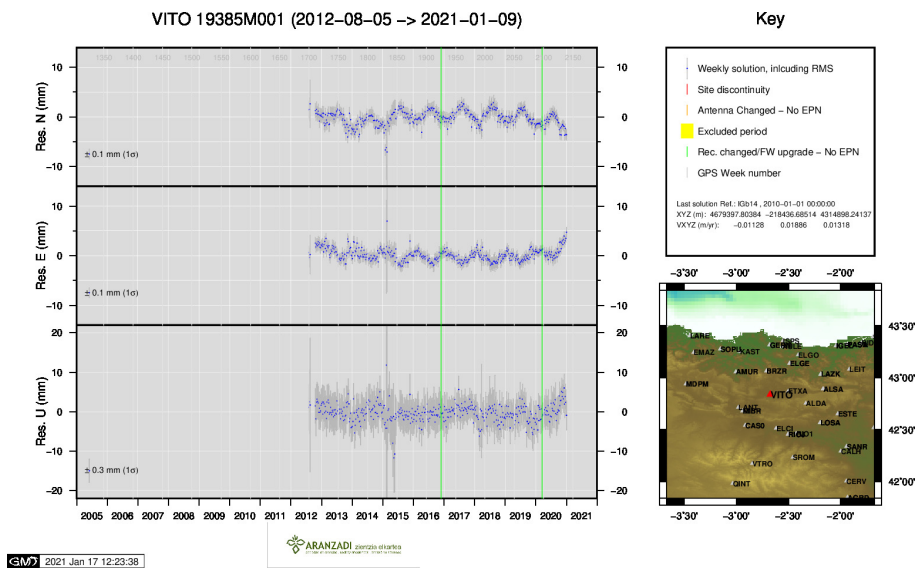
20 ) SALA



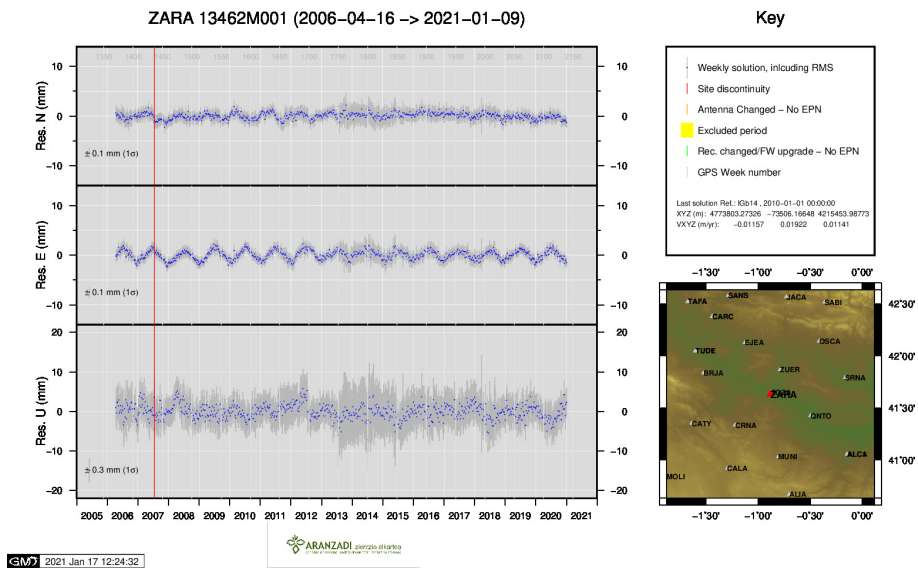
21 ) SOPU



22 ) TERU



23 ) VITO



GM 2021 Jan 17 12:24:32

24 ) ZARA