

# ARA-DAC Weekly Analysis Result: 2214 (GFA)

## Technical Report

**GPS Week: 2214 (GFA)**

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

**ARA-DAC details:**

Contact person: J. Zurutuza

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

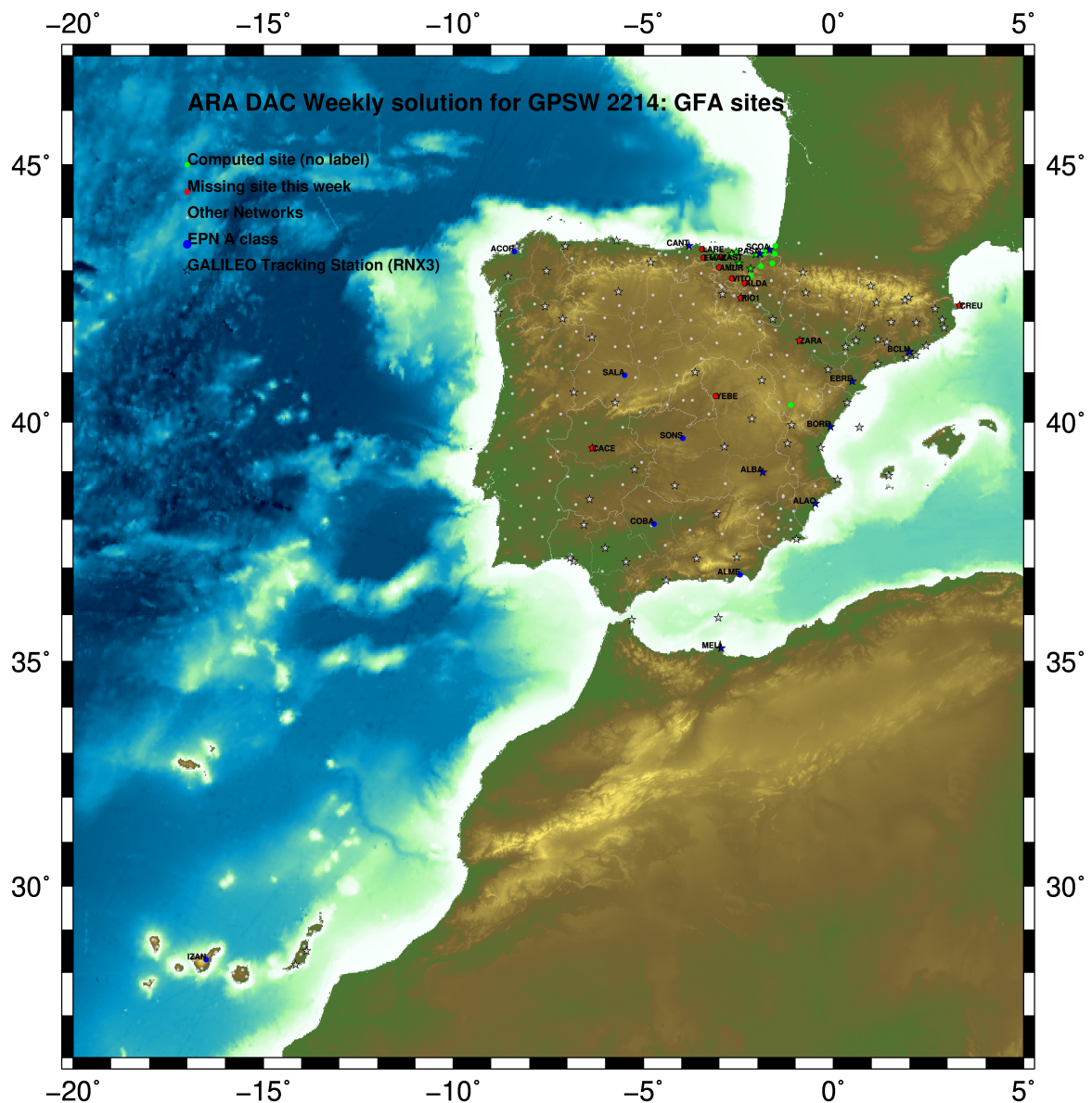
Report generated on 2022/07/03 at 13:29:41



# 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 2022 Jul 03 13:29:33

Fig.1: Computed Sites for GPS Week2214 (GFA)

### 3 Main Computation Parameters

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

- Preprocessing: Independent baselines are defined by the criterion of maximum common observations. Cycle slips are fixed with the MAUPRP program, analysing triple phase differences for each independent baseline. If MAUPRP does not fix all slips for one station, that station is edited out.
- Basic Observable : Carrier phase,  $L_1$  and  $L_2$ ; a priori sigma of single differences: 0.002 m.
  - sampling (for ambiguity resolution): 30 s
  - sampling (for final processing): 180 s
  - Systems: GPS+GLONASS observations are used (Galileo also used if available from GPSW 1986 on)
- Modelled observable: Double differences of carrier phase using different combinations based on the distance.
- Ground antenna phase center calibrations: Group APCV used from the PCV\_COD.I14 file and individual calibrations from EPNC\_14.ATX. EPN\_A class sites (CRD + VEL) IGb14 used to define the reference frame (from GPSW 1934). If individual calibrations, other from these, are available, they are also included in the analysis.
- Troposphere:
  - 3 deg elev. cutoff; elevation dependent weighting
  - VMF1 mapping function. ZPD parameters are estimated using the VMF1 mapping function.
  - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2004 (Scherneck).
- Atmosph. Loading: computed from a global grid using the GRDS1S2 program of Bernese 5.2.

### 4 Estimated Parameters

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

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

## 5 Computed Coordinates

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

### 5.1 IGB14

The Reference Frame considered in this section is IGB14, release C2130.

```

ARA LAC 2214 WEEK FINAL COMBINATION: PRECISE ORBITS          03-JUL-22 10:48
-----
LOCAL GEODETIC DATUM: IGB14          EPOCH: 2022-06-15 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  4 ACRD 13434M001        4594489.52551      -678367.38079    4357066.31614    W
  50 ALSA 19419M001        4677250.79737      -176770.33610    4319079.91122    A
 100 BIAZ 10074M002        4634456.00942      -124344.91916    4365785.48960    A
 101 BIDA 00000M000        4644177.78262      -145778.26586    4354832.51739    A
 113 BRZR 19387M001        4662220.95295      -220769.84225    4333309.47651    A
 116 CANT 13438M001        4625924.27772      -307096.17996    4365771.59178    W
 154 CHER 00000M000        4645879.98244      -125721.85190    4353624.11954    A
 204 EBRE 13410M001        4833519.94943        41537.44972    4147461.75015    W
 180 ELGE 19353S001        4657557.35854      -202241.41321    4338991.92537    A
 209 GERN 19389M001        4642811.27951      -217222.86972    4353278.91500    A
 257 HOND 15012M002        4640529.27532      -145676.92686    4358761.78859    A
 235 IGEL 19352S001        4645951.38729      -165574.44651    4352550.45524    A
 240 ISFS 19484M001        4640596.43742      -206963.72129    4356391.94856    A
 256 LAZK 19354S001        4666098.30279      -178186.13371    4330463.70752    A
 261 LEIT 19428M001        4663520.89989      -155858.66074    4334519.91984    A
 334 ORDN 19427M001        4659695.73874      -130864.67635    4338948.91778    A
 345 PASZ 19351S001        4644909.02343      -156645.01148    4353623.11342    A
 493 PASA 19351S001        4644909.02245      -156645.01146    4353623.11348    W
 558 SALA 13469M001        4803054.45443      -462131.01325    4158379.11802    W
 566 SODA 10088M002        4639940.46044      -136224.88291    4359552.45336    W
 418 SOPU 19386M001        4643997.87004      -255913.85032    4350063.17879    A
 443 TERU 13487M001        4867391.27356      -95523.28703    4108341.71300    A
    
```

### 5.2 ETRF2000 (ETRS89) Coordinates

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

```

ETRF2000 FINAL COORD. wk 2214          03-JUL-22 10:48
-----
LOCAL GEODETIC DATUM: ETRF2000        EPOCH: 2022-06-15 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  4 ACRD 13434M001        4594489.85663      -678367.97716    4357065.85952    W
  50 ALSA 19419M001        4677251.19019      -176770.94085    4319079.45448    A
 100 BIAZ 10074M002        4634456.41254      -124345.51884    4365785.03711    A
 101 BIDA 00000M000        4644178.18215      -145778.86672    4354832.06381    A
 113 BRZR 19387M001        4662221.34120      -220770.44541    4333309.02043    A
 116 CANT 13438M001        4625924.65733      -307096.77918    4365771.13757    W
 154 CHER 00000M000        4645880.38446      -125722.45289    4353623.66608    A
 204 EBRE 13410M001        4833520.35720        41536.82791    4147461.28326    W
 180 ELGE 19353S001        4657557.74961      -202242.01578    4338991.46993    A
 209 GERN 19389M001        4642811.66974      -217223.47063    4353278.46058    A
 257 HOND 15012M002        4640529.67517      -145676.52730    4358781.33531    A
 235 IGEL 19352S001        4645951.78410      -165575.04764    4352550.00125    A
 240 ISFS 19484M001        4640596.82920      -206964.32192    4356391.49446    A
 256 LAZK 19354S001        4666098.69630      -178186.73718    4330463.25169    A
 261 LEIT 19428M001        4663521.29658      -155859.26385    4334519.46452    A
 334 ORDN 19427M001        4659696.13998      -130865.27894    4338948.46311    A
 345 PASZ 19351S001        4644909.42047      -156645.61246    4353622.65963    A
 493 PASA 19351S001        4644909.42049      -156645.61244    4353622.65969    W
 558 SALA 13469M001        4803054.79826      -462131.63304    4158378.64697    W
 566 SODA 10088M002        4639940.86156      -136225.48326    4359552.00026    W
 418 SOPU 19386M001        4643998.25504      -255914.45148    4350062.72376    A
 443 TERU 13487M001        4867391.66074      -95523.91315    4108341.24148    A
    
```

### 5.3 ETRF2014 (ETRS89) Coordinates

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

```

ETRF2014 FINAL COORD. wk 2214          03-JUL-22 10:48
-----
LOCAL GEODETIC DATUM: ETRF2014        EPOCH: 2022-06-15 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  4 ACRD 13434M001        4594489.81604      -678368.01467    4357065.91108    W
  50 ALSA 19419M001        4677251.14728      -176770.97979    4319079.50595    A
 100 BIAZ 10074M002        4634456.36990      -124345.55815    4365785.08874    A
 101 BIDA 00000M000        4644178.13948      -145778.90591    4354832.11540    A
    
```

113	BRZR	19387M001	4662221.29859	-220770.48426	4333309.07193	A
116	CANT	13438M001	4625924.61537	-307096.81788	4365771.18914	W
154	CHER	00000M000	4645880.34170	-125722.49215	4353623.71768	A
204	EBRE	13410M001	4833520.31182	41536.78888	4147461.33443	W
180	ELGE	19353S001	4657557.70698	-202242.05471	4338991.52145	A
209	GERN	19389M001	4642811.62731	-217223.50958	4353278.51214	A
257	HOND	15012M002	4640529.63253	-145676.56651	4358781.38691	A
235	IGEL	19352S001	4645951.74148	-165575.08675	4352550.05282	A
240	ISPS	19484M001	4640596.78677	-206964.36092	4356391.54603	A
256	LAZK	19354S001	4666098.65350	-178186.77616	4330463.30319	A
261	LEIT	19428M001	4663521.25374	-155859.30293	4334519.51604	A
334	ORON	19427M001	4659696.09709	-130865.31812	4338948.51466	A
345	PAS2	19351S001	4644909.37783	-156645.65161	4353622.71121	A
493	PASA	19351S001	4644909.37785	-156645.65159	4353622.71127	W
558	SALA	13469M001	4803054.75486	-462131.67043	4158378.69798	W
566	SCDA	10088M002	4639940.81890	-136225.52250	4359552.05186	W
418	SOPU	19386M001	4643998.21273	-255914.49028	4350062.77529	A
443	TERU	13487M001	4867391.61546	-95523.95156	4108341.29248	A

## 6 Quality Control

### 6.1 Mean and Daily Repeatabilities

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

ARA LAC 2214 WEEK FINAL COMBINATION: PRECISE ORBITS 03-JUL-22 10:48

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	1.61	1.09	4.35
ALSA 19419M001	7	XXXXXX	1.62	0.94	3.75
BIAZ 10074M002	7	XXXXXX	0.51	4.20	6.17
BIDA 00000M000	7	XXXXXX	0.88	3.10	5.67
BRZR 19387M001	7	XXXXXX	0.99	0.86	4.93
CANT 13438M001	7	XXXXXX	0.78	1.33	2.64
CHER 00000M000	6	XXX XX	1.43	2.37	6.60
EBRE 13410M001	7	XXXXXX	0.49	1.35	1.27
ELGE 19353S001	7	XXXXXX	1.16	0.94	2.44
GERN 19389M001	7	XXXXXX	1.35	0.89	3.54
HOND 15012M002	7	XXXXXX	0.82	0.78	4.25
IGEL 19352S001	7	XXXXXX	0.88	0.73	4.58
ISPS 19484M001	7	XXXXXX	1.82	2.11	6.15
LAZK 19354S001	7	XXXXXX	0.77	0.39	3.80
LEIT 19428M001	7	XXXXXX	0.71	0.97	4.67
ORON 19427M001	7	XXXXXX	1.37	0.69	4.82
PAS2 19351S001	7	XXXXXX	1.11	1.15	3.91
PASA 19351S001	7	XXXXXX	1.13	1.10	3.80
SALA 13469M001	7	XXXXXX	0.83	0.56	1.88
SCDA 10088M002	7	XXXXXX	1.36	3.77	6.88
SOPU 19386M001	7	XXXXXX	1.85	1.34	6.31
TERU 13487M001	7	XXXXXX	0.81	1.13	3.97

Comparison of individual solutions:

ACOR 13434M001	N	1.61	-1.97	0.38	0.93	1.59	-0.71	-2.13	1.78
ACOR 13434M001	E	1.09	1.50	-0.46	1.41	1.08	0.65	0.85	-0.62
ACOR 13434M001	U	4.35	-8.51	2.24	1.57	2.51	2.36	2.87	-3.68
ALSA 19419M001	N	1.62	-0.02	-1.11	-2.53	-0.27	1.51	1.97	1.38
ALSA 19419M001	E	0.94	-0.27	-0.51	0.07	-0.52	-1.01	0.05	1.93
ALSA 19419M001	U	3.75	5.34	4.42	0.04	-3.53	-1.72	-3.87	2.42
BIAZ 10074M002	N	0.51	-0.07	0.19	-0.19	-0.26	1.18	0.22	0.06
BIAZ 10074M002	E	4.20	-0.18	0.40	-0.59	-0.05	8.62	-0.65	-5.53
BIAZ 10074M002	U	8.17	3.91	-10.52	-4.72	-8.72	-1.86	8.73	9.82
BIDA 00000M000	N	0.88	-0.45	0.97	-0.33	-0.18	0.27	-0.63	1.71
BIDA 00000M000	E	3.10	-0.44	-0.91	-0.65	-1.46	7.31	-0.61	0.58
BIDA 00000M000	U	5.67	-0.81	-7.60	1.82	-9.21	-0.25	2.94	6.12
BRZR 19387M001	N	0.99	-0.86	-1.18	-0.75	1.58	-0.43	0.70	0.19
BRZR 19387M001	E	0.86	0.51	0.93	-1.26	-0.88	-0.54	-0.22	-0.76
BRZR 19387M001	U	4.93	2.88	7.59	-4.98	-1.54	-2.32	-5.78	-3.69
CANT 13438M001	N	0.78	-1.14	0.51	0.19	0.13	-0.36	-1.00	0.97
CANT 13438M001	E	1.33	1.65	1.49	2.10	-0.21	-0.53	-0.90	-0.41
CANT 13438M001	U	2.64	3.33	0.62	-3.53	-2.29	-1.09	2.91	1.68
CHER 00000M000	N	1.43	-0.12	2.27	0.23	-1.67		-0.17	1.46
CHER 00000M000	E	2.37	-1.09	-1.65	0.05	4.35		-2.08	-0.95
CHER 00000M000	U	6.60	1.32	-6.42	-0.67	-10.65		6.49	-4.35
EBRE 13410M001	N	0.49	0.73	0.09	-0.59	0.06	0.32	0.63	0.24
EBRE 13410M001	E	1.35	0.63	-0.36	-1.15	0.63	1.06	-2.74	-0.04
EBRE 13410M001	U	1.27	-0.01	1.54	0.61	0.25	-1.97	-1.28	-1.16
ELGE 19353S001	N	1.16	-1.58	-0.77	0.95	-0.42	-1.02	1.60	0.54
ELGE 19353S001	E	0.94	0.79	-0.72	-0.34	-0.75	-1.63	-0.57	0.68
ELGE 19353S001	U	2.44	-4.32	0.63	1.58	-0.38	-2.19	-0.61	-2.99
GERN 19389M001	N	1.35	-1.94	-1.20	0.03	0.87	0.76	1.58	1.40
GERN 19389M001	E	0.89	1.11	-0.27	0.46	0.64	-0.53	-0.12	-1.58
GERN 19389M001	U	3.54	-2.37	-3.86	3.09	1.30	-4.30	-4.84	1.23
HOND 15012M002	N	0.82	0.36	-0.03	0.49	0.84	1.25	0.86	0.80
HOND 15012M002	E	0.78	-1.04	-0.66	-0.66	-0.14	-0.44	-1.12	0.47
HOND 15012M002	U	4.25	-1.79	-5.48	-0.79	-7.38	-3.10	0.99	-3.08
IGEL 19352S001	N	0.88	0.61	-0.15	-0.44	1.08	0.71	1.01	1.16
IGEL 19352S001	E	0.73	-1.19	-0.62	-0.27	-0.25	-0.22	0.26	-1.06
IGEL 19352S001	U	4.58	-2.94	-6.26	3.95	-5.44	-1.31	-1.77	-5.28
ISPS 19484M001	N	1.82	-3.14	-0.71	-0.35	0.81	1.10	1.69	2.18
ISPS 19484M001	E	2.11	-0.20	-0.57	-0.68	3.94	1.36	-1.85	-2.27
ISPS 19484M001	U	6.15	1.93	-4.38	-1.77	8.39	-7.18	1.01	-8.82
LAZK 19354S001	N	0.77	0.90	-1.21	0.42	-0.11	0.21	0.96	-0.34
LAZK 19354S001	E	0.39	0.22	-0.31	-0.24	0.59	-0.28	-0.52	0.13
LAZK 19354S001	U	3.80	-1.56	1.40	4.45	-4.50	-1.01	-1.50	6.24
LEIT 19428M001	N	0.71	0.56	-0.69	-0.12	0.55	1.14	-0.70	0.37
LEIT 19428M001	E	0.97	-1.30	-0.37	0.63	-0.88	-0.91	1.14	0.70
LEIT 19428M001	U	4.67	3.49	2.40	4.70	-0.21	2.50	-8.61	-3.20
ORON 19427M001	N	1.37	0.29	-1.12	0.03	0.17	0.82	2.61	-1.56
ORON 19427M001	E	0.69	-0.17	-0.57	0.01	-1.20	0.65	0.75	-0.29
ORON 19427M001	U	4.82	0.13	5.24	4.20	2.59	2.30	-8.62	-2.85
PAS2 19351S001	N	1.11	0.53	-0.38	-0.50	1.00	1.97	1.17	0.66
PAS2 19351S001	E	1.15	-0.76	-0.51	-0.15	-0.11	-0.07	0.53	-2.60
PAS2 19351S001	U	3.91	-2.13	-5.85	0.59	-6.07	-3.21	-1.63	-1.74
PASA 19351S001	N	1.13	0.41	-0.48	-0.43	1.05	2.00	1.30	0.57
PASA 19351S001	E	1.10	-0.70	-0.60	-0.11	-0.23	-0.03	0.49	-2.47
PASA 19351S001	U	3.80	-2.17	-5.92	-0.20	-5.80	-2.95	-1.96	-0.85
SALA 13469M001	N	0.83	-0.91	1.02	0.21	-0.09	-0.37	-0.91	-1.11
SALA 13469M001	E	0.56	0.45	-0.18	0.15	0.49	0.15	-0.34	1.13
SALA 13469M001	U	1.88	2.00	-3.62	0.39	1.49	-0.80	0.84	-0.70
SCDA 10088M002	N	1.36	1.62	1.57	1.31	-0.45	-1.70	0.08	-1.11
SCDA 10088M002	E	3.77	-2.08	-1.34	-1.07	-0.65	8.79	-0.09	0.30
SCDA 10088M002	U	6.88	-0.23	-13.25	-2.58	-4.73	1.96	5.07	7.06
SOPU 19386M001	N	1.85	-2.76	0.28	-0.24	3.09	1.03	-0.05	-1.51
SOPU 19386M001	E	1.34	0.93	-0.91	0.81	0.61	0.51	1.07	2.58
SOPU 19386M001	U	6.31	4.26	-1.61	0.35	-5.40	-3.55	-2.08	13.10
TERU 13487M001	N	0.81	0.43	-0.15	0.28	-0.27	-0.04	1.89	-0.03
TERU 13487M001	E	1.13	-1.27	-1.25	-1.30	1.30	-0.34	0.65	-0.73
TERU 13487M001	U	3.97	-7.14	2.96	0.44	3.29	-3.87	-2.86	0.70

## 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	-1.07	2.35	1.47
12	ALAC 13433M001	I W	0.01	-0.41	2.79
15	ALBA 13452M001	I W	1.41	-1.41	-2.36
21	ALME 13437M001	I W	-1.22	-0.22	7.91
47	BCLN 13412M001	I W	-0.39	-3.73	2.30
71	BORR 13480M001	I W	-0.30	-1.18	2.81
116	CANT 13438M001	I W	-1.50	3.06	-1.45
143	COBA 13453M001	I W	2.43	0.80	-1.10
204	EBRE 13410M001	I W	-1.29	0.07	3.59
316	IZAN 31309M002	I W	1.73	2.28	-2.90
432	MELI 19379M001	I W	3.47	-1.99	-3.20
493	PASA 19351S001	I W	-0.04	-0.59	-3.10
558	SALA 13469M001	I W	0.88	0.96	-7.10
566	SCDA 10088M002	I W	-3.82	-2.59	-5.38
599	SONS 13446M001	I W	-0.29	2.61	5.72
	RMS / COMPONENT		1.80	2.02	4.21
	MEAN		0.00	0.00	0.00
	MIN		-3.82	-3.73	-7.10
	MAX		3.47	3.06	7.91

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 45  
RMS OF TRANSFORMATION : 2.89 MM

BARYCENTER COORDINATES:

LATITUDE : 39 33 19.86  
LONGITUDE : - 3 34 9.67  
HEIGHT : -25.352 KM

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.75 MM  
TRANSLATION IN E : 0.00 +- 0.75 MM  
TRANSLATION IN U : -0.00 +- 0.75 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                14091165
NUMBER OF UNKNOWN                    183987
NUMBER OF DEGREES OF FREEDOM          13907178
PHASE MEASUREMENTS SIGMA              0.00100
SAMPLING INTERVAL (SECONDS)           180
VARIANCE FACTOR                       2.297597731349813

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00211      0.0235  0.0045 -0.0240 -0.0001  0.0011  0.0001 -0.00046
 2  0.00206      0.0030 -0.0159 -0.0034  0.0003  0.0002 -0.0004 -0.00049
 3  0.00164      0.0069 -0.0107 -0.0093  0.0005  0.0004 -0.0001  0.00001
 4  0.00219     -0.0230 -0.0123  0.0213  0.0001 -0.0010 -0.0004  0.00046
 5  0.00219      0.0031 -0.0005 -0.0029  0.0000  0.0001 -0.0000 -0.00011
 6  0.00267     -0.0184 -0.0094  0.0421 -0.0001 -0.0014 -0.0005 -0.00197
 7  0.00271     -0.0121 -0.0200  0.0139  0.0004 -0.0006 -0.0005 -0.00010
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00146      2104891      2.13      2132982      3      756      27338      0
 2  0.00145      2099814      2.10      2126937      3      756      26370      0
 3  0.00150      2069898      2.26      2098675      3      726      28054      0
 4  0.00155      1935356      2.41      1963959      3      687      27919      0
 5  0.00155      1932054      2.42      1959313      3      687      26575      0
 6  0.00152      1814443      2.31      1837618      3      624      22554      0
 7  0.00156      1946576      2.43      1971681      3      690      24418      0
```

## 7 Equipment

### 7.1 Receiver List

Serial numbers not shown.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__ FIRMWARE___
ACOR  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
ALSA  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
BIAZ  A  1 P 22:163:00000 22:169:86370 SPECTRA SP90M -----
BIDA  A  1 P 22:163:00000 22:169:86370 LEICA GR10 -----
BRZR  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
CANT  A  1 P 22:163:00000 22:169:86370 LEICA GR10 -----
CHER  A  1 P 22:163:00000 22:169:41790 LEICA GR30 -----
EBRE  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
ELGE  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
GERN  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
HOND  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
IGEL  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
ISPS  A  1 P 22:163:00000 22:169:86370 TRIMBLE NETR9 -----
LAZK  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
LEIT  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
ORON  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
PAS2  A  1 P 22:163:00030 22:169:86370 STONEX SC2200 -----
PASA  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
SALA  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
SCOA  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
SOPU  A  1 P 22:163:00000 22:169:86370 LEICA GR30 -----
TERU  A  1 P 22:163:00000 22:169:86370 LEICA GR50 -----
```

### 7.2 Antennas

Serial number ONLY provided in case individual calibrations are available.

```
*SITE PT SOLN T DATA_START__ DATA_END_____ DESCRIPTION_____ S/N__
ACOR  A  1 P 22:163:00000 22:169:86370 LEIAT504      LEIS -----
ALSA  A  1 P 22:163:00000 22:169:86370 LEIAR10      NONE -----
BIAZ  A  1 P 22:163:00000 22:169:86370 LEIAR25      LEIT -----
BIDA  A  1 P 22:163:00000 22:169:86370 LEIAS10      NONE -----
BRZR  A  1 P 22:163:00000 22:169:86370 LEIAS10      NONE -----
CANT  A  1 P 22:163:00000 22:169:86370 LEIAR25.R4   LEIT 25066
CHER  A  1 P 22:163:00000 22:169:41790 LEIAR10      NONE -----
EBRE  A  1 P 22:163:00000 22:169:86370 LEIAR25.R4   NONE 26359
ELGE  A  1 P 22:163:00000 22:169:86370 LEIAR25.R4   LEIT -----
GERN  A  1 P 22:163:00000 22:169:86370 LEIAS10      NONE -----
HOND  A  1 P 22:163:00000 22:169:86370 LEIAR20      LEIM 41012
IGEL  A  1 P 22:163:00000 22:169:86370 LEIAR20      LEIM 43011
ISPS  A  1 P 22:163:00000 22:169:86370 TRM59900.00 SCIS -----
LAZK  A  1 P 22:163:00000 22:169:86370 LEIAR25.R4   LEIT -----
```

```

LEIT A 1 P 22:163:00000 22:169:86370 LEIAR10 NONE -----
ORON A 1 P 22:163:00000 22:169:86370 LEIAR10 NONE -----
PAS2 A 1 P 22:163:00030 22:169:86370 LEIAR20 LEIM 73034
PASA A 1 P 22:163:00000 22:169:86370 LEIAR20 LEIM 73034
SALA A 1 P 22:163:00000 22:169:86370 LEIAR25 NONE -----
SCOA A 1 P 22:163:00000 22:169:86370 TRM55971.00 NONE -----
SOPU A 1 P 22:163:00000 22:169:86370 LEIAS10 NONE -----
TERU A 1 P 22:163:00000 22:169:86370 LEIAR20 LEIM 49044
    
```

### 7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START_ DATA_END_ AXE UP_ NORTH_ EAST_
*ARP->BENCHMARK(M)-----
ACOR A 1 P 22:163:00000 22:169:86370 UNE 3.0460 0.0000 0.0000
ALSA A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 22:163:00000 22:169:86370 UNE 0.0771 0.0000 0.0000
CANT A 1 P 22:163:00000 22:169:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 22:163:00000 22:169:41790 UNE 0.0000 0.0000 0.0000
EBRE A 1 P 22:163:00000 22:169:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
GERN A 1 P 22:163:00000 22:169:86370 UNE 0.0771 0.0000 0.0000
HOND A 1 P 22:163:00000 22:169:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 22:163:00000 22:169:86370 UNE 0.0350 0.0000 0.0000
LAZK A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
ORON A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 22:163:00030 22:169:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
SALA A 1 P 22:163:00000 22:169:86370 UNE 0.0600 0.0000 0.0000
SCOA A 1 P 22:163:00000 22:169:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 22:163:00000 22:169:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 22:163:00000 22:169:86370 UNE 0.0600 0.0000 0.0000
    
```

## 8 References

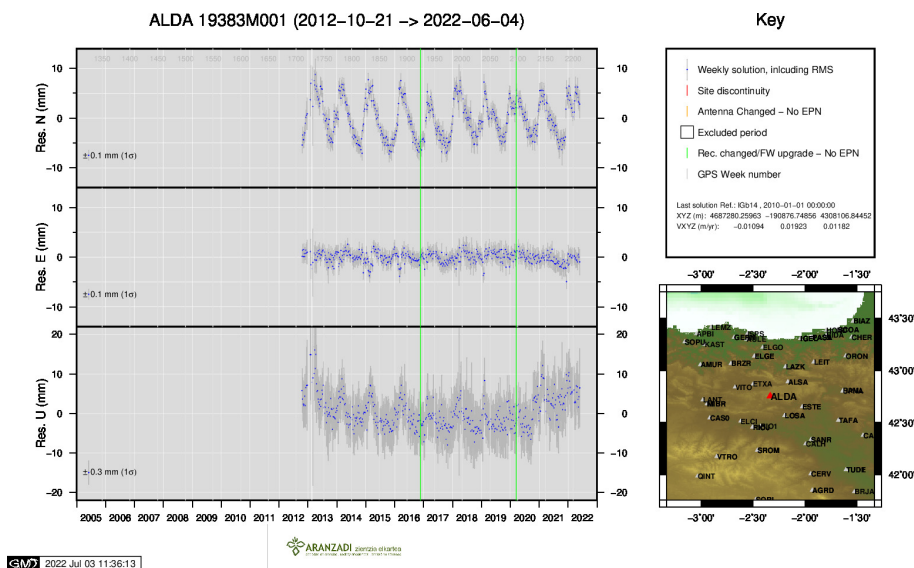
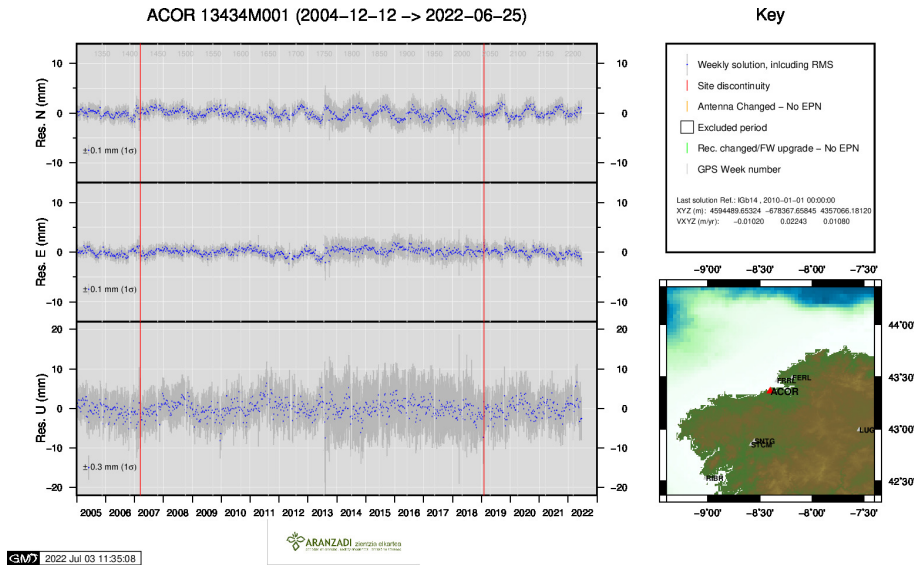
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](https://etrs89.ensg.ign.fr/memo-V8.pdf)

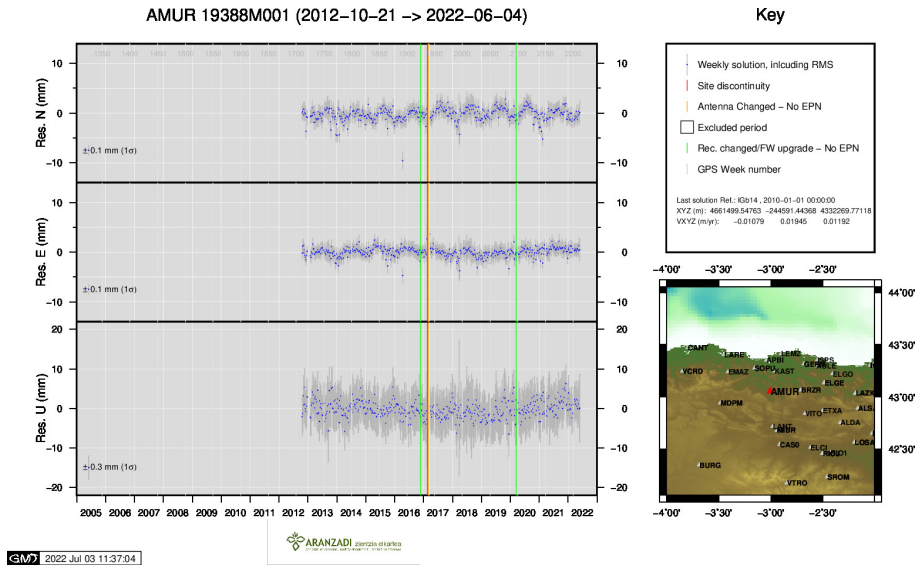
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](https://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

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)

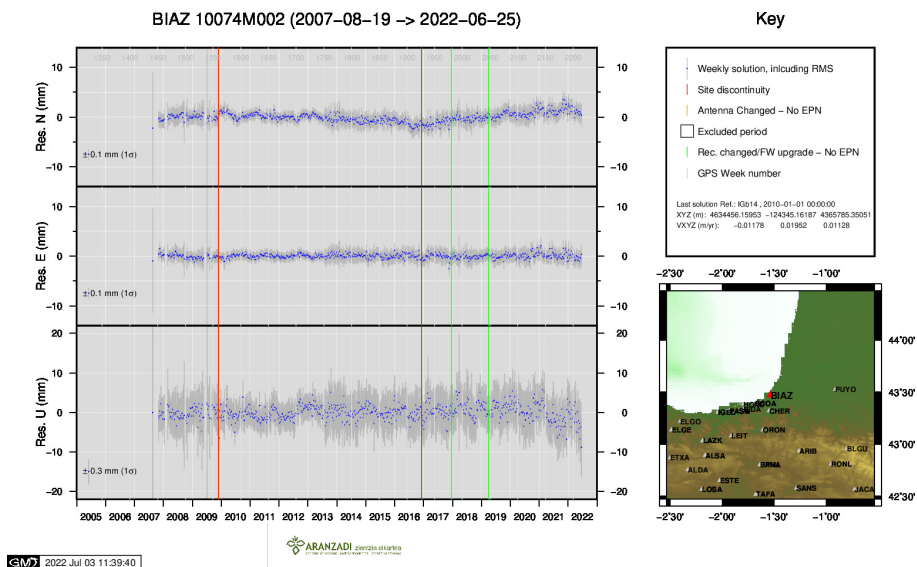
## 9 Cumulative Time Series

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

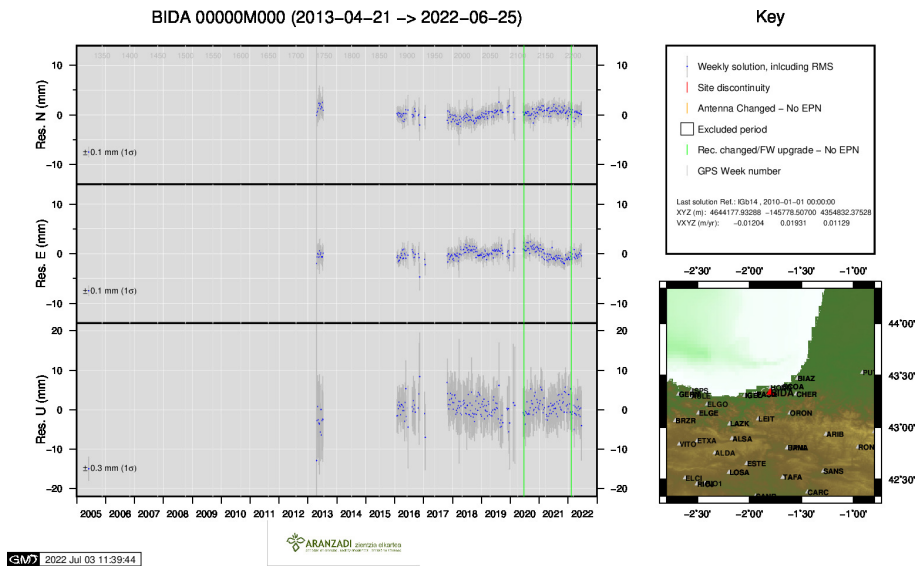




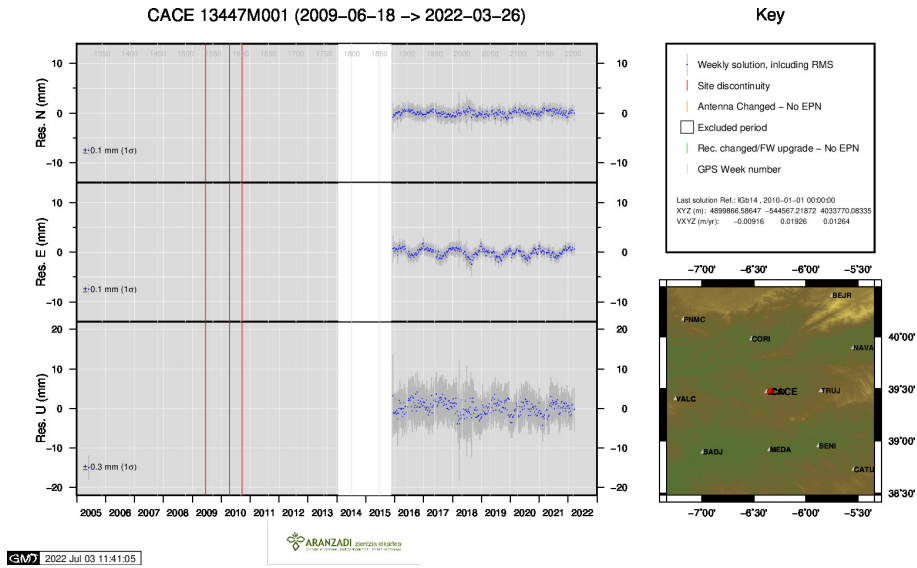
3 ) AMUR



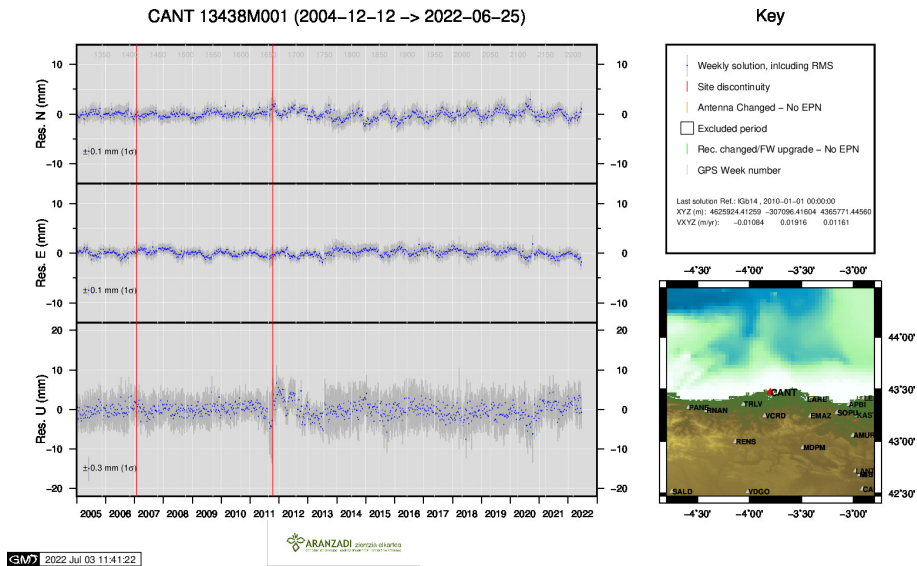
4 ) BIAZ



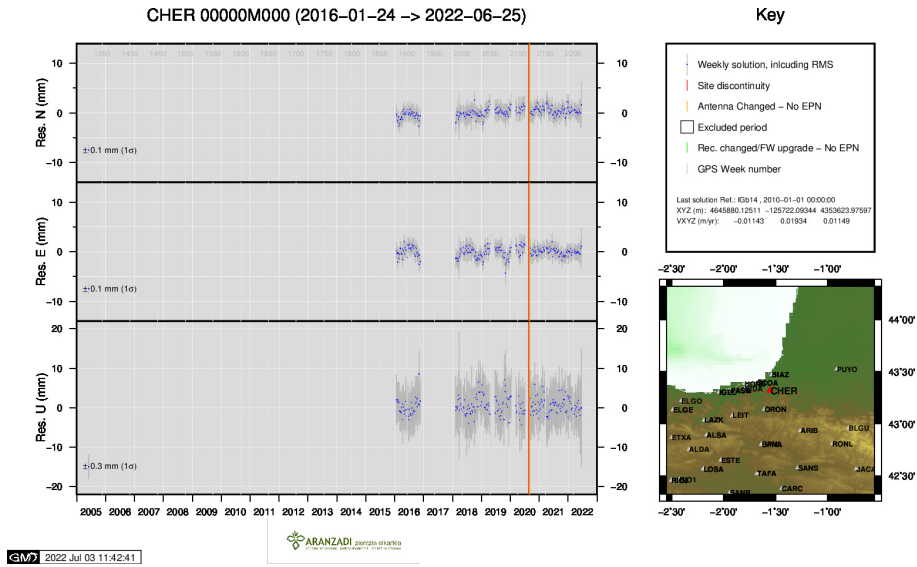
5 ) BIDA



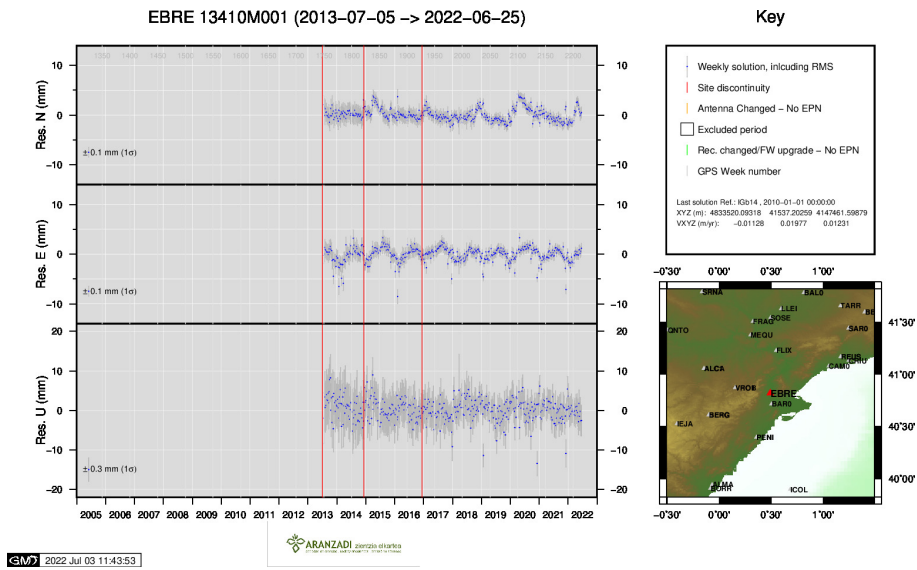
6 ) CACE



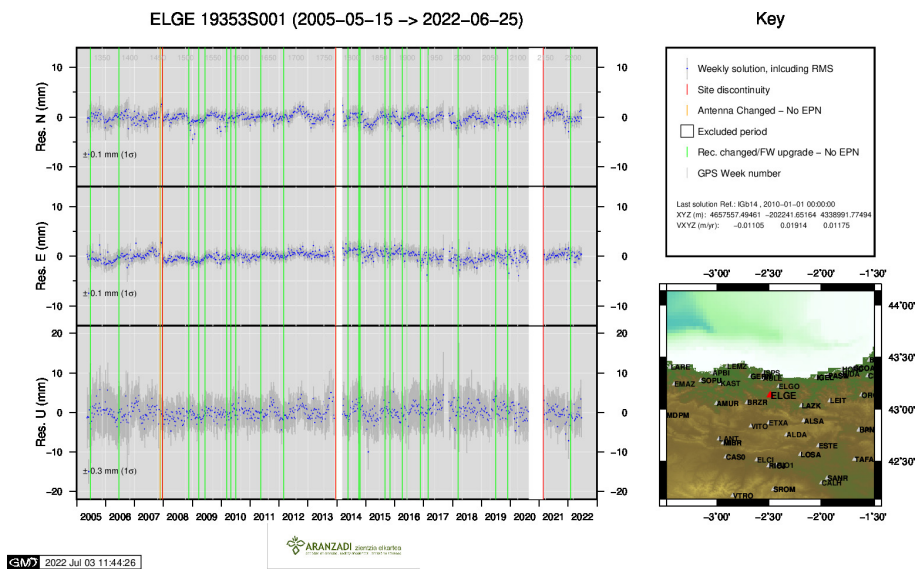
7 ) CANT



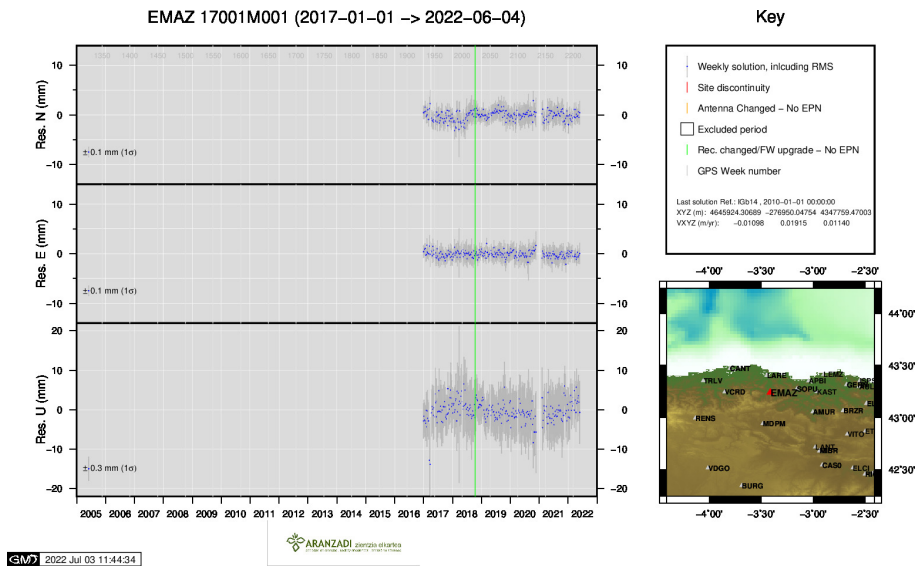
8 ) CHER



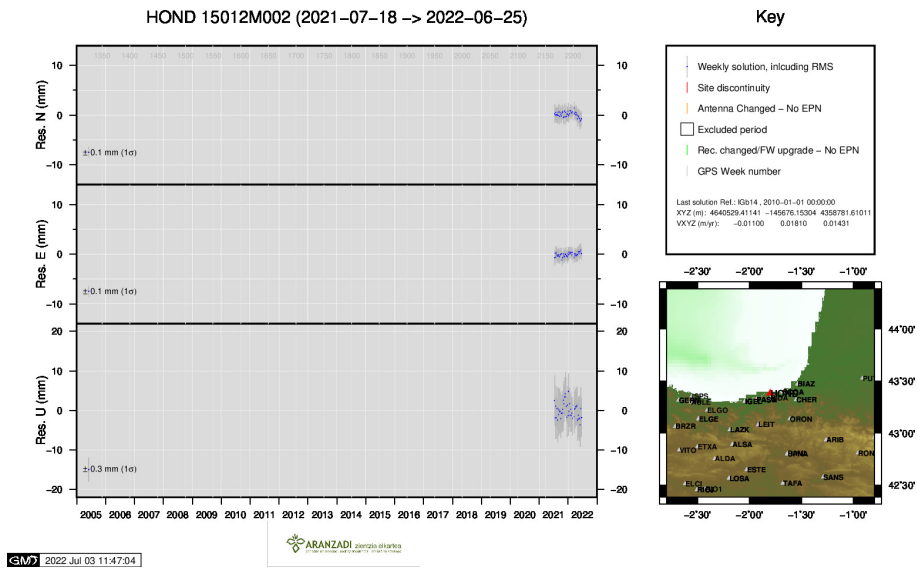
9 ) EBRE



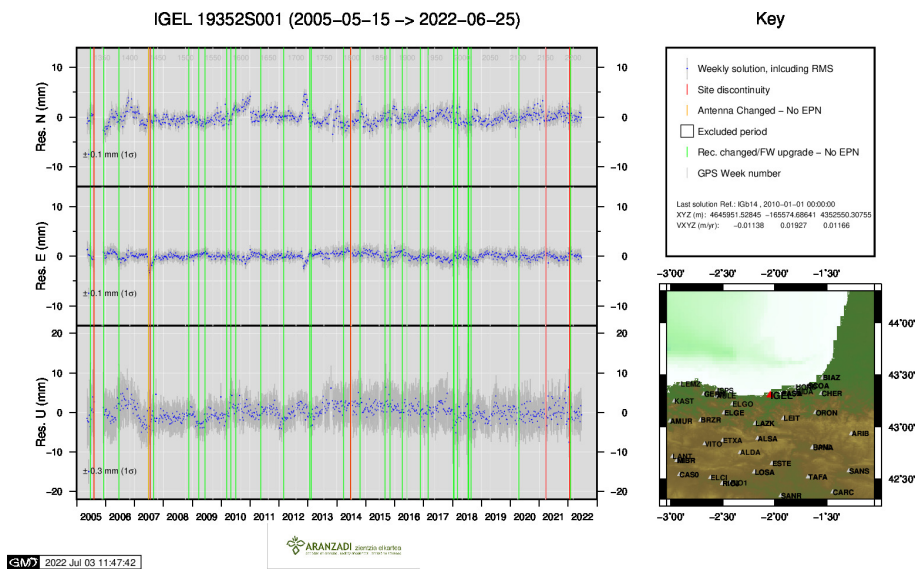
10 ) ELGE



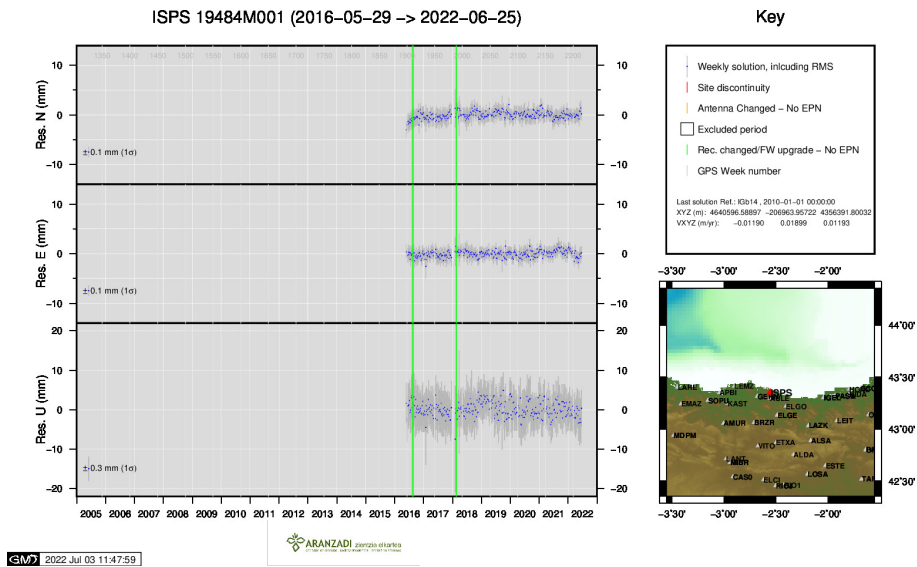
11 ) EMAZ



12 ) HOND

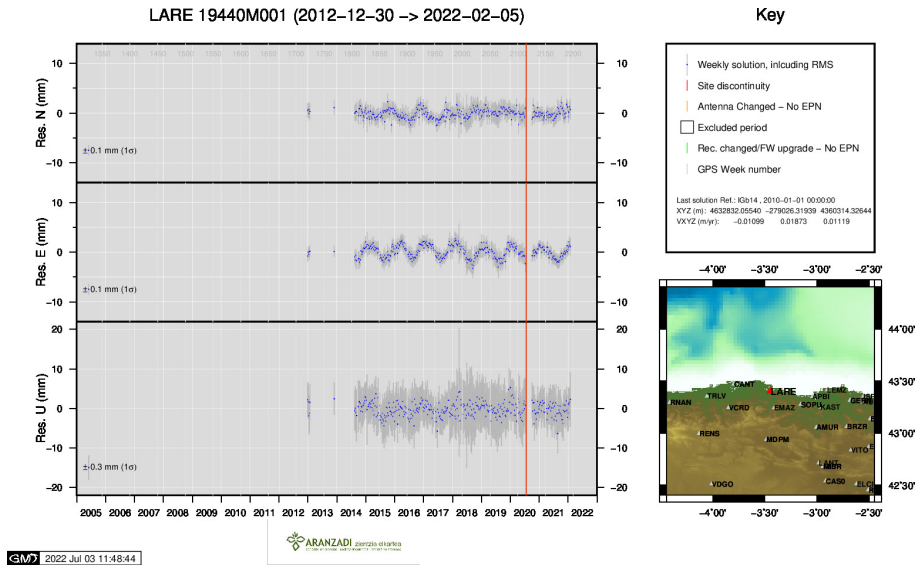


13 ) IGEL

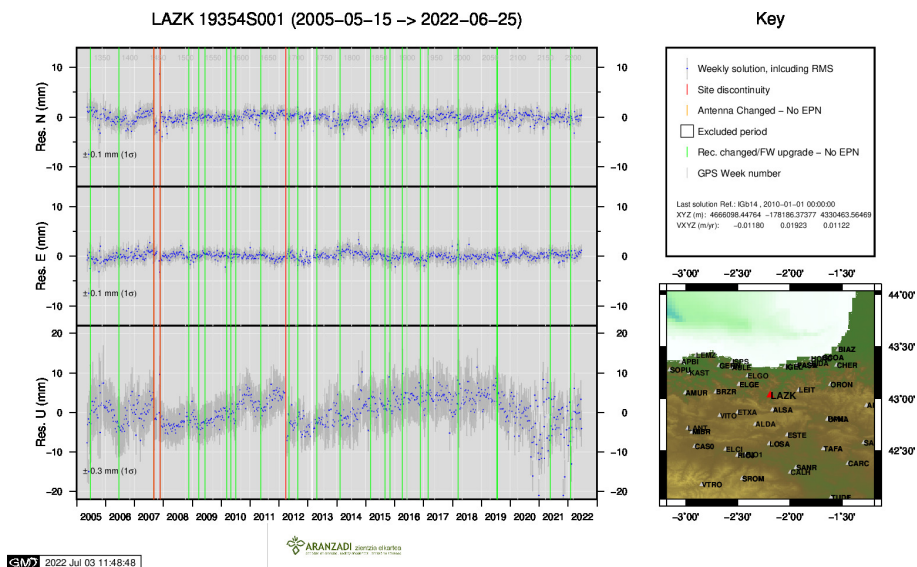


14 ) ISPS

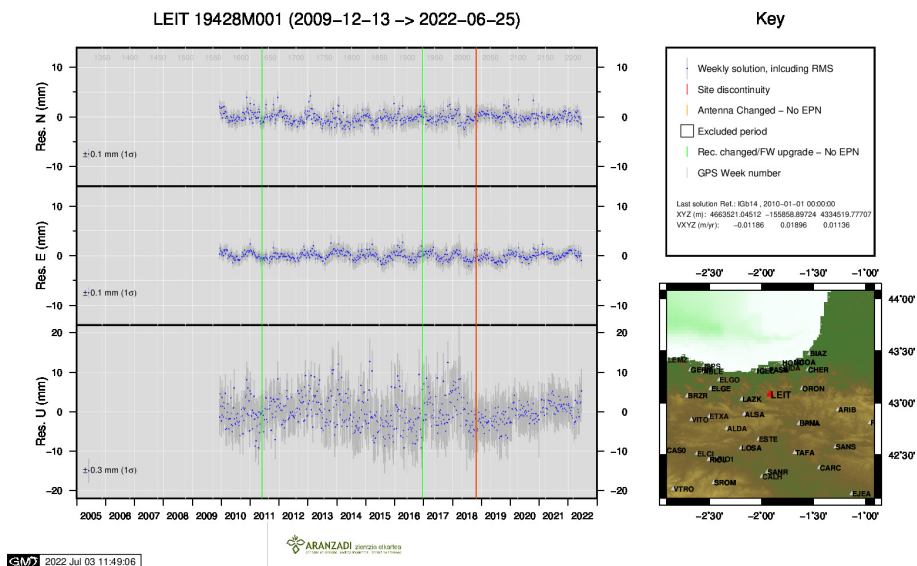




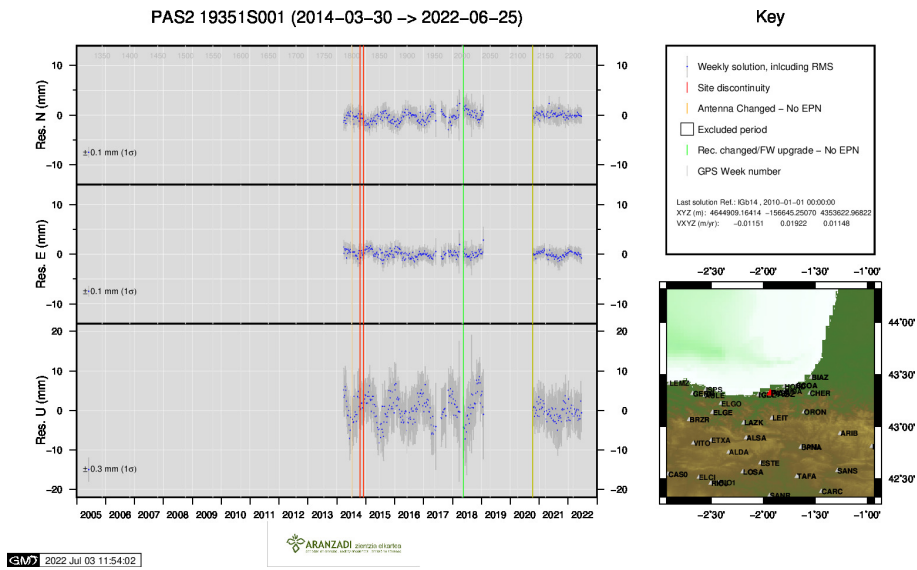
15 ) LARE



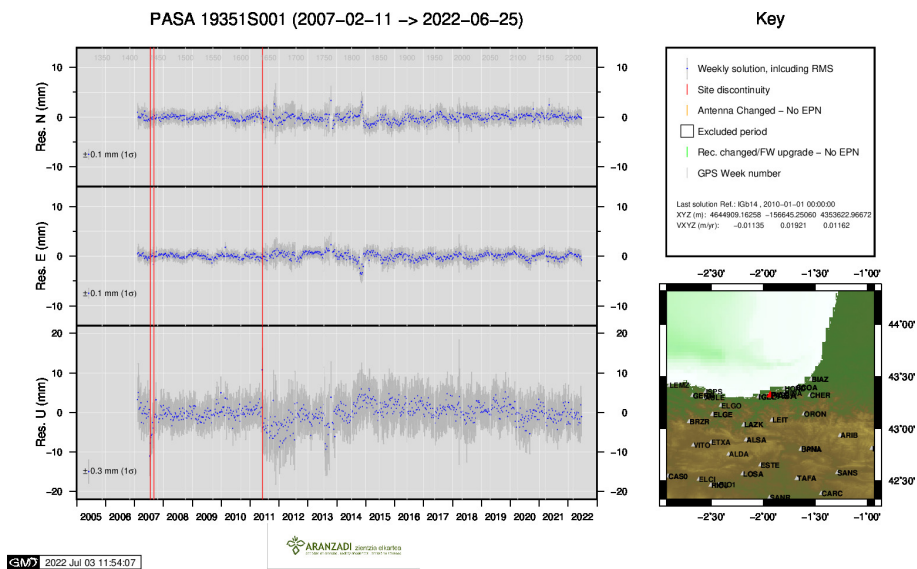
16 ) LAZK



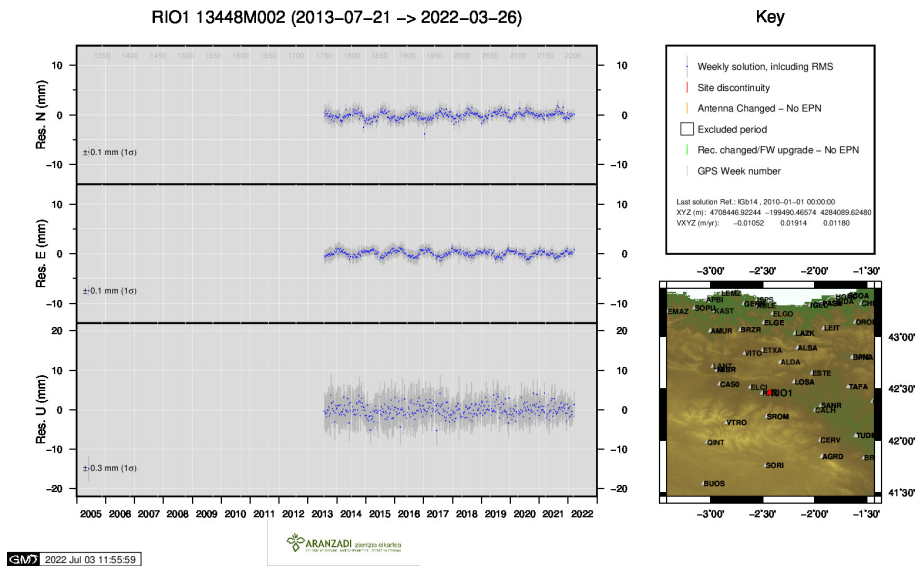
17 ) LEIT



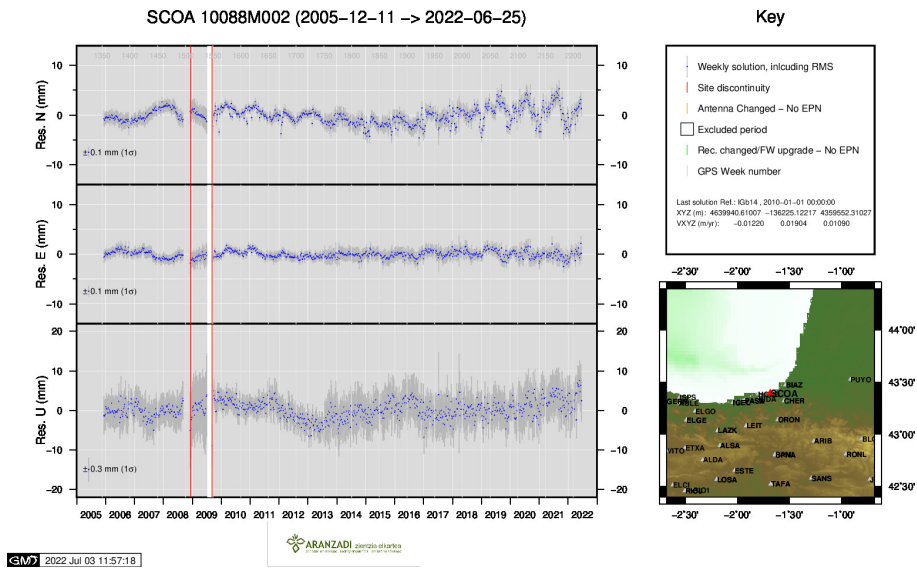
18 ) PAS2



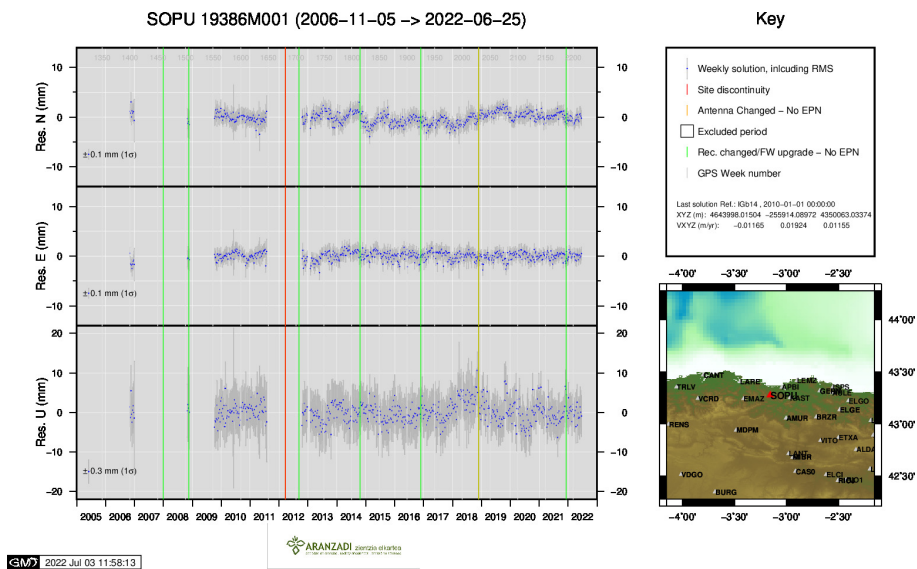
19 ) PASA



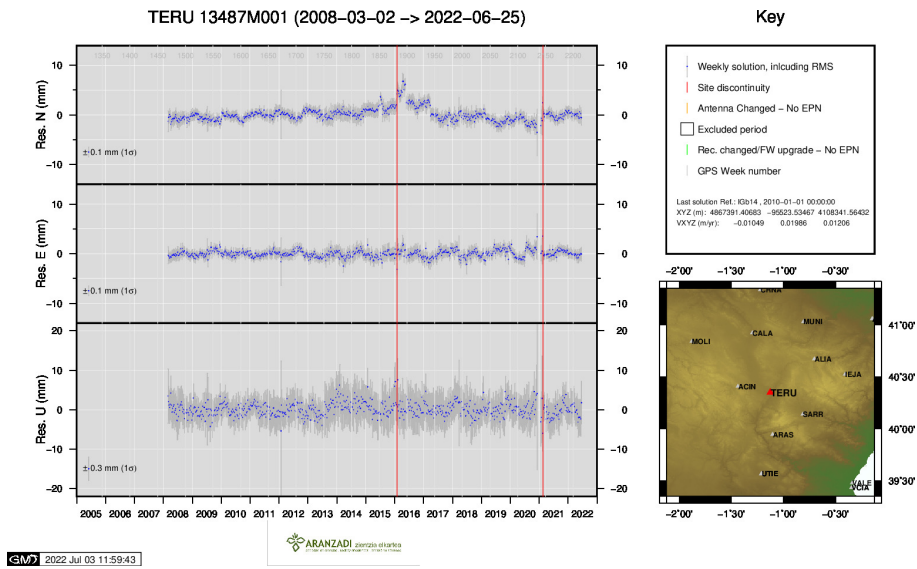
20 ) RIO1



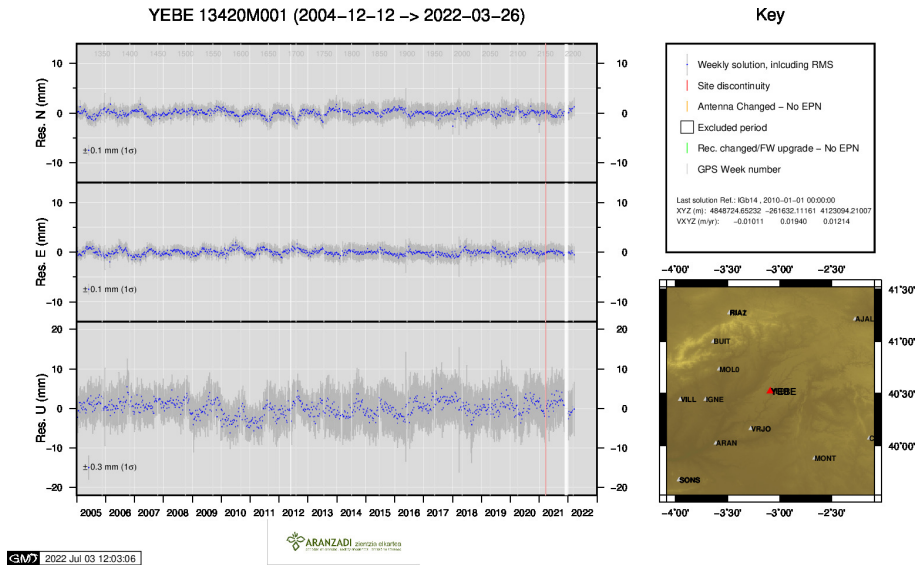
21 ) SCOA



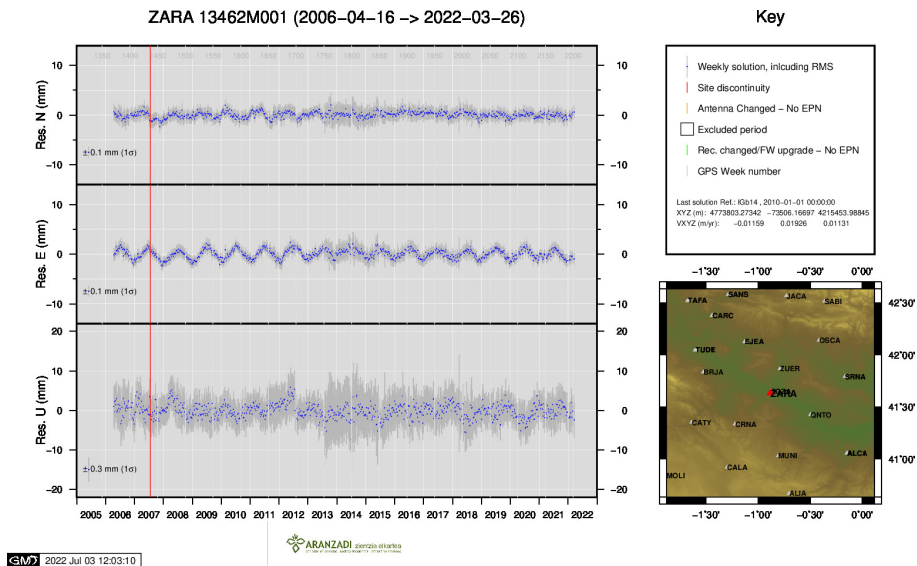
22 ) SOPU



23 ) TERU



24 ) YEBE



25 ) ZARA