ARA-DAC Weekly Analysis Result: 2216 (GFA)

Technical Report

GPS Week: 2216 (GFA)

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

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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

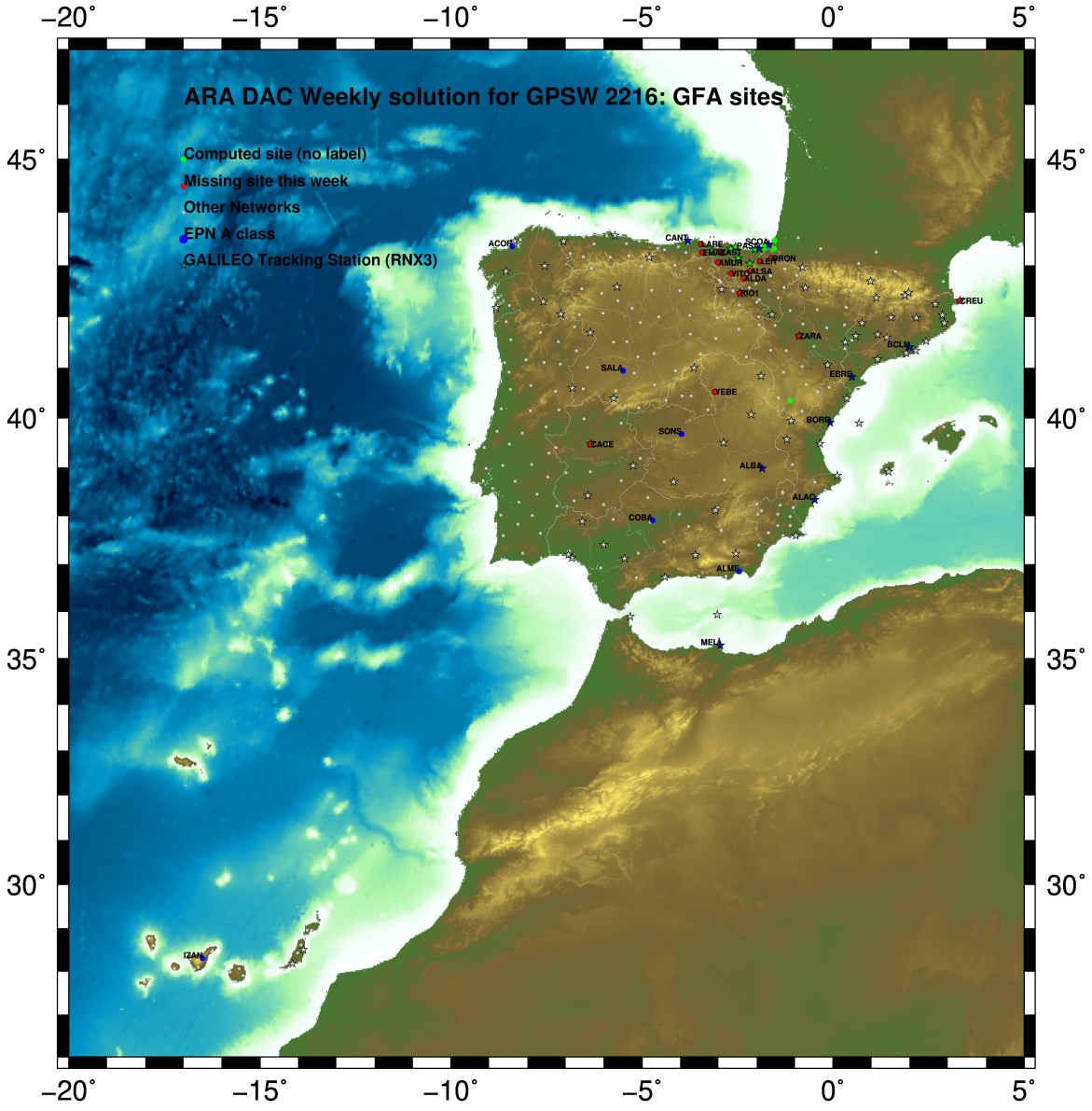


Fig.1: Computed Sites for GPS Week2216 (GFA)

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

5 Computed Coordinates

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

5.1 IGb14

The Reference Frame considered in this section is IGb14, release C2130.

```
ARA LAC 2216 WEEK FINAL COMBINATION: PRECISE ORBITS              17-JUL-22 00:13
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: IGb14              EPOCH: 2022-06-29 12:00:00

NUM  STATION NAME           X (M)          Y (M)          Z (M)     FLAG

  4  ACOR 13434M001    4594489.52527  -678367.38010  4357066.31827    W
100  BIAZ 10074M002    4634456.00808  -124344.91796  4365785.49108    A
101  BIDA 00000M000    4644177.78058  -145778.26530  4354832.51716    A
113  BRZR 19387M001    4662220.95470  -220769.84078  4333309.48009    A
116  CANT 13438M001    4625924.27703  -307096.17703  4365771.59185    W
154  CHER 00000M000    4645879.98352  -125721.85224  4353624.12320    A
204  EBRE 13410M001    4833519.95159    41537.45038  4147461.75256    W
180  ELGE 19353S001    4657557.35606  -202241.41136  4338991.92338    A
209  GERN 19389M001    4642811.27884  -217222.86639  4353278.91600    A
257  HOND 15012M002    4640529.27181  -145675.92542  4358781.78789    A
235  IGEL 19352S001    4645951.38431  -165574.44446  4352550.45341    A
240  ISPS 19484M001    4640596.43986  -206963.71799  4356391.95070    A
256  LAZK 19354S001    4666098.29848  -178186.13191  4330463.70509    A
345  PAS2 19351S001    4644909.01916  -156645.01012  4353623.11227    A
493  PASA 19351S001    4644909.01919  -156645.01007  4353623.11222    W
558  SALA 13469M001    4803054.45136  -462131.01229  4158379.11652    W
566  SCOA 10088M002    4639940.45889  -136224.88448  4359552.45231    W
418  SOPU 19386M001    4643997.86615  -255913.84812  4350063.17769    A
443  TERU 13487M001    4867391.27541   -95523.28644  4108341.71472    A
```

5.2 ETRF2000 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

```
ETRF2000 FINAL COORD. wk 2216                                    17-JUL-22 00:13
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2000           EPOCH: 2022-06-29 12:00:00

NUM  STATION NAME           X (M)          Y (M)          Z (M)     FLAG

  4  ACOR 13434M001    4594489.85671  -678367.97721  4357065.86117    W
100  BIAZ 10074M002    4634456.41160  -124345.51839  4365785.03811    A
101  BIDA 00000M000    4644178.18051  -145778.86691  4354832.06310    A
113  BRZR 19387M001    4662221.34334  -220770.44469  4333309.02353    A
116  CANT 13438M001    4625924.65702  -307096.77700  4365771.13716    W
154  CHER 00000M000    4645880.38594  -125722.45398  4353623.66926    A
204  EBRE 13410M001    4833520.35977    41536.82780  4147461.28517    W
180  ELGE 19353S001    4657557.74751  -202242.01468  4338991.46746    A
209  GERN 19389M001    4642811.66945  -217223.46805  4353278.46110    A
257  HOND 15012M002    4640529.67205  -145676.52661  4358781.33413    A
235  IGEL 19352S001    4645951.78152  -165575.04633  4352549.99894    A
240  ISPS 19484M001    4640596.83203  -206964.31937  4356391.49612    A
256  LAZK 19354S001    4666098.69238  -178186.73613  4330463.24877    A
345  PAS2 19351S001    4644909.41760  -156645.61184  4353622.65800    A
493  PASA 19351S001    4644909.41763  -156645.61179  4353622.65795    W
558  SALA 13469M001    4803054.79553  -462131.63285  4158378.64497    W
566  SCOA 10088M002    4639940.86041  -136225.48557  4359551.99873    W
418  SOPU 19386M001    4643998.25154  -255914.45003  4350062.72218    A
443  TERU 13487M001    4867391.66297   -95523.91334  4108341.24270    A
```

5.3 ETRF2014 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2014 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

```
ETRF2014 FINAL COORD. wk 2216                                    17-JUL-22 00:13
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2014           EPOCH: 2022-06-29 12:00:00

NUM  STATION NAME           X (M)          Y (M)          Z (M)     FLAG

  4  ACOR 13434M001    4594489.81614  -678368.01470  4357065.91275    W
100  BIAZ 10074M002    4634456.36897  -124345.55768  4365785.08976    A
101  BIDA 00000M000    4644178.13785  -145778.90608  4354832.11471    A
113  BRZR 19387M001    4662221.30073  -220770.48352  4333309.07505    A
116  CANT 13438M001    4625924.61507  -307096.81568  4365771.18874    W
154  CHER 00000M000    4645880.34319  -125722.49322  4353623.72088    A
204  EBRE 13410M001    4833520.31440    41536.78878  4147461.33637    W
180  ELGE 19353S001    4657557.70490  -202242.05360  4338991.51899    A
209  GERN 19389M001    4642811.62704  -217223.50698  4353278.51268    A
257  HOND 15012M002    4640529.62943  -145676.56580  4358781.38575    A
```

```
235  IGEL 19352S001    4645951.73890  -165575.08543  4352550.05053    A
240  ISPS 19484M001    4640596.78961  -206964.35835  4356391.54771    A
256  LAZK 19354S001    4666098.64959  -178186.77510  4330463.30030    A
345  PAS2 19351S001    4644909.37496  -156645.65098  4353622.70960    A
493  PASA 19351S001    4644909.37499  -156645.65093  4353622.70955    W
558  SALA 13469M001    4803054.75213  -462131.67023  4158378.69600    W
566  SCOA 10088M002    4639940.81776  -136225.52480  4359552.05035    W
418  SOPU 19386M001    4643998.20923  -255914.48882  4350062.77373    A
443  TERU 13487M001    4867391.61771   -95523.95173  4108341.29371    A
```

6 Quality Control

6.1 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repatabilities refer to the IGb14 solution and are given with respect to the Local frame (North-East-Up).

ARA LAC 2216 WEEK FINAL COMBINATION: PRECISE ORBITS 17-JUL-22 00:13

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	7	XXXXXXX	0.87	0.52	2.93
BIAZ 10074M002	6	XXXXX X	1.66	1.36	3.84
BIDA 00000M000	5	XXXXX	0.77	1.22	5.29
BRZR 19387M001	7	XXXXXXX	0.75	0.75	5.88
CANT 13438M001	7	XXXXXXX	0.58	0.41	3.12
CHER 00000M000	5	XX XX X	4.01	1.46	7.98
EBRE 13410M001	7	XXXXXXX	0.95	0.95	2.60
ELGE 19353S001	7	XXXXXXX	1.27	0.50	2.27
GERN 19389M001	7	XXXXXXX	0.54	0.59	3.59
HOND 15012M002	7	XXXXXXX	0.70	0.70	2.32
IGEL 19352S001	7	XXXXXXX	0.70	0.56	1.76
ISPS 19484M001	7	XXXXXXX	1.25	1.64	2.65
LAZK 19354S001	7	XXXXXXX	0.58	0.76	6.36
PAS2 19351S001	7	XXXXXXX	0.60	0.47	2.29
PASA 19351S001	5	XXXXX	0.78	0.49	2.01
SALA 13469M001	7	XXXXXXX	0.73	0.41	2.28
SCOA 10088M002	6	XXXXXX	1.72	2.02	4.73
SOPU 19386M001	7	XXXXXXX	1.00	0.78	6.70
TERU 13487M001	7	XXXXXXX	0.69	1.54	2.66

Comparison of individual solutions:

ACOR 13434M001	N	0.87	-0.15	-0.09	0.13	0.37	0.63	-1.72	-0.99
ACOR 13434M001	E	0.52	-0.17	-0.23	0.38	0.94	0.09	0.40	0.58
ACOR 13434M001	U	2.93	-3.49	-2.30	0.53	-3.88	1.24	1.70	3.78
BIAZ 10074M002	N	1.66	0.13	1.15	-3.08	-0.69	-1.27		0.91
BIAZ 10074M002	E	1.36	-1.28	1.97	0.99	-0.97	-1.29		-0.42
BIAZ 10074M002	U	3.84	2.86	0.46	4.30	-6.12	0.84		-2.93
BIDA 00000M000	N	0.77			-1.02	0.32	-0.74	0.67	0.50
BIDA 00000M000	E	1.22			1.91	-1.21	-0.78	0.21	-0.44
BIDA 00000M000	U	5.29			-6.48	1.60	4.01	-7.07	-1.07
BRZR 19387M001	N	0.75	-0.50	-1.06	0.41	0.09	0.07	0.17	1.33
BRZR 19387M001	E	0.75	1.11	-0.33	-0.44	0.38	-1.01	-0.51	-0.67
BRZR 19387M001	U	5.88	10.39	-0.73	-1.79	2.89	-6.02	-5.60	-4.48
CANT 13438M001	N	0.58	-0.48	0.18	0.32	0.64	-0.30	-0.44	0.98
CANT 13438M001	E	0.41	0.25	0.35	-0.27	0.13	-0.39	-0.52	-0.54
CANT 13438M001	U	3.12	1.55	1.60	3.73	-0.61	-1.93	5.53	2.21
CHER 00000M000	N	4.01	-1.24	-7.53		-0.75	-0.74		2.24
CHER 00000M000	E	1.46	-1.19	-1.52		-0.12	-2.17		0.33
CHER 00000M000	U	7.98	8.40	8.78		-9.77	-1.97		-2.72
EBRE 13410M001	N	0.95	-0.61	0.70	0.80	1.31	-0.83	-1.09	-0.59
EBRE 13410M001	E	0.95	-0.53	-2.02	-0.01	0.33	0.09	-0.03	0.94
EBRE 13410M001	U	2.60	-3.94	-0.41	2.36	-0.73	3.74	1.00	1.98
ELGE 19353S001	N	1.27	-1.67	-0.35	1.25	-0.94	-0.65	1.32	1.48
ELGE 19353S001	E	0.50	0.64	-0.39	-0.02	-0.30	-0.71	-0.52	-0.23
ELGE 19353S001	U	2.27	-1.09	-1.58	1.56	0.28	-3.87	-2.86	1.24
GERN 19389M001	N	0.54	0.47	-0.53	-0.55	0.32	0.59	0.68	0.24
GERN 19389M001	E	0.59	0.12	-0.56	-0.48	-0.96	-0.62	-0.37	0.23
GERN 19389M001	U	3.59	6.12	-1.55	-1.76	1.78	-3.88	-3.05	-2.58
HOND 15012M002	N	0.70	0.14	0.39	-0.04	-1.28	0.01	0.33	0.99
HOND 15012M002	E	0.70	0.81	-1.02	0.27	-0.37	-1.02	-0.09	-0.09
HOND 15012M002	U	2.32	0.82	0.31	1.11	-1.58	-4.57	-1.94	-1.76
IGEL 19352S001	N	0.70	-0.21	0.23	0.31	-0.62	-0.56	-0.00	1.42
IGEL 19352S001	E	0.56	0.25	-0.22	-0.45	0.38	-1.14	0.09	-0.32
IGEL 19352S001	U	1.76	0.75	0.20	-0.66	-0.20	-2.26	-2.97	-1.89
ISPS 19484M001	N	1.25	0.89	-0.04	-2.31	0.27	0.04	1.58	0.78
ISPS 19484M001	E	1.64	-1.44	0.60	-0.97	-2.52	-1.10	2.18	0.69
ISPS 19484M001	U	2.65	3.68	-0.40	0.28	-1.56	-3.42	-0.12	-3.79
LAZK 19354S001	N	0.58	-0.04	-0.06	0.62	-1.11	0.14	0.53	0.32
LAZK 19354S001	E	0.76	-0.52	0.81	0.15	0.01	0.00	-0.48	-1.50
LAZK 19354S001	U	6.36	-0.23	-5.72	8.56	-2.99	-10.31	-0.63	4.60
PAS2 19351S001	N	0.60	-0.29	-0.18	0.50	-0.93	0.37	0.16	0.89
PAS2 19351S001	E	0.47	0.30	0.32	-0.50	-0.32	-0.76	-0.08	-0.46
PAS2 19351S001	U	2.29	2.05	1.08	-1.38	-1.27	-3.60	-1.64	-2.61
PASA 19351S001	N	0.78			0.44	-1.00	0.34	0.46	0.97
PASA 19351S001	E	0.49			-0.54	-0.29	-0.67	-0.07	-0.34
PASA 19351S001	U	2.01			-0.79	-1.14	-2.58	-1.39	-2.36
SALA 13469M001	N	0.73	0.76	-0.60	0.94	0.21	-0.25	-0.75	-0.84
SALA 13469M001	E	0.41	0.47	0.34	0.44	-0.44	-0.45	0.28	-0.05
SALA 13469M001	U	2.28	-2.76	-0.61	0.90	0.86	3.15	-1.30	-3.15
SCOA 10088M002	N	1.72	-1.63	-1.74	1.72	1.32	-2.08	0.11	
SCOA 10088M002	E	2.02	-1.53	1.48	0.88	-1.54	-3.09	1.78	
SCOA 10088M002	U	4.73	4.88	-1.10	-0.59	-8.79	0.52	3.02	
SOPU 19386M001	N	1.00	-0.72	-0.24	-0.84	0.69	0.26	1.08	1.72
SOPU 19386M001	E	0.78	-0.21	0.07	0.54	-0.58	-1.62	0.28	0.51
SOPU 19386M001	U	6.70	-0.86	2.08	8.25	9.64	-5.95	3.38	-7.50
TERU 13487M001	N	0.69	-0.21	-1.02	0.01	0.17	1.27	0.23	0.30
TERU 13487M001	E	1.54	-0.05	-0.42	0.44	2.83	0.69	-2.31	-0.24
TERU 13487M001	U	2.66	1.39	-0.78	2.20	0.96	-5.81	0.02	0.48

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	-2.30	2.52	0.26
12	ALAC 13433M001	I W	0.79	-0.70	4.29
15	ALBA 13452M001	I W	1.93	-1.33	-5.66
21	ALME 13437M001	I W	-0.92	-0.20	5.65
47	BCLN 13412M001	I W	-0.14	-3.39	-0.46
71	BORR 13480M001	I W	0.05	-0.66	0.08
116	CANT 13438M001	I W	-1.47	0.89	-0.88
143	COBA 13453M001	I W	1.92	0.73	-0.58
204	EBRE 13410M001	I W	-1.15	0.01	0.35
316	IZAN 31309M002	I W	2.29	2.06	-0.55
432	MELI 19379M001	I W	3.99	-1.65	-1.00
493	PASA 19351S001	I W	-0.54	-1.06	0.17
558	SALA 13469M001	I W	0.68	0.92	-3.77
566	SCOA 10088M002	I W	-3.28	-0.23	-3.72
599	SONS 13446M001	I W	-1.84	2.11	5.81
	RMS / COMPONENT		1.96	1.59	3.24
	MEAN		-0.00	0.00	0.00
	MIN		-3.28	-3.39	-5.66
	MAX		3.99	2.52	5.81

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 45
RMS OF TRANSFORMATION : 2.37 MM

BARYCENTER COORDINATES:

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

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.61 MM
TRANSLATION IN E : -0.00 +- 0.61 MM
TRANSLATION IN U : -0.00 +- 0.61 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                       12984363
 NUMBER OF UNKNOWNS                             152201
 NUMBER OF DEGREES OF FREEDOM                 12832162
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                    2.008191133092962


 Helmert Transformation Parameters With Respect to Combined Solution:
 --------------------------------------------------------------------

                    Translation (m)             Rotation (")
Sol   Rms (m)      X       Y       Z         X       Y       Z     Scale (ppm)
-------------------------------------------------------------------------------
  1    0.00219    0.0198  0.0048 -0.0292   -0.0000  0.0011  0.0002    0.00034
  2    0.00198   -0.0212 -0.0457  0.0097    0.0011 -0.0007 -0.0011    0.00116
  3    0.00177   -0.0039  0.0238  0.0009   -0.0005 -0.0001  0.0006    0.00058
  4    0.00241   -0.0141 -0.0143  0.0179    0.0003 -0.0007 -0.0003   -0.00033
  5    0.00204   -0.0000 -0.0329  0.0034    0.0007 -0.0001 -0.0008   -0.00047
  6    0.00172   -0.0077 -0.0129  0.0121    0.0002 -0.0005 -0.0004   -0.00026
  7    0.00189    0.0021 -0.0046 -0.0057    0.0001  0.0002 -0.0001    0.00020


 Statistics of individual solutions:
 -----------------------------------

File     RMS (m)         DOF  Chi**2/DOF  #Observations authentic  / pseudo  #Parameters explicit  / implicit / singular
-------------------------------------------------------------------------------------------------------------------------
   1     0.00143     1847528        2.04                 1870995         3                  666       22804          0
   2     0.00142     1793409        2.03                 1815051         3                  636       21009          0
   3     0.00140     1815629        1.96                 1838173         3                  654       21893          0
   4     0.00144     1832058        2.07                 1854404         3                  657       21692          0
   5     0.00142     1849756        2.00                 1871929         3                  663       21513          0
   6     0.00135     1867521        1.83                 1889470         3                  651       21301          0
   7     0.00144     1822379        2.08                 1844341         3                  651       21314          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 22:177:00000 22:183:86370 LEICA GR50           ----- -----------
 BIAZ  A    1 P 22:177:00000 22:183:86370 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 22:179:00000 22:183:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 CANT  A    1 P 22:177:00000 22:183:86370 LEICA GR10           ----- -----------
 CHER  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 EBRE  A    1 P 22:177:00000 22:183:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 HOND  A    1 P 22:177:00000 22:183:86370 LEICA GR50           ----- -----------
 IGEL  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 22:177:00000 22:183:86370 TRIMBLE NETR9        ----- -----------
 LAZK  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 PAS2  A    1 P 22:177:00030 22:183:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 22:179:00000 22:183:86370 LEICA GR30           ----- -----------
 SALA  A    1 P 22:177:00000 22:183:86370 LEICA GR50           ----- -----------
 SCOA  A    1 P 22:177:00000 22:182:86370 LEICA GR50           ----- -----------
 SOPU  A    1 P 22:177:00000 22:183:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 22:177:00000 22:183:86370 LEICA GR50           ----- -----------
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are vailable.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__
 ACOR  A    1 P 22:177:00000 22:183:86370 LEIAT504        LEIS -----
 BIAZ  A    1 P 22:177:00000 22:183:86370 LEIAR25         LEIT -----
 BIDA  A    1 P 22:179:00000 22:183:86370 LEIAS10         NONE -----
 BRZR  A    1 P 22:177:00000 22:183:86370 LEIAS10         NONE -----
 CANT  A    1 P 22:177:00000 22:183:86370 LEIAR25.R4      LEIT 25066
 CHER  A    1 P 22:177:00000 22:183:86370 LEIAR10         NONE -----
 EBRE  A    1 P 22:177:00000 22:183:86370 LEIAR25.R4      NONE 26359
 ELGE  A    1 P 22:177:00000 22:183:86370 LEIAR25.R4      LEIT -----
 GERN  A    1 P 22:177:00000 22:183:86370 LEIAS10         NONE -----
 HOND  A    1 P 22:177:00000 22:183:86370 LEIAR20         LEIM 41012
 IGEL  A    1 P 22:177:00000 22:183:86370 LEIAR20         LEIM 43011
 ISPS  A    1 P 22:177:00000 22:183:86370 TRM59900.00     SCIS -----
 LAZK  A    1 P 22:177:00000 22:183:86370 LEIAR25.R4      LEIT -----
 PAS2  A    1 P 22:177:00030 22:183:86370 LEIAR20         LEIM 73034
 PASA  A    1 P 22:179:00000 22:183:86370 LEIAR20         LEIM 73034
 SALA  A    1 P 22:177:00000 22:183:86370 LEIAR25         NONE -----
 SCOA  A    1 P 22:177:00000 22:182:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 22:177:00000 22:183:86370 LEIAS10         NONE -----
 TERU  A    1 P 22:177:00000 22:183:86370 LEIAR20         LEIM 49044
```

7.3 Eccentricities

*SITE	PT	SOLN	T	DATA_START__	DATA_END____	AXE	UP_____ ARP->BENCHMARK(M)_____	NORTH___	EAST____
ACOR	A	1	P	22:177:00000	22:183:86370	UNE	3.0460	0.0000	0.0000
BIAZ	A	1	P	22:177:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
BIDA	A	1	P	22:179:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	22:177:00000	22:183:86370	UNE	0.0771	0.0000	0.0000
CANT	A	1	P	22:177:00000	22:183:86370	UNE	3.0490	0.0000	0.0000
CHER	A	1	P	22:177:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
EBRE	A	1	P	22:177:00000	22:183:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	22:177:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
GERN	A	1	P	22:177:00000	22:183:86370	UNE	0.0771	0.0000	0.0000
HOND	A	1	P	22:177:00000	22:183:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	22:177:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	22:177:00000	22:183:86370	UNE	0.0350	0.0000	0.0000
LAZK	A	1	P	22:177:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
PAS2	A	1	P	22:177:00030	22:183:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	22:179:00000	22:183:86370	UNE	0.0000	0.0000	0.0000
SALA	A	1	P	22:177:00000	22:183:86370	UNE	0.0600	0.0000	0.0000
SCOA	A	1	P	22:177:00000	22:182:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	22:177:00000	22:183:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	22:177:00000	22:183:86370	UNE	0.0600	0.0000	0.0000

8 References

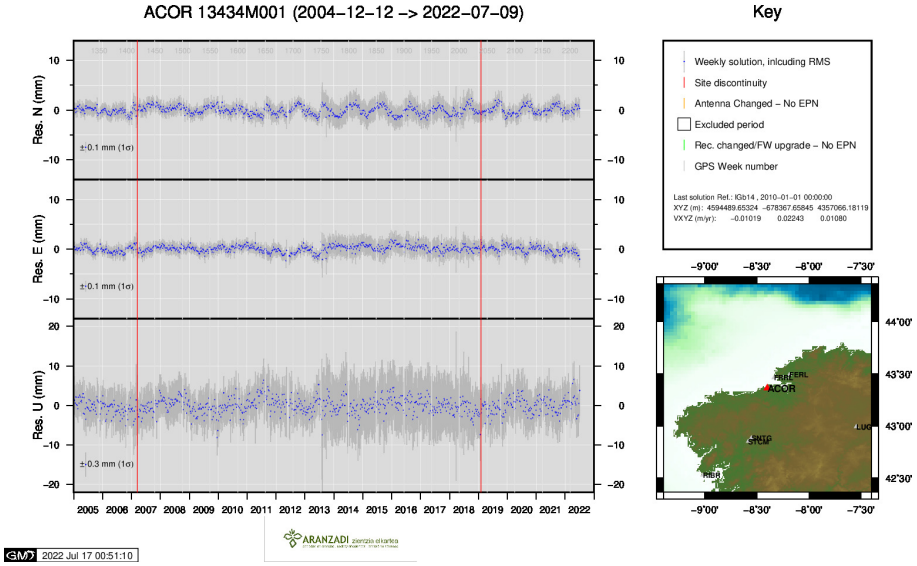
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres.* epncb.oma.be/$_d$*ocumentation/guidelines/guidelines*$_a$*nalysis*$_c$*entres.pdf*

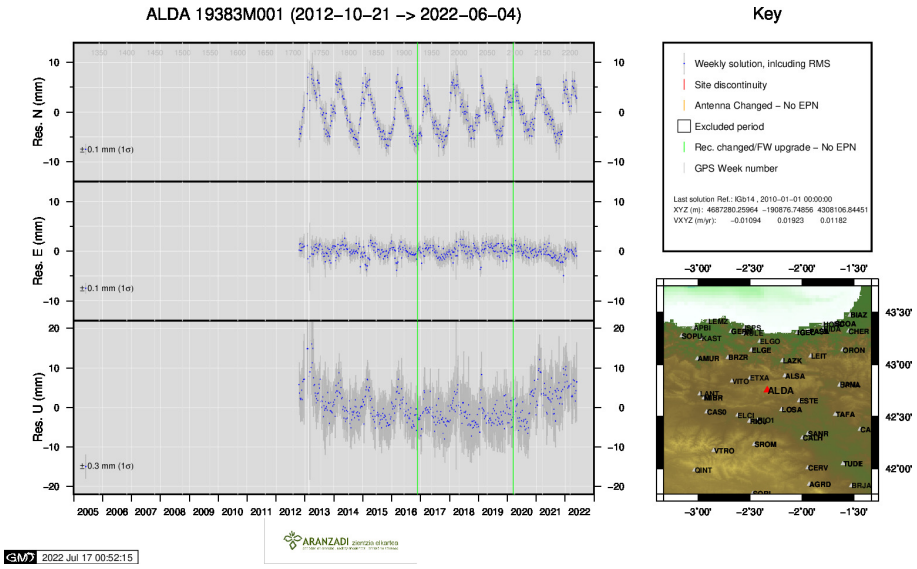
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

9 Cumulative Time Series

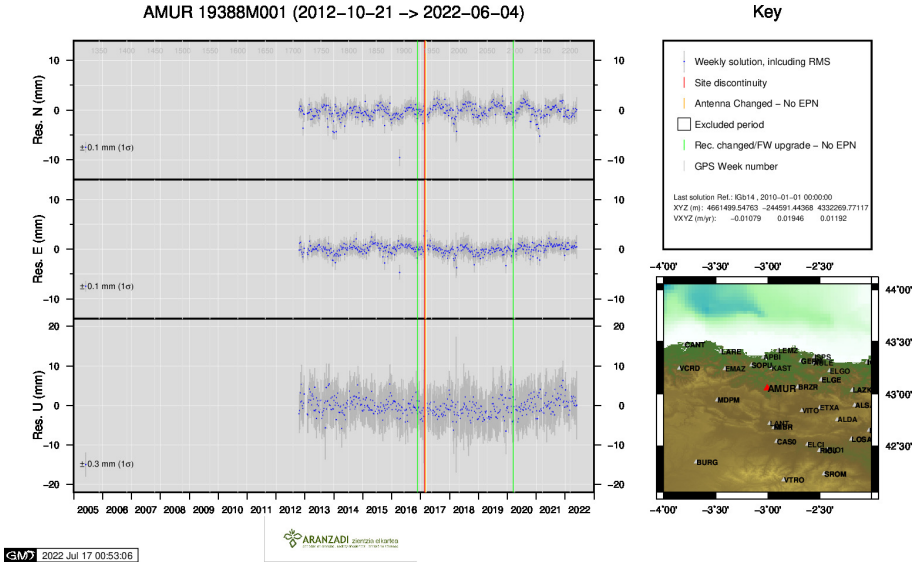
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



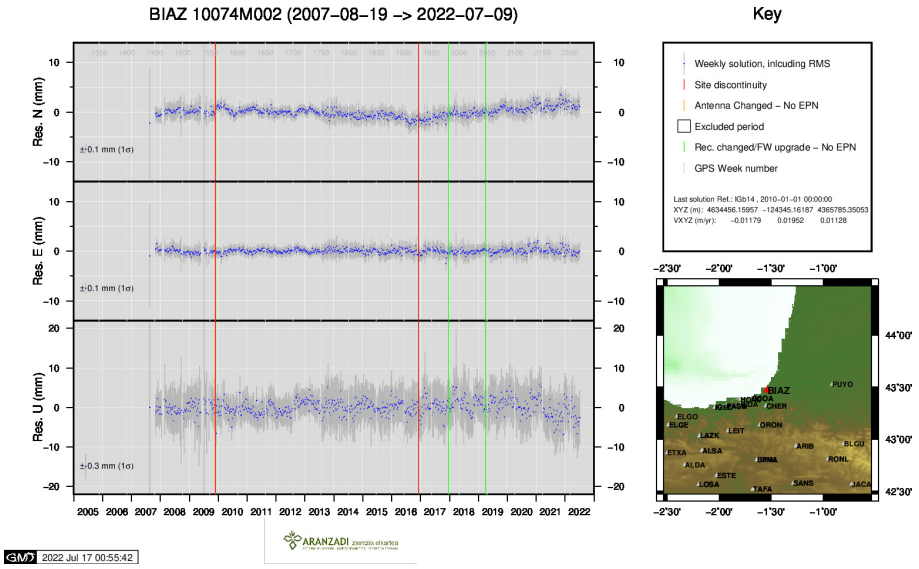
1) ACOR



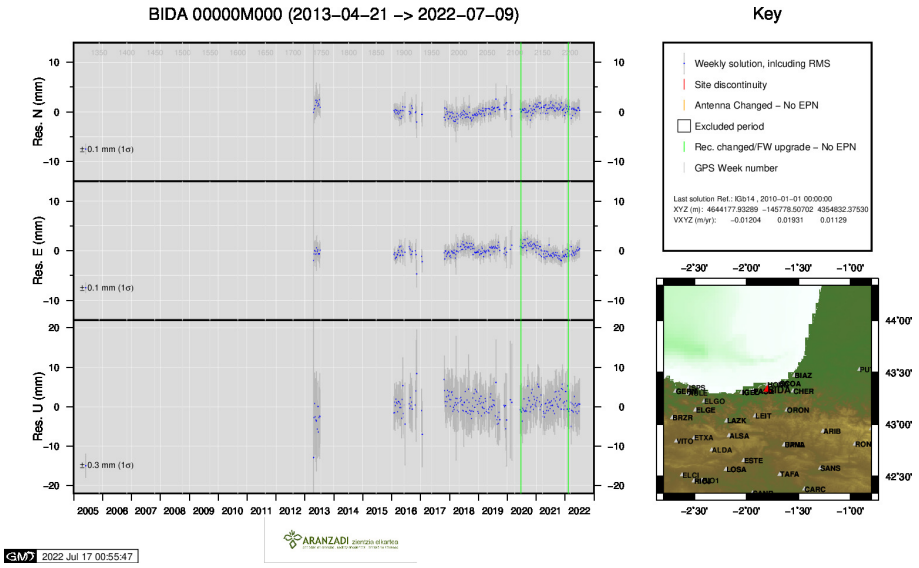
2) ALDA



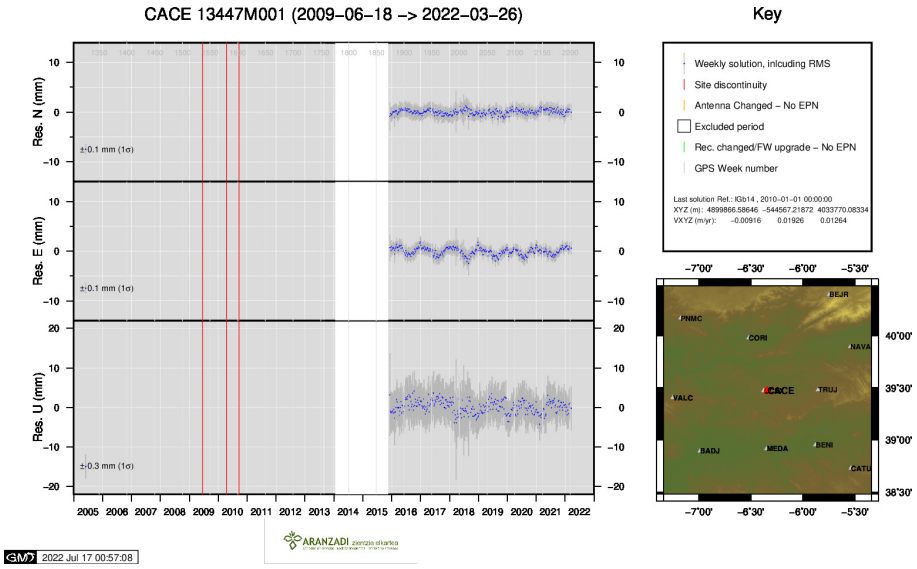
3) AMUR



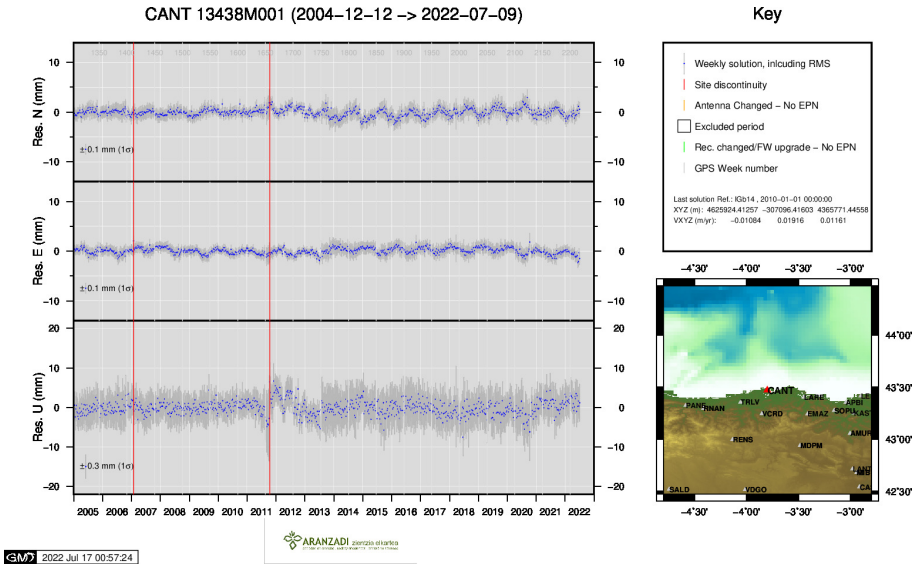
4) BIAZ



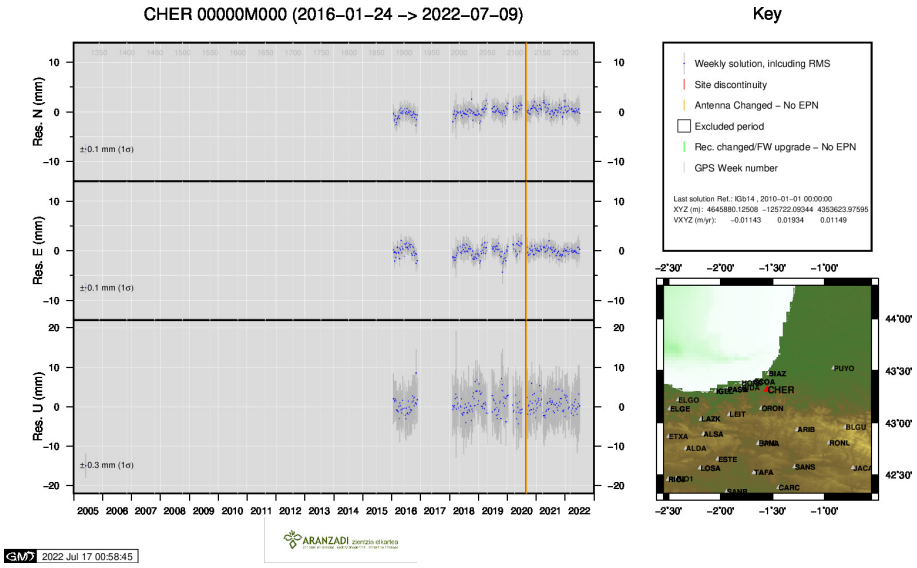
5) BIDA



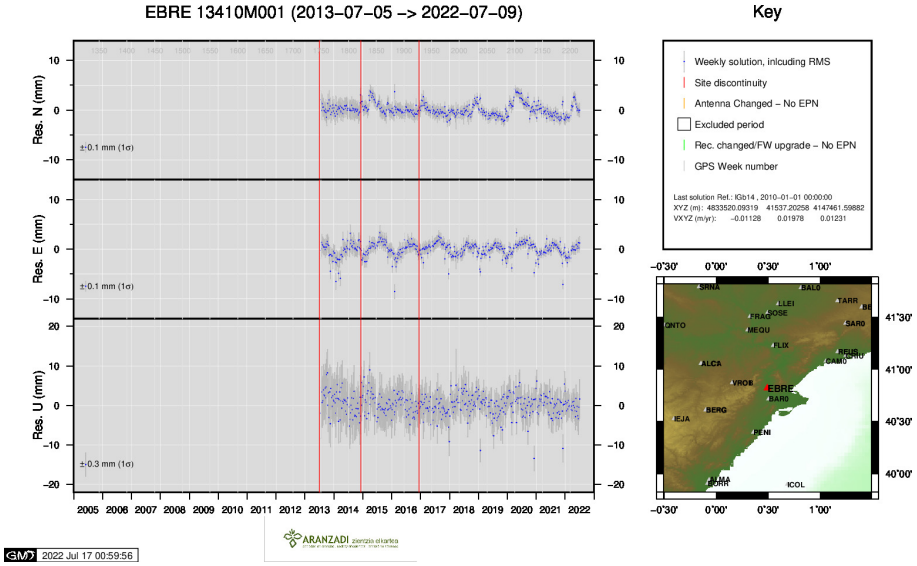
6) CACE



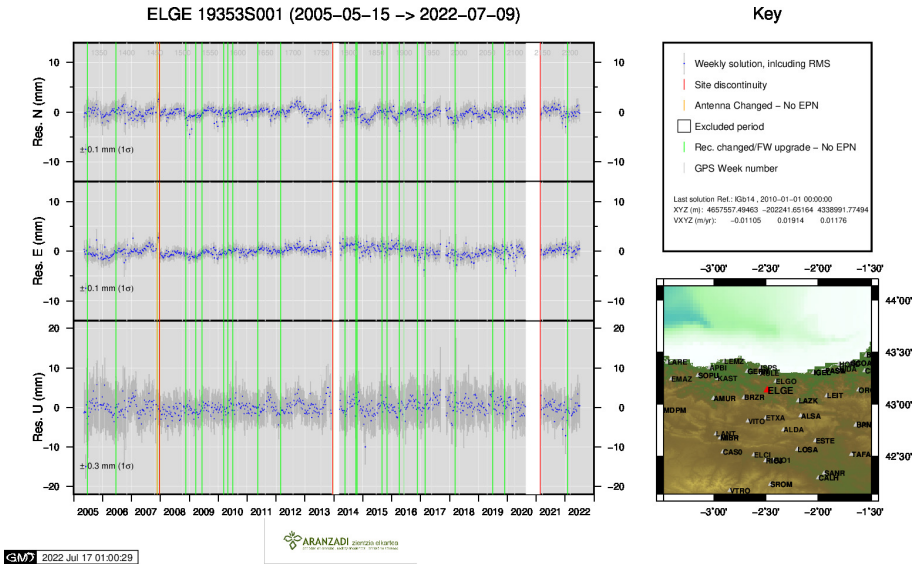
7) CANT



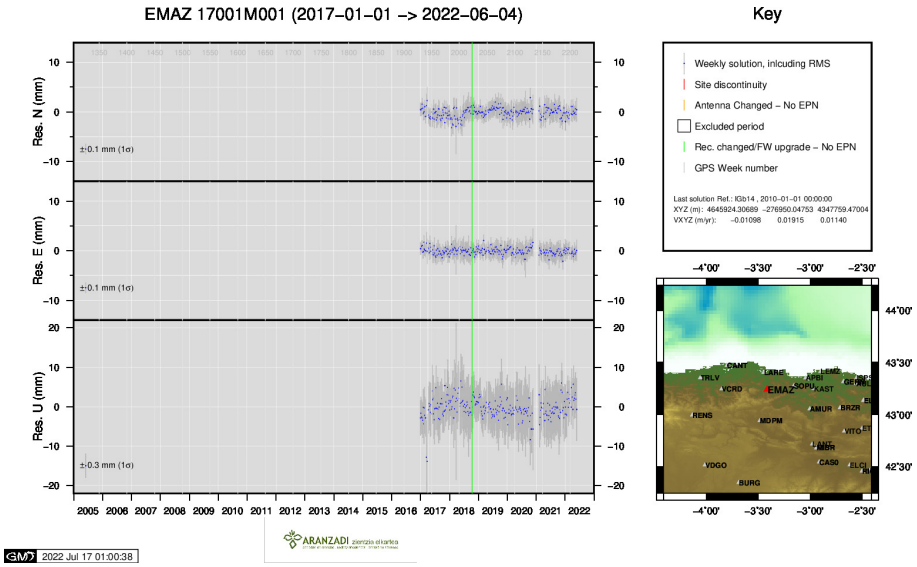
8) CHER



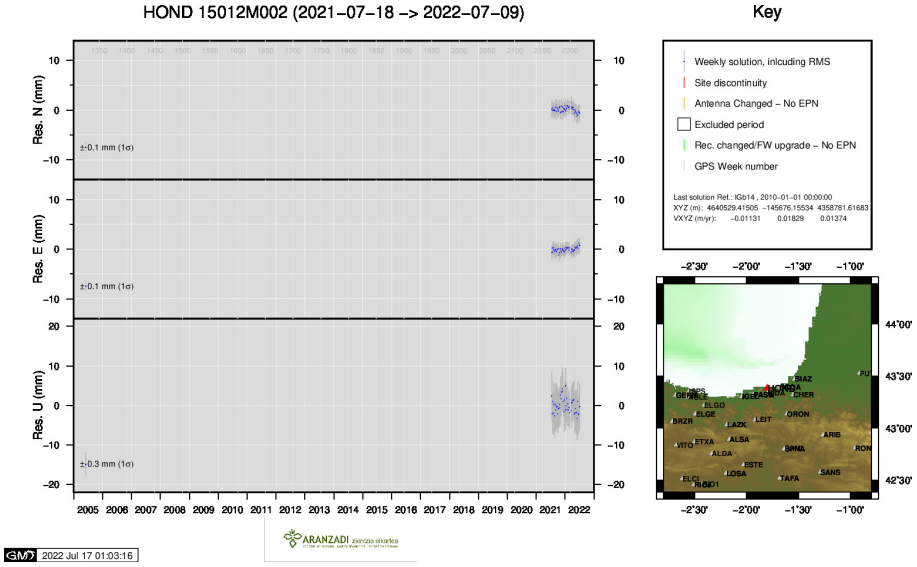
9) EBRE



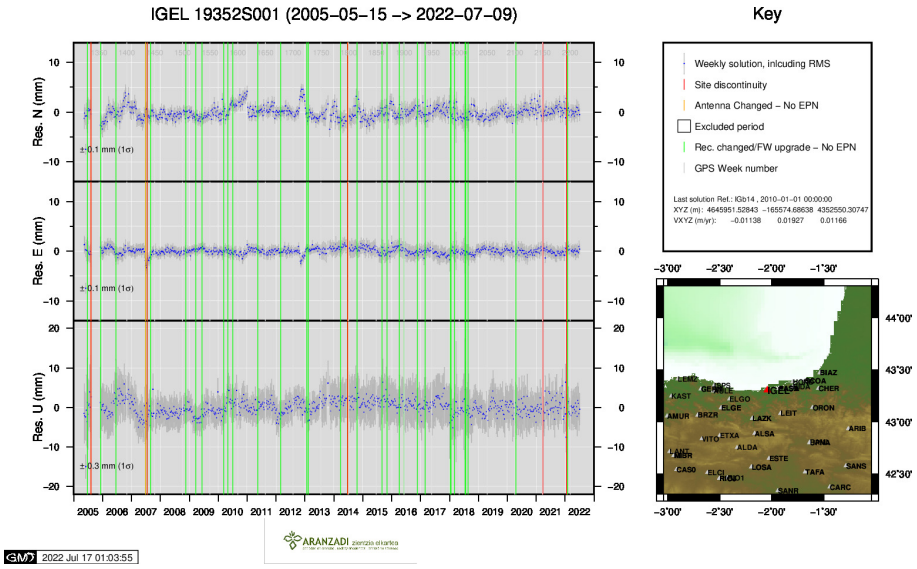
10) ELGE



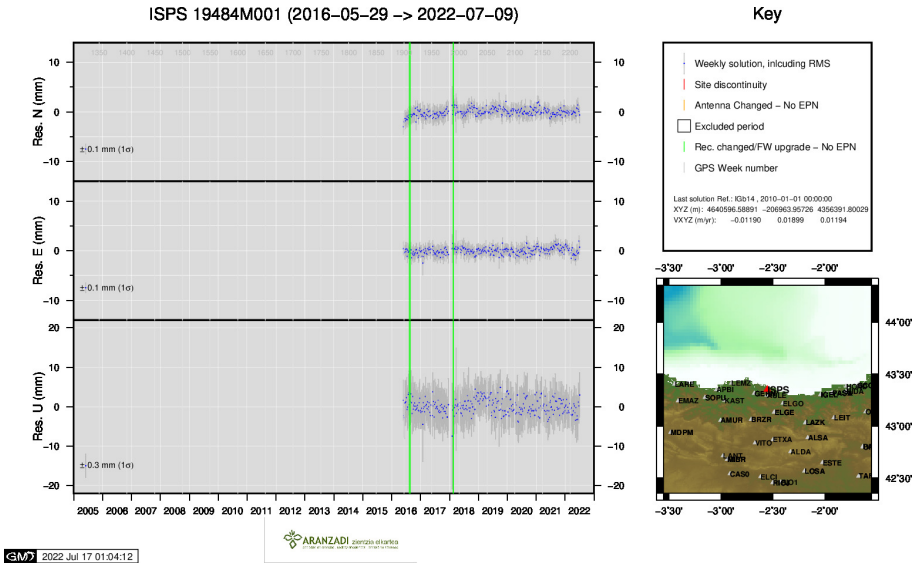
11) EMAZ



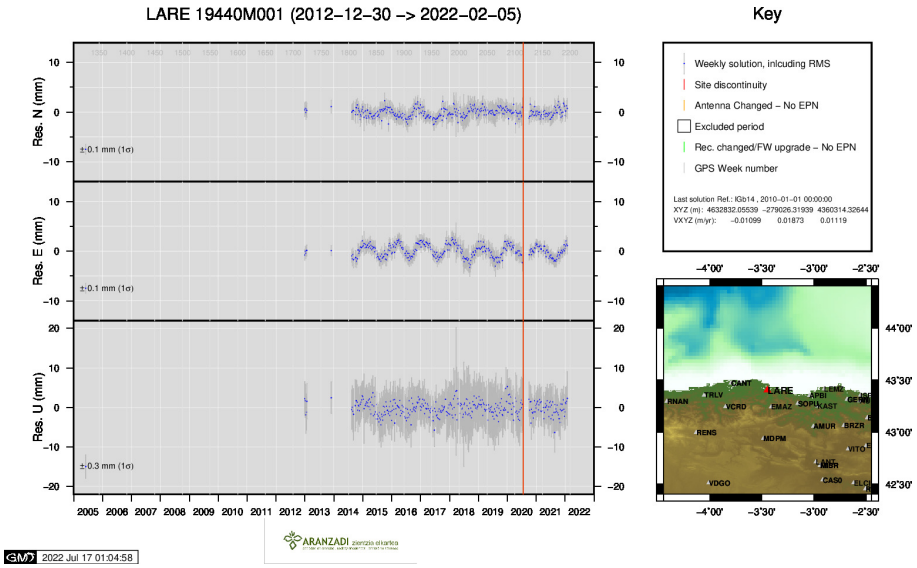
12) HOND



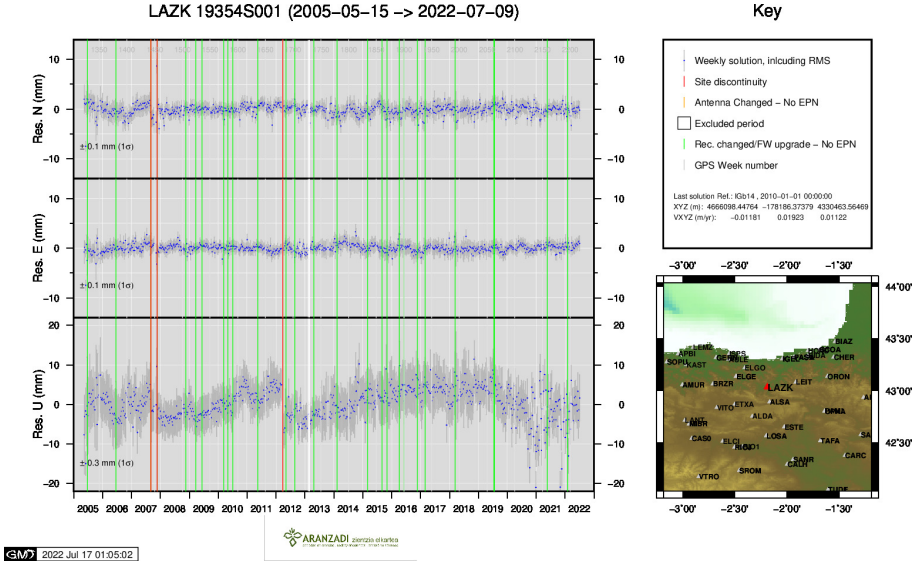
13) IGEL



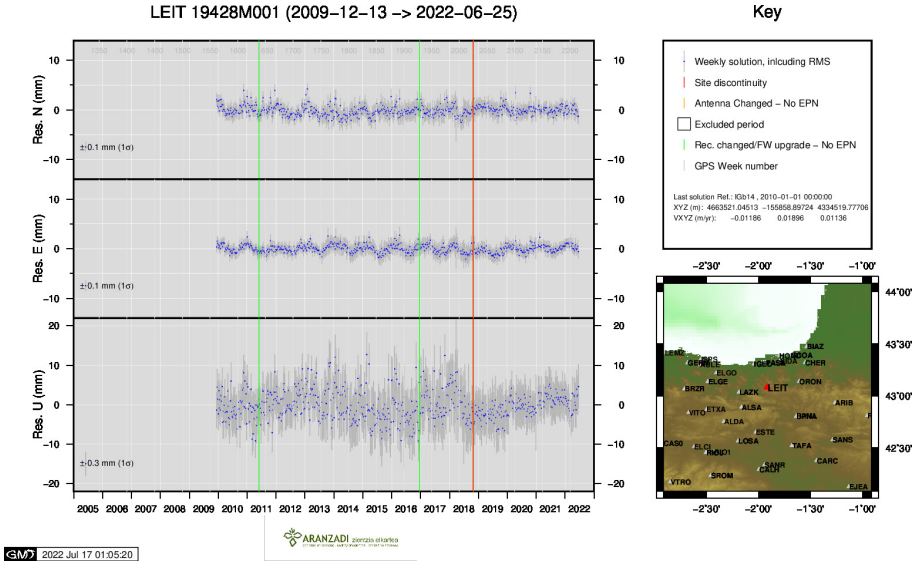
14) ISPS



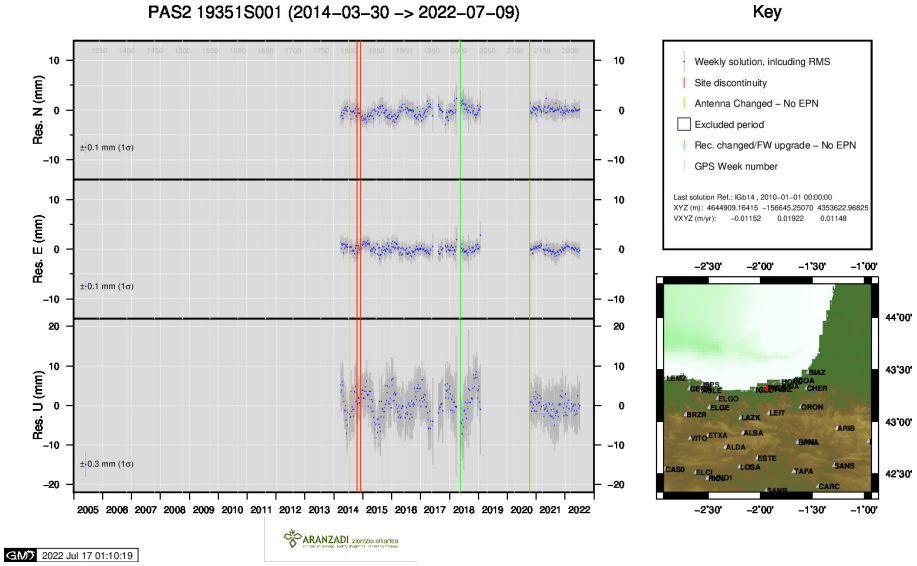
15) LARE



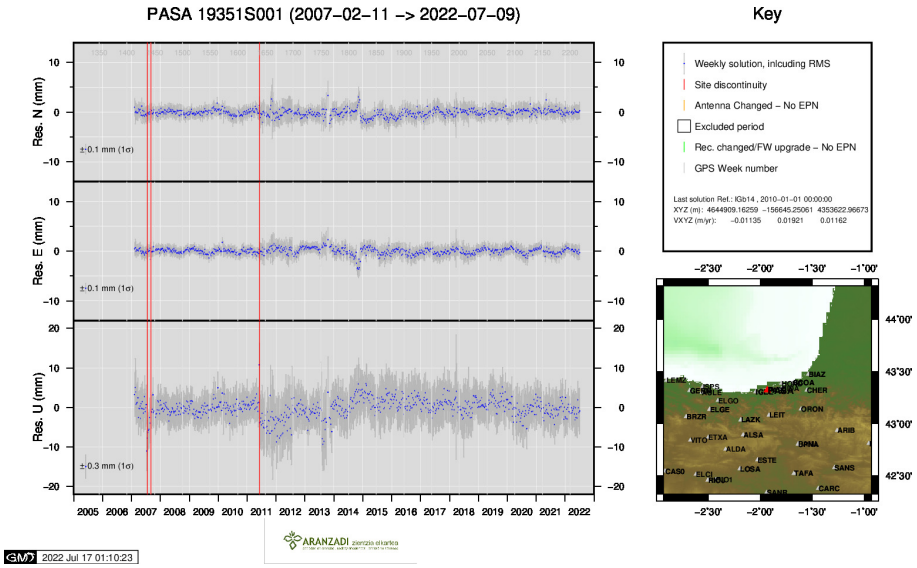
16) LAZK



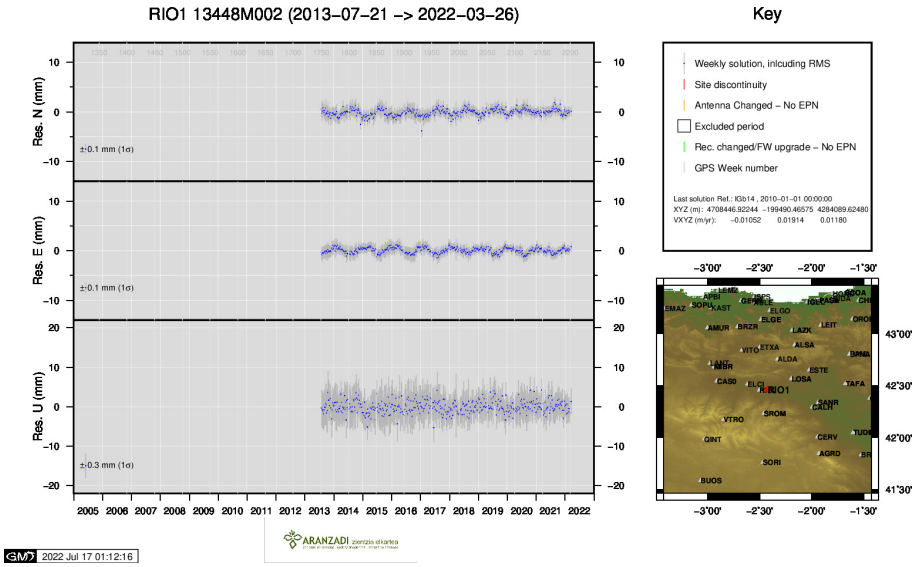
17) LEIT



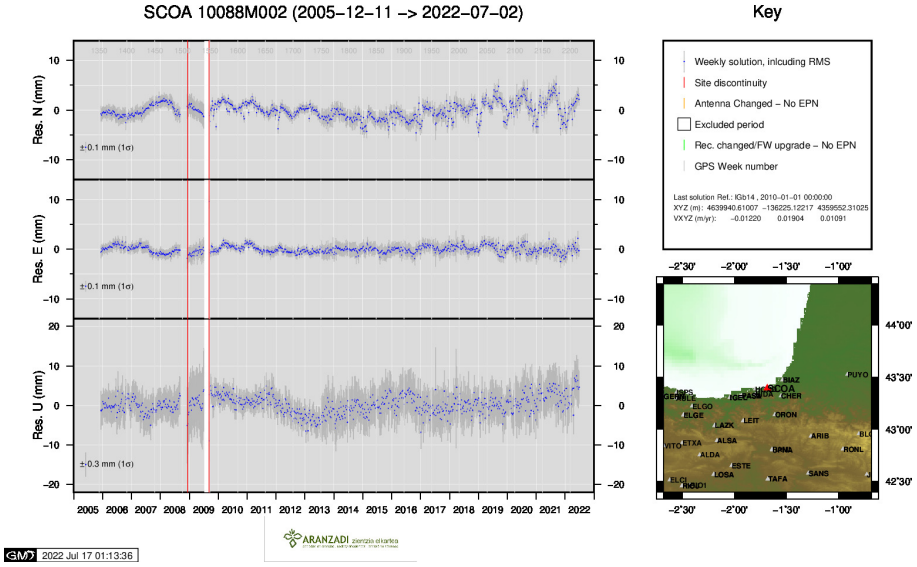
18) PAS2



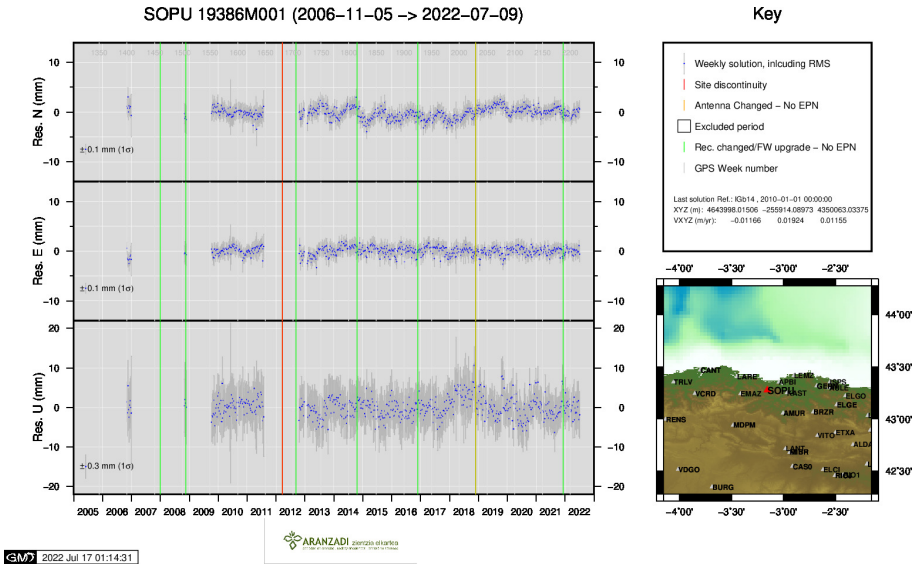
19) PASA



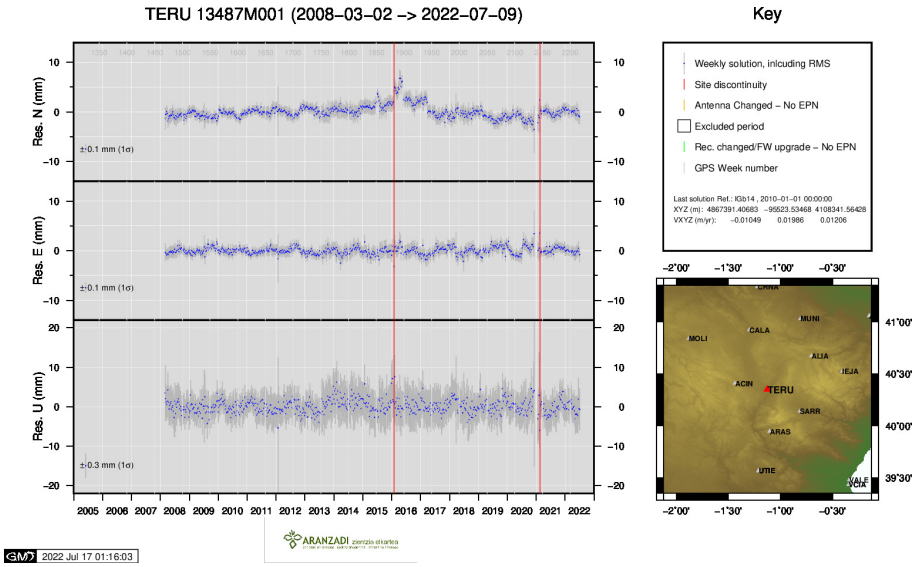
20) RIO1



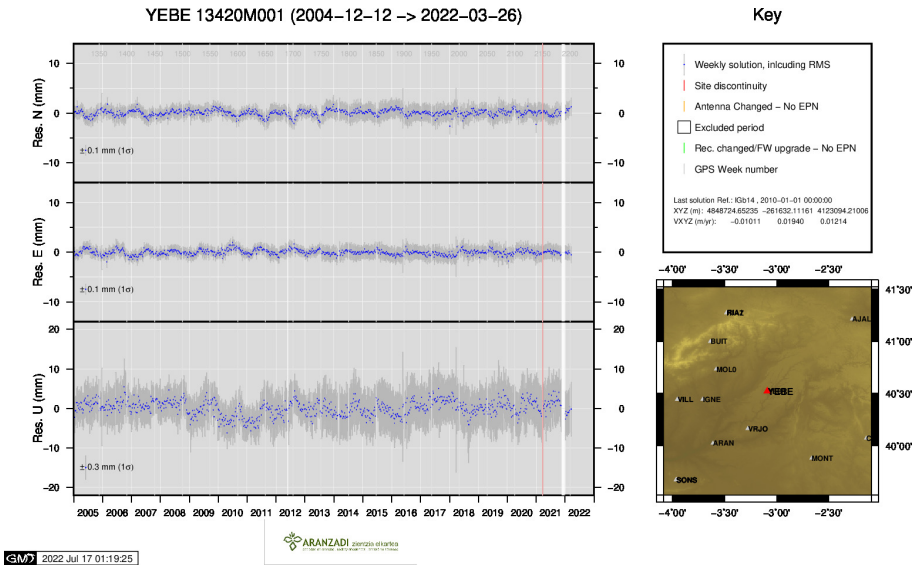
21) SCOA



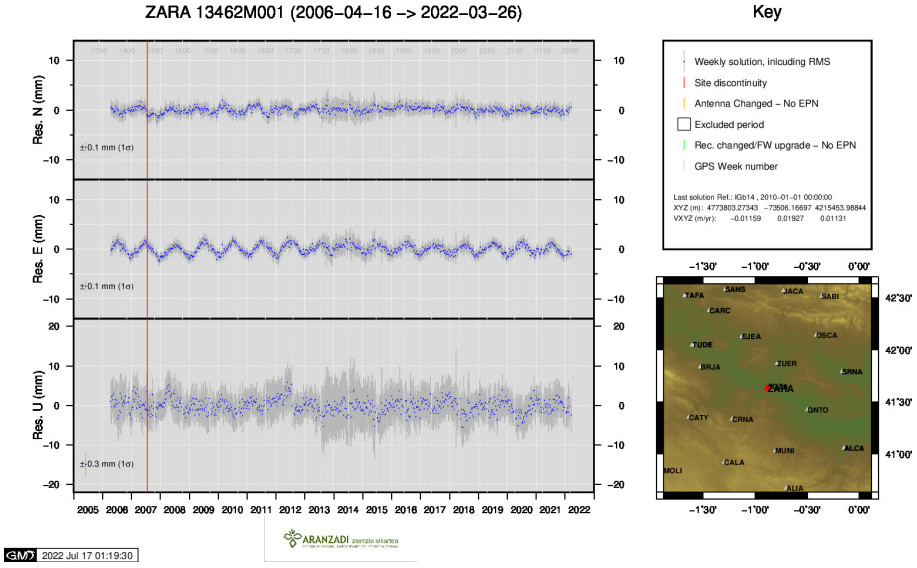
22) SOPU



23) TERU



24) YEBE



25) ZARA