ARA-DAC Weekly Analysis Result: 2221 (GFA)

Technical Report

GPS Week: 2221 (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

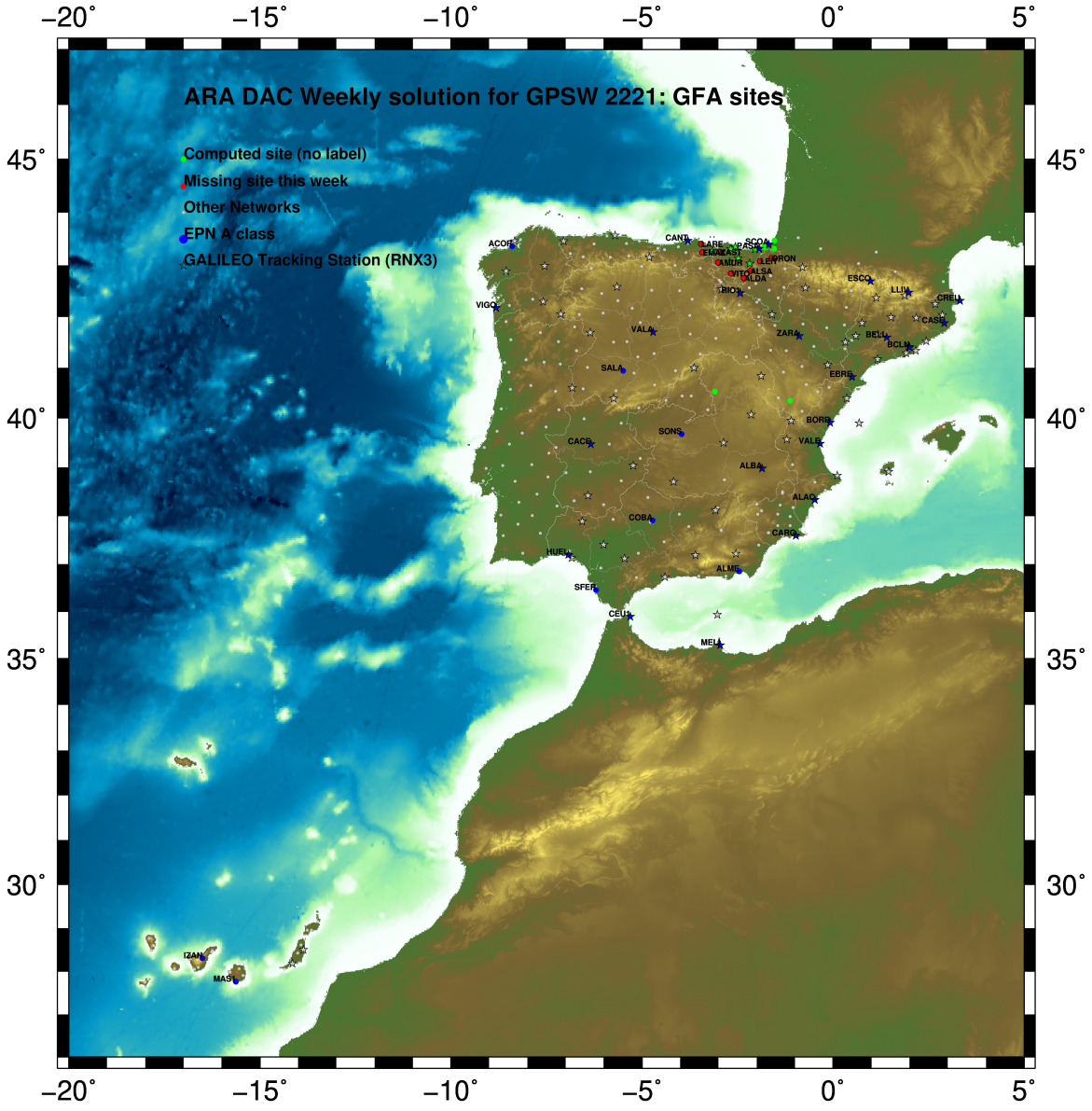


Fig.1: Computed Sites for GPS Week2221 (GFA)

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 2221 WEEK FINAL COMBINATION: PRECISE ORBITS              21-AUG-22 10:58
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: IGb14              EPOCH: 2022-08-03 12:00:00

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

  4  ACOR 13434M001    4594489.52388  -678367.37790  4357066.31959    W
100  BIAZ 10074M002    4634456.00734  -124344.91647  4365785.49054    A
101  BIDA 00000M000    4644177.78096  -145778.26427  4354832.51962    A
113  BRZR 19387M001    4662220.95269  -220769.83946  4333309.47906    A
104  CACE 13447M001    4899866.47181  -544566.97787  4033770.24318    W
116  CANT 13438M001    4625924.27795  -307096.17641  4365771.59558    W
154  CHER 00000M000    4645879.97933  -125721.84950  4353624.12058    A
162  CREU 13432M001    4715420.08603   273178.11864  4271946.87463    W
204  EBRE 13410M001    4833519.94728    41537.45318  4147461.75064    W
180  ELGE 19353S001    4657557.35513  -202241.41086  4338991.92470    A
209  GERN 19389M001    4642811.27722  -217222.86663  4353278.91752    A
257  HOND 15012M002    4640529.27112  -145675.92365  4358781.78807    A
235  IGEL 19352S001    4645951.38244  -165574.44327  4352550.45343    A
240  ISPS 19484M001    4640596.43838  -206963.71717  4356391.95042    A
256  LAZK 19354S001    4666098.29952  -178186.13116  4330463.70825    A
345  PAS2 19351S001    4644909.01717  -156645.00904  4353623.11207    A
493  PASA 19351S001    4644909.01796  -156645.00902  4353623.11289    W
553  RIO1 13448M002    4708446.79190  -199490.22644  4284089.77703    W
558  SALA 13469M001    4803054.45404  -462131.00980  4158379.12124    W
566  SCOA 10088M002    4639940.45808  -136224.87610  4359552.46378    W
418  SOPU 19386M001    4643997.86620  -255913.84771  4350063.17836    A
443  TERU 13487M001    4867391.27439   -95523.28459  4108341.71416    A
752  YEBE 13420M001    4848724.52739  -261631.86749  4123094.36520    A
755  ZARA 13462M001    4773803.12842   -73505.92282  4215454.13110    W
```

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 2221                                    21-AUG-22 10:58
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2000           EPOCH: 2022-08-03 12:00:00

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

  4  ACOR 13434M001    4594489.85612  -678367.97686  4357065.86128    W
100  BIAZ 10074M002    4634456.41187  -124345.51876  4365785.03638    A
101  BIDA 00000M000    4644178.18189  -145778.86774  4354832.06436    A
113  BRZR 19387M001    4662221.34229  -220770.44524  4333309.02130    A
104  CACE 13447M001    4899866.79658  -544567.61148  4033769.76113    W
116  CANT 13438M001    4625924.65888  -307096.77824  4365771.13969    W
154  CHER 00000M000    4645880.38275  -125722.45310  4353623.66544    A
162  CREU 13432M001    4715420.53463   273177.50854  4271946.41892    W
204  EBRE 13410M001    4833520.35648    41536.82868  4147461.28202    W
180  ELGE 19353S001    4657557.74756  -202242.01605  4338991.46757    A
209  GERN 19389M001    4642811.66880  -217223.47015  4353278.46142    A
257  HOND 15012M002    4640529.67236  -145676.52670  4358781.33312    A
235  IGEL 19352S001    4645951.78064  -165575.04701  4352549.99776    A
240  ISPS 19484M001    4640596.83153  -206964.32041  4356391.49464    A
256  LAZK 19354S001    4666098.69440  -178186.73725  4330463.25073    A
345  PAS2 19351S001    4644909.41660  -156645.61263  4353622.65660    A
493  PASA 19351S001    4644909.41739  -156645.61261  4353622.65742    W
553  RIO1 13448M002    4708447.18048  -199490.83746  4284089.31569    W
558  SALA 13469M001    4803054.79905  -462131.63228  4158378.64844    W
566  SCOA 10088M002    4639940.86060  -136225.47905  4359552.00900    W
418  SOPU 19386M001    4643998.25254  -255914.45148  4350062.72165    A
443  TERU 13487M001    4867391.66291   -95523.91342  4108341.24089    A
752  YEBE 13420M001    4848724.89560  -261632.49469  4123093.89128    A
755  ZARA 13462M001    4773803.52800   -73506.54092  4215453.66596    W
```

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 2221                                    21-AUG-22 10:58
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2014           EPOCH: 2022-08-03 12:00:00

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

4	ACOR	13434M001	4594489.81558	-678368.01432	4357065.91291	W
100	BIAZ	10074M002	4634456.36926	-124345.55802	4365785.08807	A
101	BIDA	00000M000	4644178.13925	-145778.90689	4354832.11602	A
113	BRZR	19387M001	4662221.29971	-220770.48404	4333309.07286	A
104	CACE	13447M001	4899866.75233	-544567.64810	4033769.81195	W
116	CANT	13438M001	4625924.61696	-307096.81689	4365771.19132	W
154	CHER	00000M000	4645880.34003	-125722.49231	4353623.71711	A
162	CREU	13432M001	4715420.48968	273177.46824	4271946.47066	W
204	EBRE	13410M001	4833520.31112	41536.78969	4147461.33326	W
180	ELGE	19353S001	4657557.70497	-202242.05494	4338991.51916	A
209	GERN	19389M001	4642811.62641	-217223.50905	4353278.51304	A
257	HOND	15012M002	4640529.62976	-145676.56586	4358781.38478	A
235	IGEL	19352S001	4645951.73805	-165575.08608	4352550.04940	A
240	ISPS	19484M001	4640596.78913	-206964.35936	4356391.54628	A
256	LAZK	19354S001	4666098.65164	-178186.77619	4330463.30230	A
345	PAS2	19351S001	4644909.37399	-156645.65173	4353622.70825	A
493	PASA	19351S001	4644909.37478	-156645.65171	4353622.70907	W
553	RIO1	13448M002	4708447.13734	-199490.87614	4284089.36712	W
558	SALA	13469M001	4803054.75567	-462131.66962	4158378.69952	W
566	SCOA	10088M002	4639940.81797	-136225.51825	4359552.06067	W
418	SOPU	19386M001	4643998.21027	-255914.49024	4350062.77325	A
443	TERU	13487M001	4867391.61766	-95523.95178	4108341.29195	A
752	YEBE	13420M001	4848724.85111	-261632.53255	4123093.94230	A
755	ZARA	13462M001	4773803.48372	-73506.57976	4215453.71729	W

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 2221 WEEK FINAL COMBINATION: PRECISE ORBITS              21-AUG-22 10:58
-------------------------------------------------------------------------------

                     Weekday     Repeatability (mm)
Station         #Days 0123456      N      E      U
-----------------------------------------------------
ACOR 13434M001     7  XXXXXXX     1.04   1.24   2.97
BIAZ 10074M002     7  XXXXXXX     1.03   1.44   7.75
BIDA 00000M000     6  XXXXX X     1.26   0.70   3.61
BRZR 19387M001     7  XXXXXXX     0.65   0.91   2.99
CACE 13447M001     7  XXXXXXX     0.57   1.11   3.03
CANT 13438M001     7  XXXXXXX     0.64   1.03   1.57
CHER 00000M000     7  XXXXXXX     1.21   1.07   4.87
CREU 13432M001     1   X          0.21   0.44   1.35
EBRE 13410M001     4   XX XX      1.17   0.83   2.28
ELGE 19353S001     7  XXXXXXX     0.73   0.69   2.83
GERN 19389M001     7  XXXXXXX     0.59   0.76   2.35
HOND 15012M002     6  XXX XXX     1.45   0.44   2.31
IGEL 19352S001     5    XXXXX     0.50   0.84   3.58
ISPS 19484M001     7  XXXXXXX     1.22   1.18   5.26
LAZK 19354S001     7  XXXXXXX     0.51   0.81   3.44
PAS2 19351S001     6   XXXXXX     0.50   0.45   2.52
PASA 19351S001     7  XXXXXXX     0.59   0.37   2.47
RIO1 13448M002     7  XXXXXXX     1.00   0.70   2.84
SALA 13469M001     7  XXXXXXX     1.00   0.93   4.74
SCOA 10088M002     1       X      1.55   1.83   6.14
SOPU 19386M001     7  XXXXXXX     0.91   0.56   2.21
TERU 13487M001     7  XXXXXXX     1.49   1.64   5.72
YEBE 13420M001     6  XXX XXX     0.58   1.41   3.64
ZARA 13462M001     7  XXXXXXX     0.55   0.66   2.19

Comparison of individual solutions:
-----------------------------------
ACOR 13434M001   N    1.04     -0.10   -0.90   -1.70    0.45    1.20   -0.42    1.01
ACOR 13434M001   E    1.24      0.68   -0.07   -0.82    2.02   -0.21   -1.96    0.29
ACOR 13434M001   U    2.97      0.19   -2.17   -0.04   -4.33    1.50    3.11   -4.18
BIAZ 10074M002   N    1.03      0.41    0.46    0.02   -0.43    1.03   -2.11   -0.50
BIAZ 10074M002   E    1.44      0.31    0.33    0.69    0.64   -1.00    3.15   -0.60
BIAZ 10074M002   U    7.75     -4.76    1.89   -5.62  -10.21    0.83   13.79    2.76
BIDA 00000M000   N    1.26      0.75    2.22   -0.44   -1.08    0.73           -0.77
BIDA 00000M000   E    0.70      0.87   -0.64    0.25   -0.57    0.26            0.93
BIDA 00000M000   U    3.61     -0.67   -2.72   -4.15    2.40    0.99           -5.76
BRZR 19387M001   N    0.65      0.31    0.48   -0.03    1.16    0.27   -0.53   -0.68
BRZR 19387M001   E    0.91     -0.80   -0.71   -0.11    1.41    1.19    0.59   -0.26
BRZR 19387M001   U    2.99     -2.51   -3.79   -3.08    1.12   -1.44    2.62    3.64
CACE 13447M001   N    0.57      0.61    0.02    0.36    0.70    0.94   -0.07   -0.16
CACE 13447M001   E    1.11      1.56    0.98    0.61    1.13    1.24   -0.45   -0.79
CACE 13447M001   U    3.03      1.66   -2.21    1.19    2.39   -2.13   -5.73    1.66
CANT 13438M001   N    0.64      0.61    0.33   -0.46    0.87    0.43   -0.86   -0.24
CANT 13438M001   E    1.03      0.09    0.28   -1.01    1.96    0.91   -0.68    0.32
CANT 13438M001   U    1.57     -0.51   -3.12    0.11    1.10    1.40   -0.47    1.23
CHER 00000M000   N    1.21      0.46    1.16    1.09   -0.20   -0.01   -2.29   -0.85
CHER 00000M000   E    1.07      0.33    0.20    1.04   -0.87    0.03    2.07    0.78
CHER 00000M000   U    4.87     -6.75    2.53   -2.46   -1.37    4.11    7.75    2.33
CREU 13432M001   N    0.21             -0.21
CREU 13432M001   E    0.44             -0.44
CREU 13432M001   U    1.35              1.35
EBRE 13410M001   N    1.17              0.39    1.43           -0.95   -0.99
EBRE 13410M001   E    0.83             -0.41    0.61           -1.02   -0.70
EBRE 13410M001   U    2.28              3.16    0.23           -0.81    2.21
ELGE 19353S001   N    0.73      0.91    0.68    0.57    0.62   -0.48   -0.85   -0.51
ELGE 19353S001   E    0.69     -0.58   -0.32    0.91   -0.65    0.91    0.38    0.48
ELGE 19353S001   U    2.83     -1.18   -2.62   -4.42    1.16   -2.07    3.37    1.85
GERN 19389M001   N    0.59      0.54    0.35    0.74    0.62    0.12   -0.86    0.20
GERN 19389M001   E    0.76     -0.42   -0.71    0.28   -0.46    1.24   -0.22    0.97
GERN 19389M001   U    2.35      0.23   -2.84   -2.46    3.83   -1.13    1.73    0.02
HOND 15012M002   N    1.45      1.61    0.47    1.42            0.06   -1.93   -1.38
HOND 15012M002   E    0.44      0.13   -0.13    0.30           -0.40    0.81    0.23
HOND 15012M002   U    2.31      0.20   -0.89   -2.30           -1.04   -3.53    2.64
IGEL 19352S001   N    0.50                      0.50    0.16   -0.05   -0.84    0.12
IGEL 19352S001   E    0.84                     -0.73    1.14   -0.25    0.92    0.31
IGEL 19352S001   U    3.58                      3.31   -1.18   -5.98    0.86    1.55
ISPS 19484M001   N    1.22      0.50    0.08   -1.35    1.41    0.64    1.64   -1.35
ISPS 19484M001   E    1.18      0.91   -0.52   -0.37   -0.60   -0.65   -0.49    2.46
ISPS 19484M001   U    5.26      0.87   -0.02   -9.59    3.35   -2.52   -1.32    7.36
LAZK 19354S001   N    0.51     -0.38   -0.09   -0.01   -0.03    1.12   -0.15    0.33
LAZK 19354S001   E    0.81      0.12   -0.66    0.59    1.11    1.07   -0.88    0.11
LAZK 19354S001   U    3.44     -1.13    0.42    1.02    4.57   -3.67    1.71   -5.57
PAS2 19351S001   N    0.50              0.68    0.28   -0.17    0.14    0.10   -0.80
PAS2 19351S001   E    0.45              0.16   -0.33    0.13    0.42    0.07    0.82
PAS2 19351S001   U    2.52             -1.08   -2.26    1.28   -4.22    1.73    1.73
PASA 19351S001   N    0.59      1.05    0.42   -0.16    0.15    0.17    0.05   -0.88
PASA 19351S001   E    0.37      0.35   -0.09   -0.25    0.15    0.42    0.20    0.61
PASA 19351S001   U    2.47     -1.08   -0.43   -2.89    1.20   -4.40    1.36    2.06
RIO1 13448M002   N    1.00     -0.61    0.06   -0.02    1.01    2.11   -0.41    0.08
RIO1 13448M002   E    0.70      0.87    0.68    0.14    0.08   -0.76    0.61    0.86
RIO1 13448M002   U    2.84      0.73   -5.17   -0.52    3.51   -1.58    2.06   -1.40
SALA 13469M001   N    1.00     -1.17    0.04    0.65   -0.28    0.75    1.71    0.79
SALA 13469M001   E    0.93      0.10   -0.94    0.46    1.24    0.70    1.14   -0.88
SALA 13469M001   U    4.74     -6.88    2.41    6.23    5.46    1.28   -2.12   -2.62
SCOA 10088M002   N    1.55                                             -1.55
SCOA 10088M002   E    1.83                                              1.83
SCOA 10088M002   U    6.14                                              6.14
SOPU 19386M001   N    0.91      0.38    0.25   -0.22    1.69    1.08   -0.52   -0.65
SOPU 19386M001   E    0.56      0.59    0.47   -0.43   -0.54   -0.34    0.02    0.85
SOPU 19386M001   U    2.21     -1.30   -0.04   -0.96    3.79   -0.17   -3.41    0.75
TERU 13487M001   N    1.49      1.08    1.06    1.52   -2.46   -0.70    1.46   -0.31
TERU 13487M001   E    1.64      0.01    1.44    0.84   -3.31   -1.28    0.15    0.82
TERU 13487M001   U    5.72     -0.82   -1.50   -7.61   10.32   -5.13    1.26   -0.99
YEBE 13420M001   N    0.58     -0.48   -0.33    0.25            0.91    0.67    0.04
```

YEBE 13420M001	E	1.41	0.20	-0.60	2.80		0.37	-1.22	0.10
YEBE 13420M001	U	3.64	2.51	4.51	-5.93		0.10	-1.92	0.91
ZARA 13462M001	N	0.55	0.54	0.44	0.14	-0.60	0.92	0.27	0.24
ZARA 13462M001	E	0.66	0.47	0.47	0.65	0.27	0.97	-0.72	-0.47
ZARA 13462M001	U	2.19	-2.80	1.53	0.70	-1.39	-1.18	3.66	1.21

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	-2.83	2.48	0.39
12	ALAC 13433M001	I W	0.39	-0.49	3.46
15	ALBA 13452M001	I W	1.62	-1.18	-5.02
21	ALME 13437M001	I W	-0.84	0.34	5.34
47	BCLN 13412M001	I W	0.27	-3.21	-4.32
52	BELL 13431M001	I W	1.99	-0.41	-1.46
71	BORR 13480M001	I W	-0.64	-3.11	-1.27
76	BRST 10004M004	I W	-3.11	0.72	2.90
104	CACE 13447M001	I W	1.48	2.15	3.60
116	CANT 13438M001	I W	-2.18	1.98	-4.11
117	CARG 19412M001	I W	0.80	2.22	-2.86
122	CASE 13494M001	I W	-1.58	-0.67	-6.13
128	CEU1 13449M002	I W	0.43	-1.84	-1.17
143	COBA 13453M001	I W	2.05	0.70	-3.11
162	CREU 13432M001	I W	0.84	1.98	5.04
204	EBRE 13410M001	I W	-0.94	-0.73	4.84
222	ESCO 13435M001	I W	-0.01	0.57	-1.84
299	HUEL 13451M001	I W	6.83	2.96	-0.45
316	IZAN 31309M002	I W	0.38	2.20	5.42
385	LLIV 13436M001	I W	2.04	0.18	1.72
421	MAS1 31303M002	I W	1.65	0.61	4.65
432	MELI 19379M001	I W	3.96	-1.45	0.79
493	PASA 19351S001	I W	-0.28	-0.29	0.46
553	RIO1 13448M002	I W	-2.22	1.74	-4.36
558	SALA 13469M001	I W	0.31	0.12	-8.79
566	SCOA 10088M002	I W	-11.24	-6.81	-10.45
574	SFER 13402M004	I W	1.94	-2.58	1.53
599	SONS 13446M001	I W	-1.92	0.68	4.87
700	VALA 13463M002	I W	1.36	-1.40	2.20
704	VALE 13439M001	I W	-1.28	3.69	-0.66
715	VIGO 13450M001	I W	1.53	0.67	2.23
755	ZARA 13462M001	I W	0.41	-1.16	2.87
764	ZIMM 14001M004	I W	-1.21	-0.69	3.67
	RMS / COMPONENT		2.84	2.10	4.16
	MEAN		0.00	0.00	-0.00
	MIN		-11.24	-6.81	-10.45
	MAX		6.83	3.69	5.42

```
NUMBER OF PARAMETERS  :     3
NUMBER OF COORDINATES :    99
RMS OF TRANSFORMATION :    3.15 MM

BARYCENTER COORDINATES:

LATITUDE              :    40  6 50.57
LONGITUDE             :  -  3  6 19.03
HEIGHT                :         -30.515 KM


PARAMETERS:

TRANSLATION IN  N     :           0.01     +-  0.55    MM
TRANSLATION IN  E     :           0.01     +-  0.55    MM
TRANSLATION IN  U     :          -0.00     +-  0.55    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                       13846240
 NUMBER OF UNKNOWNS                             168785
 NUMBER OF DEGREES OF FREEDOM                 13677455
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                 2.482204588363472
```

Helmert Transformation Parameters With Respect to Combined Solution:

		Translation (m)			Rotation (")			
Sol	Rms (m)	X	Y	Z	X	Y	Z	Scale (ppm)
1	0.00225	-0.0091	-0.0254	0.0071	0.0006	-0.0004	-0.0006	-0.00001
2	0.00241	0.0206	-0.0070	-0.0343	0.0002	0.0013	-0.0001	0.00066
3	0.00282	-0.0056	-0.0045	0.0137	-0.0000	-0.0005	-0.0002	-0.00063
4	0.00304	0.0451	0.0327	-0.0384	-0.0007	0.0019	0.0009	-0.00111
5	0.00206	0.0222	0.0222	-0.0164	-0.0004	0.0009	0.0006	-0.00093
6	0.00215	0.0144	0.0157	-0.0165	-0.0003	0.0007	0.0004	-0.00004
7	0.00235	0.0071	0.0023	-0.0135	0.0001	0.0005	0.0002	0.00038

Statistics of individual solutions:

File	RMS (m)	DOF	Chi**2/DOF	#Observations authentic	/ pseudo	#Parameters explicit	/ implicit / singular	
1	0.00152	1890790	2.32	1913457	3	636	22034	0
2	0.00159	1962337	2.54	1986650	3	675	23641	0
3	0.00158	1920588	2.51	1945611	3	669	24357	0
4	0.00165	1910464	2.72	1936415	3	663	25291	0
5	0.00157	2003690	2.45	2028352	3	696	23969	0
6	0.00155	1979286	2.41	2004641	3	693	24665	0
7	0.00154	2006340	2.36	2031114	3	687	24090	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 22:212:00000 22:218:86370 LEICA GR50           ----- -----------
 BIAZ  A    1 P 22:212:00000 22:218:86370 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 22:212:00000 22:218:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 22:212:00000 22:218:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 22:212:00000 22:218:86370 LEICA GR10           ----- -----------
 CHER  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 CREU  A    1 P 22:213:00000 22:213:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 22:213:00000 22:217:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 HOND  A    1 P 22:212:00000 22:218:86370 LEICA GR50           ----- -----------
 IGEL  A    1 P 22:214:00000 22:218:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 22:212:00000 22:218:86370 TRIMBLE NETR9        ----- -----------
 LAZK  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 PAS2  A    1 P 22:213:00000 22:218:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 22:212:00000 22:218:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 22:212:00000 22:218:86370 LEICA GR50           ----- -----------
 SCOA  A    1 P 22:217:00000 22:217:86370 LEICA GR50           ----- -----------
 SOPU  A    1 P 22:212:00000 22:218:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 22:212:00000 22:218:86370 LEICA GR50           ----- -----------
 YEBE  A    1 P 22:212:00000 22:218:86370 LEICA GR50           ----- -----------
 ZARA  A    1 P 22:212:00000 22:218:86370 TRIMBLE NETR9        ----- -----------
```

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 22:212:00000 22:218:86370 LEIAT504        LEIS -----
 BIAZ  A    1 P 22:212:00000 22:218:86370 LEIAR25         LEIT -----
 BIDA  A    1 P 22:212:00000 22:218:86370 LEIAS10         NONE -----
 BRZR  A    1 P 22:212:00000 22:218:86370 LEIAS10         NONE -----
 CACE  A    1 P 22:212:00000 22:218:86370 TRM29659.00     NONE -----
 CANT  A    1 P 22:212:00000 22:218:86370 LEIAR25.R4      LEIT 25066
 CHER  A    1 P 22:212:00000 22:218:86370 LEIAR10         NONE -----
 CREU  A    1 P 22:213:00000 22:213:86370 LEIAR25.R4      NONE 26357
 EBRE  A    1 P 22:213:00000 22:217:86370 LEIAR25.R4      NONE 26359
 ELGE  A    1 P 22:212:00000 22:218:86370 LEIAR25.R4      LEIT -----
 GERN  A    1 P 22:212:00000 22:218:86370 LEIAS10         NONE -----
 HOND  A    1 P 22:212:00000 22:218:86370 LEIAR20         LEIM 41012
```

```
 IGEL  A    1 P 22:214:00000 22:218:86370 LEIAR20         LEIM 43011
 ISPS  A    1 P 22:212:00000 22:218:86370 TRM59900.00     SCIS -----
 LAZK  A    1 P 22:212:00000 22:218:86370 LEIAR25.R4      LEIT -----
 PAS2  A    1 P 22:213:00000 22:218:86370 LEIAR20         LEIM 73034
 PASA  A    1 P 22:212:00000 22:218:86370 LEIAR20         LEIM 73034
 RIO1  A    1 P 22:212:00000 22:218:86370 LEIAR25.R4      LEIT 25138
 SALA  A    1 P 22:212:00000 22:218:86370 LEIAR25         NONE -----
 SCOA  A    1 P 22:217:00000 22:217:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 22:212:00000 22:218:86370 LEIAS10         NONE -----
 TERU  A    1 P 22:212:00000 22:218:86370 LEIAR20         LEIM 49044
 YEBE  A    1 P 22:212:00000 22:218:86370 LEIAR20         LEIM 49016
 ZARA  A    1 P 22:212:00000 22:218:86370 TRM29659.00     NONE -----
```

7.3 Eccentricities

```
*                                          UP______ NORTH___ EAST____
*SITE PT SOLN T DATA_START__ DATA_END____ AXE ARP->BENCHMARK(M)_________
 ACOR  A    1 P 22:212:00000 22:218:86370 UNE   3.0460   0.0000   0.0000
 BIAZ  A    1 P 22:212:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 22:212:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 22:212:00000 22:218:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 22:212:00000 22:218:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 22:212:00000 22:218:86370 UNE   3.0490   0.0000   0.0000
 CHER  A    1 P 22:212:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 CREU  A    1 P 22:213:00000 22:213:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 22:213:00000 22:217:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 22:212:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 GERN  A    1 P 22:212:00000 22:218:86370 UNE   0.0771   0.0000   0.0000
 HOND  A    1 P 22:212:00000 22:218:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 22:214:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 22:212:00000 22:218:86370 UNE   0.0350   0.0000   0.0000
 LAZK  A    1 P 22:212:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 PAS2  A    1 P 22:213:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 22:212:00000 22:218:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 22:212:00000 22:218:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 22:212:00000 22:218:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 22:217:00000 22:217:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 22:212:00000 22:218:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 22:212:00000 22:218:86370 UNE   0.0600   0.0000   0.0000
 YEBE  A    1 P 22:212:00000 22:218:86370 UNE   0.0600   0.0000   0.0000
 ZARA  A    1 P 22:212:00000 22:218:86370 UNE   3.2590   0.0000   0.0000
```

8 Inconsistencies (logsheet-RINEX metadata)

The following inconsistencies were found comparing the data available in the logsheets and the RINEX headers:

```
2022-08-18 23:57 UTC | HOND2160.22O | RECEIVER FIRM. VERS. |  4.60/7.811 -> 4.50/7.710
2022-08-19 23:56 UTC | HOND2170.22O | RECEIVER FIRM. VERS. |  4.60/7.811 -> 4.50/7.710
2022-08-20 23:55 UTC | HOND2180.22O | RECEIVER FIRM. VERS. |  4.60/7.811 -> 4.50/7.710
```

9 References

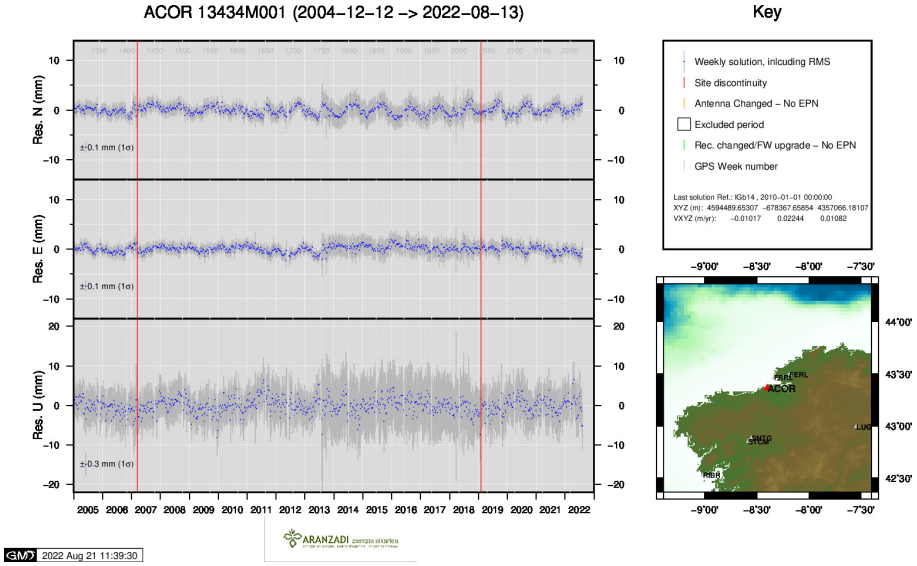
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

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*

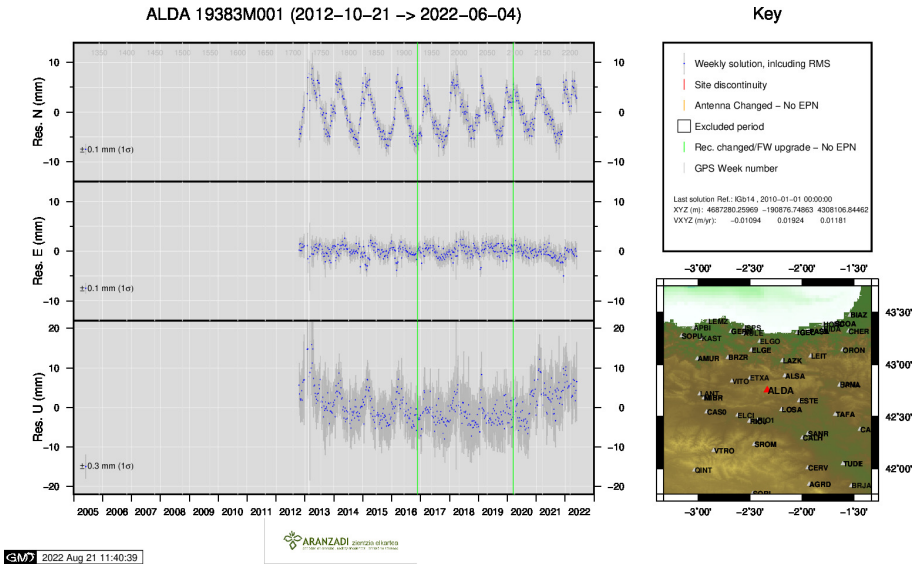
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

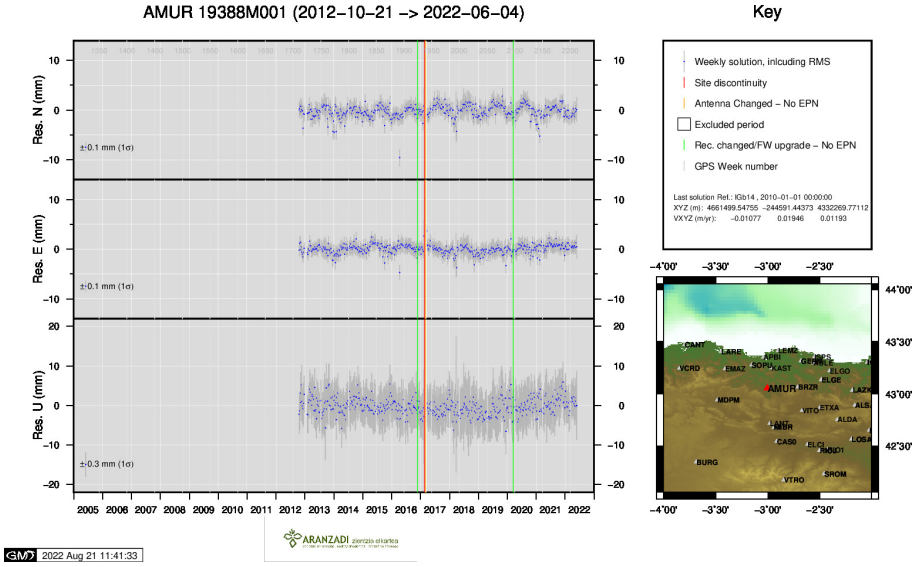
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



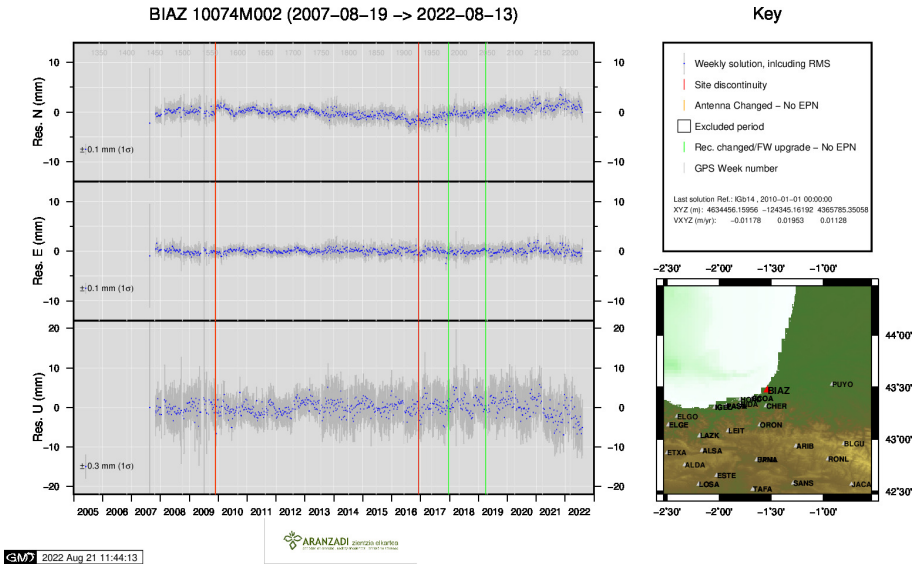
1) ACOR



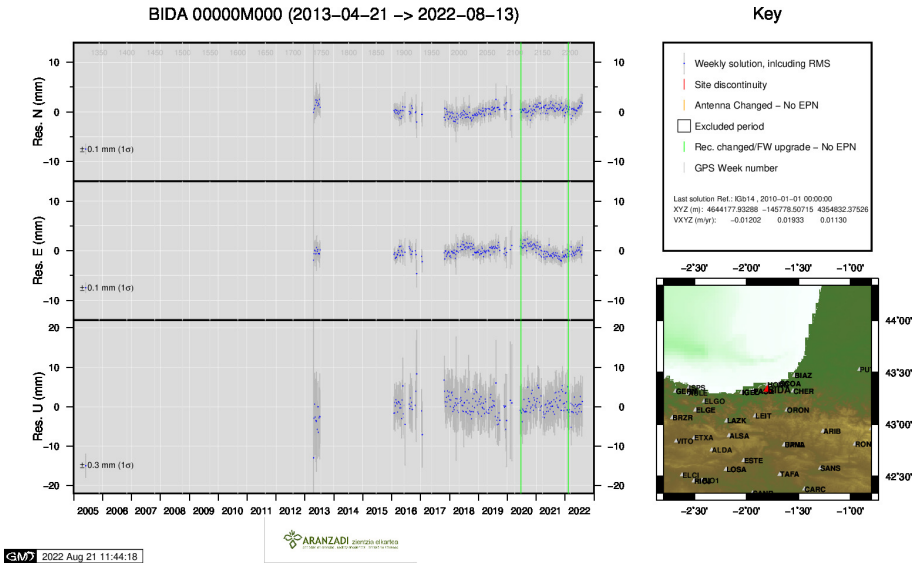
2) ALDA



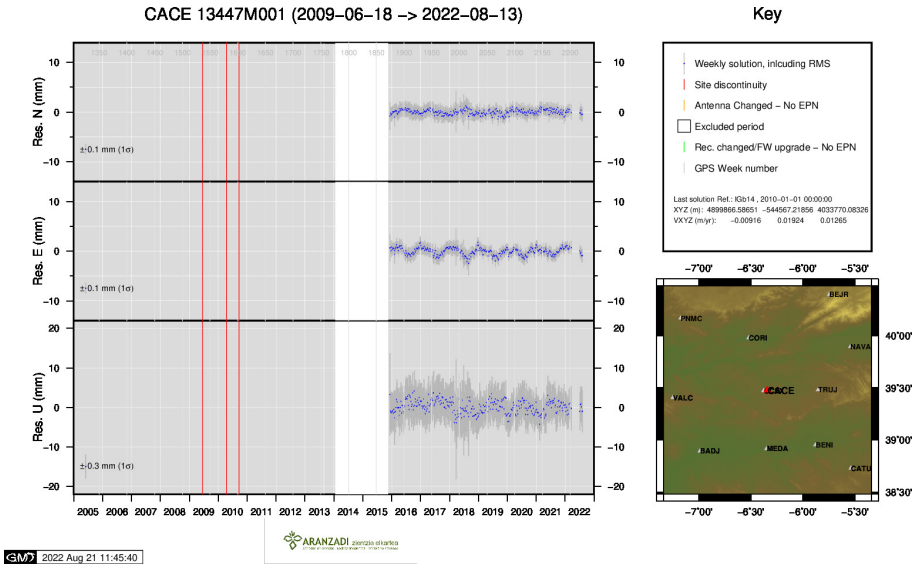
3) AMUR



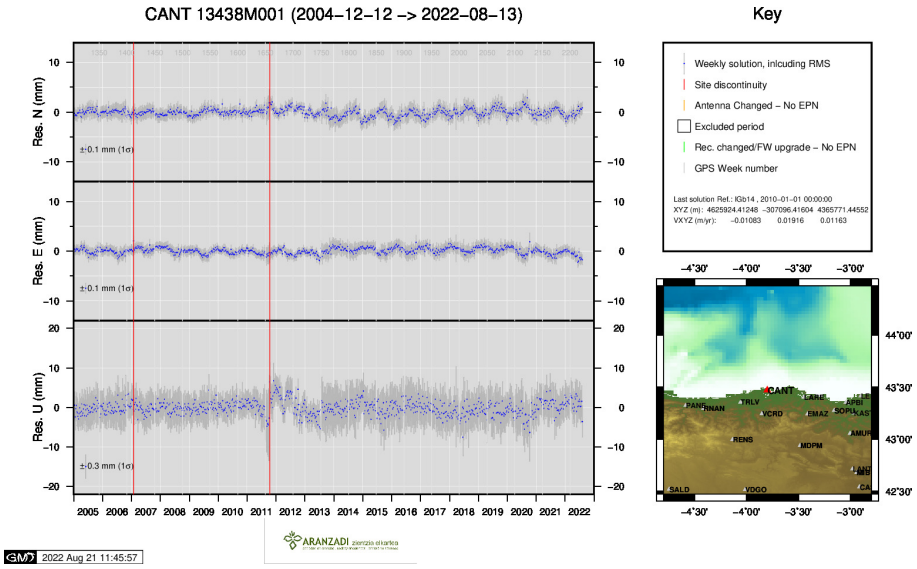
4) BIAZ



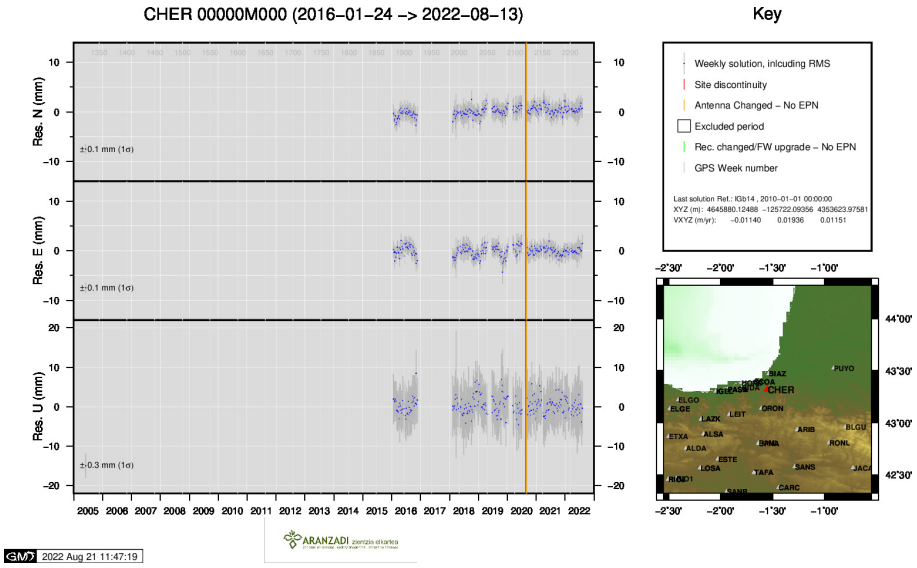
5) BIDA



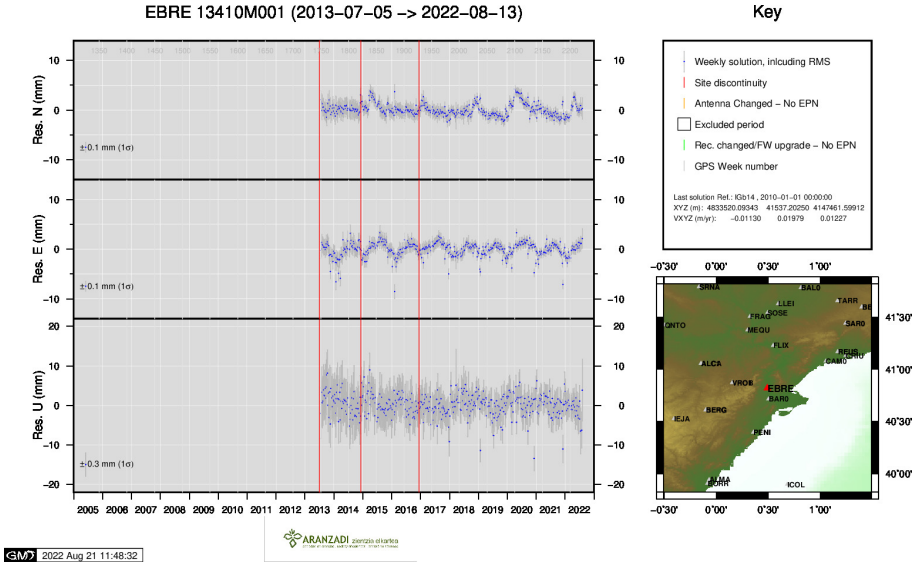
6) CACE



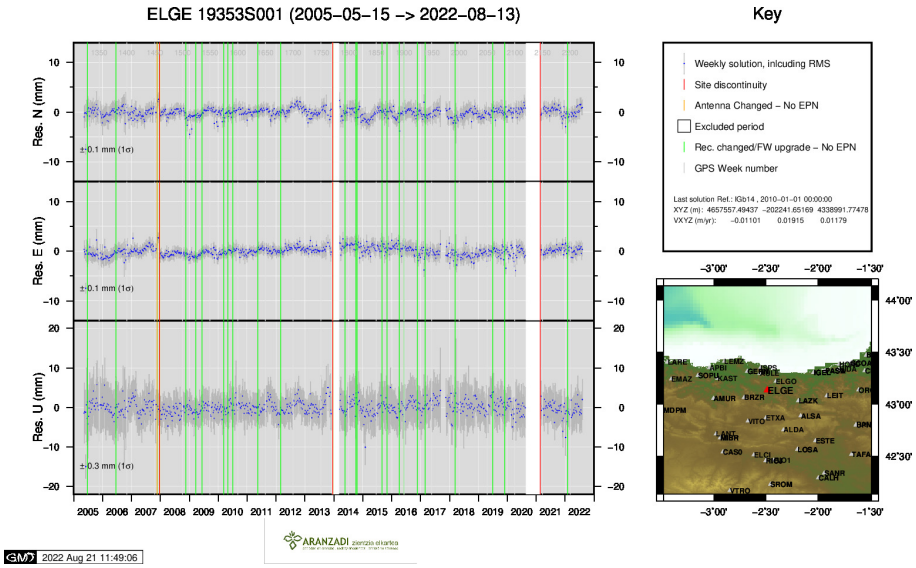
7) CANT



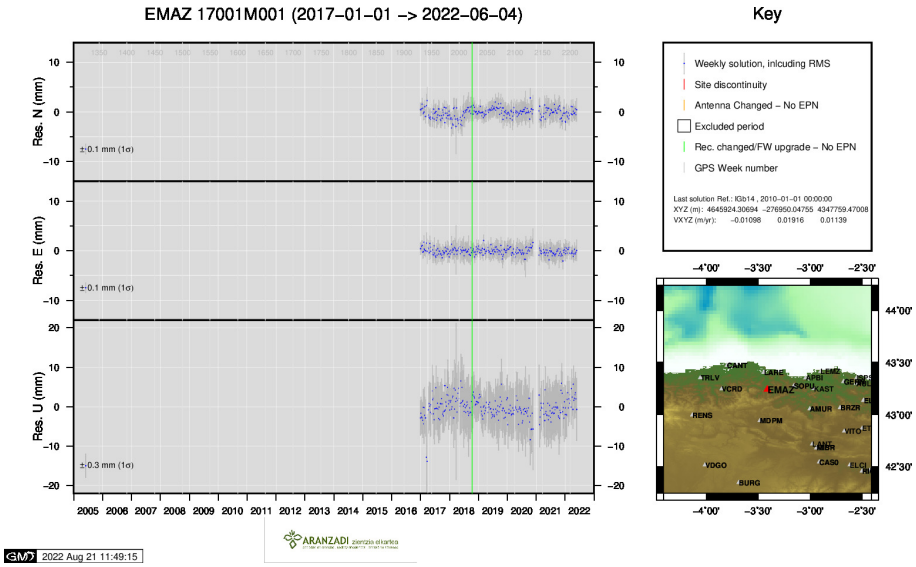
8) CHER



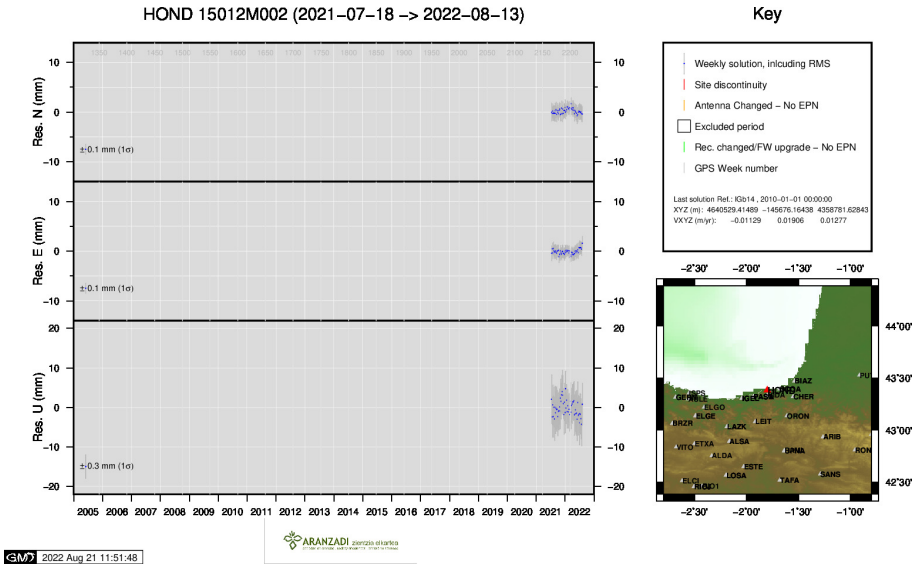
9) EBRE



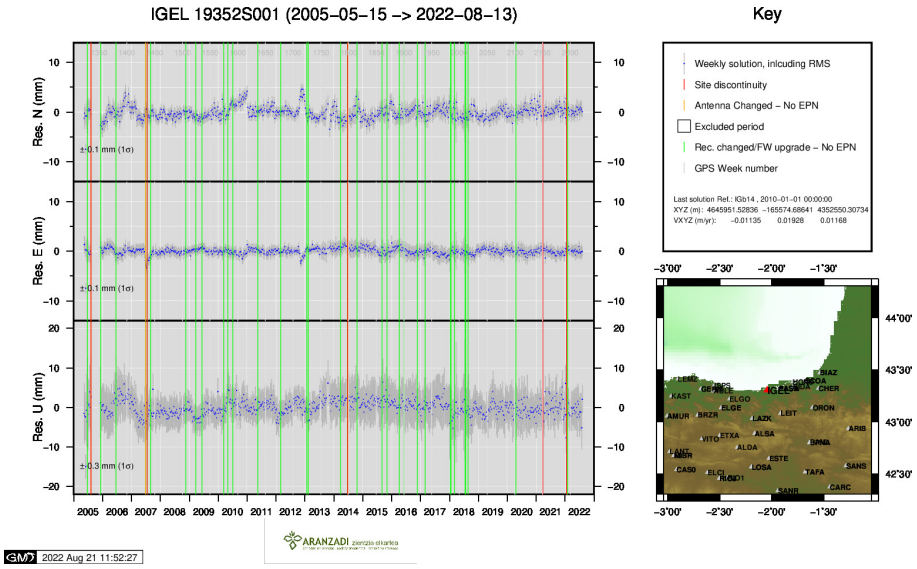
10) ELGE



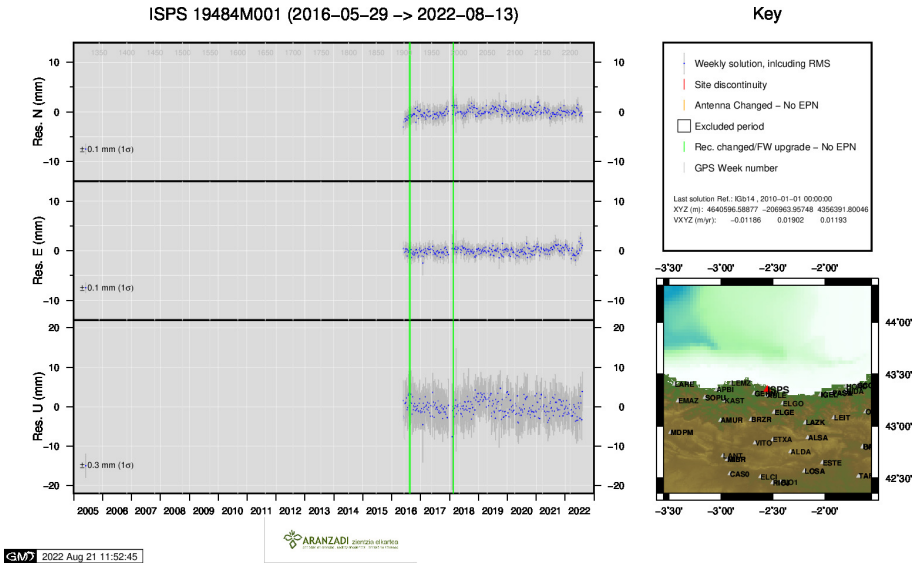
11) EMAZ



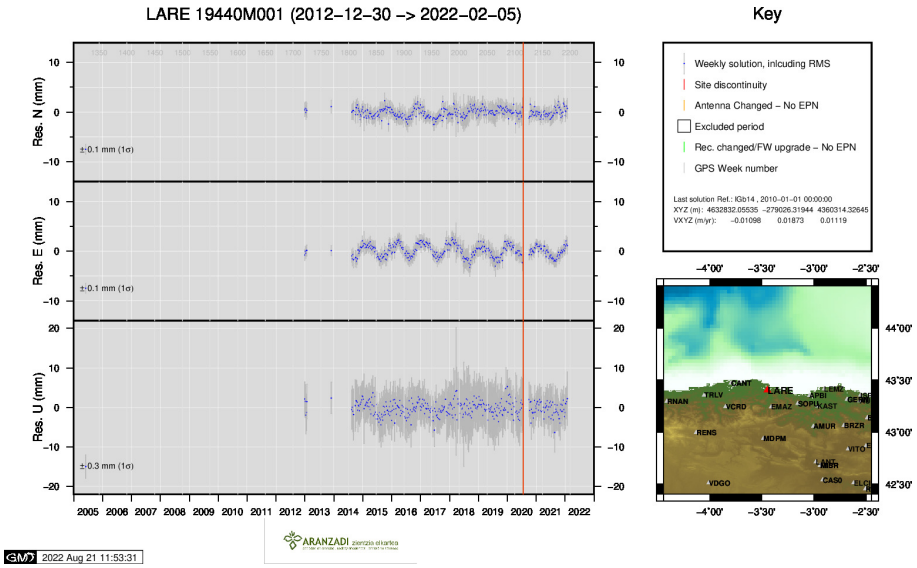
12) HOND



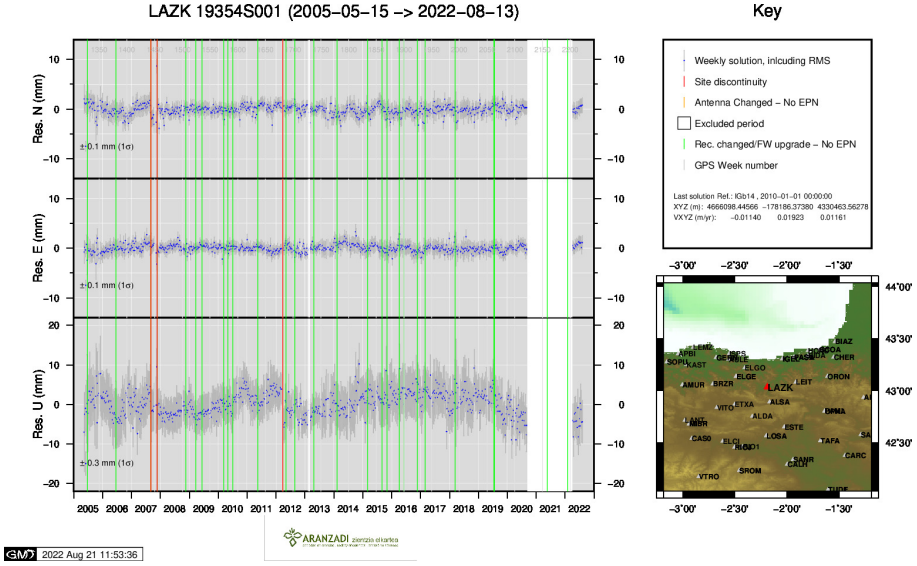
13) IGEL



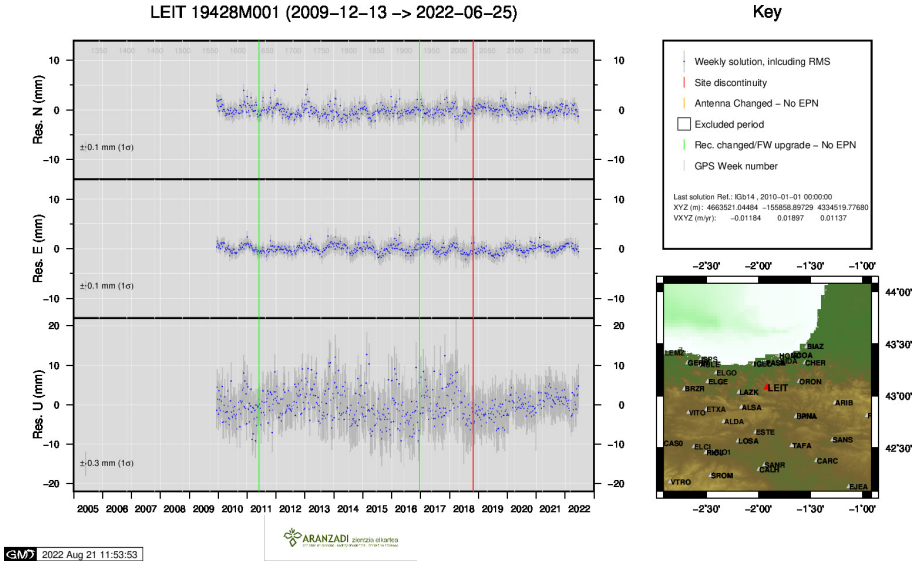
14) ISPS



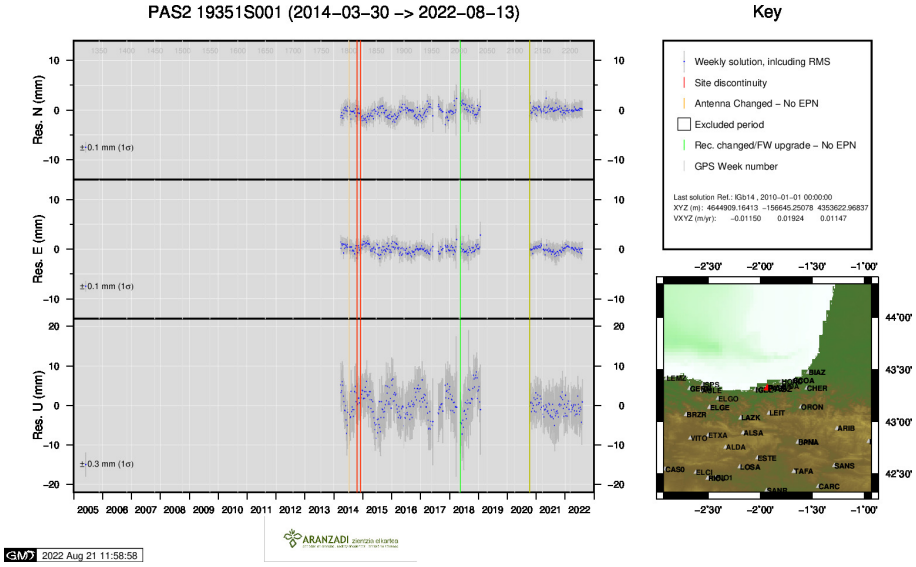
15) LARE



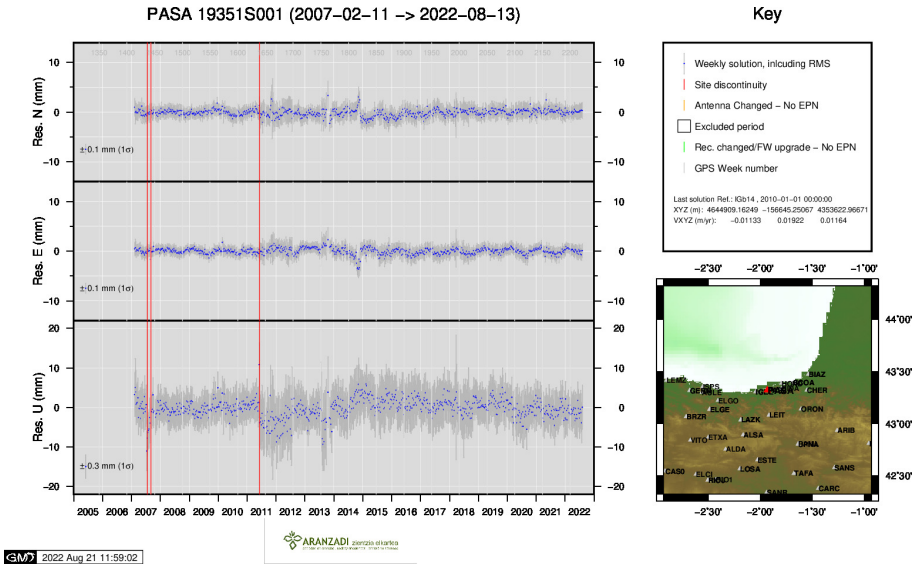
16) LAZK



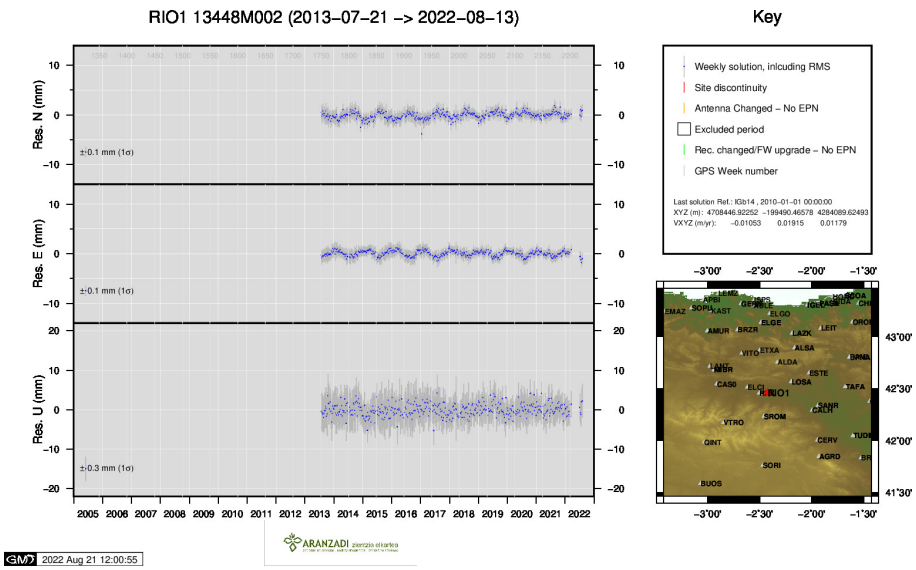
17) LEIT



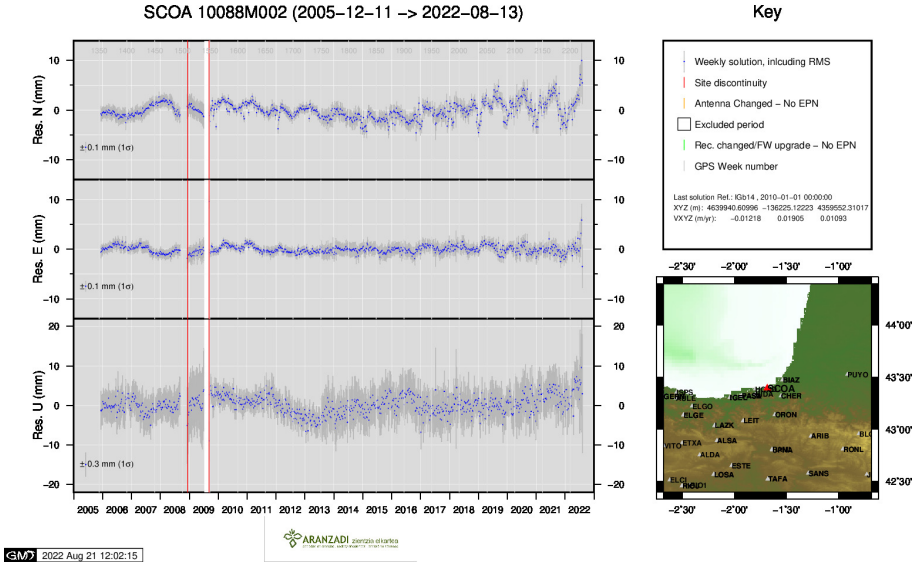
18) PAS2



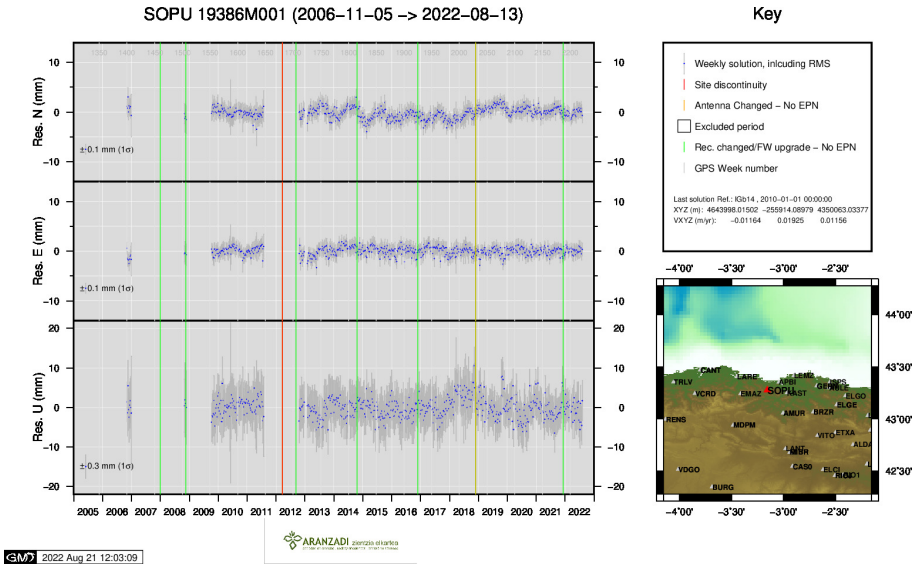
19) PASA



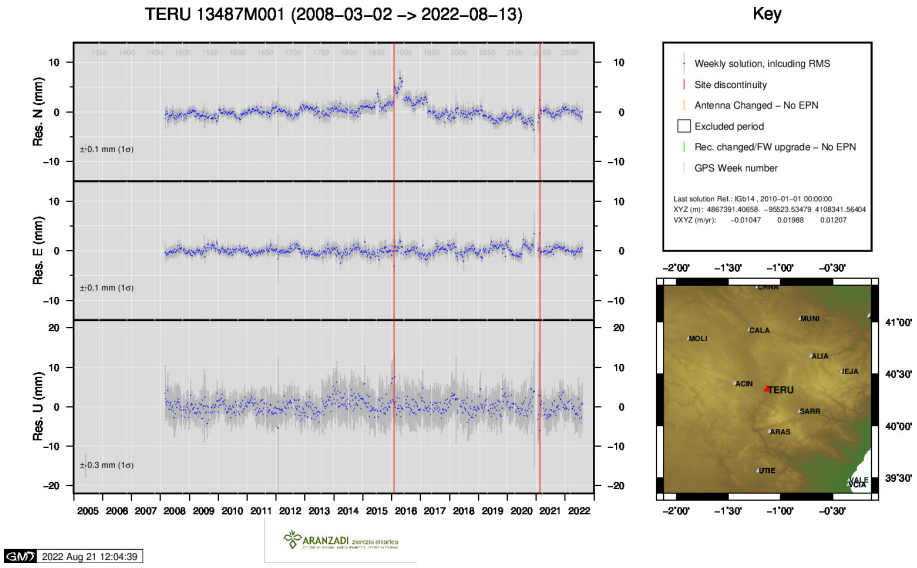
20) RIO1



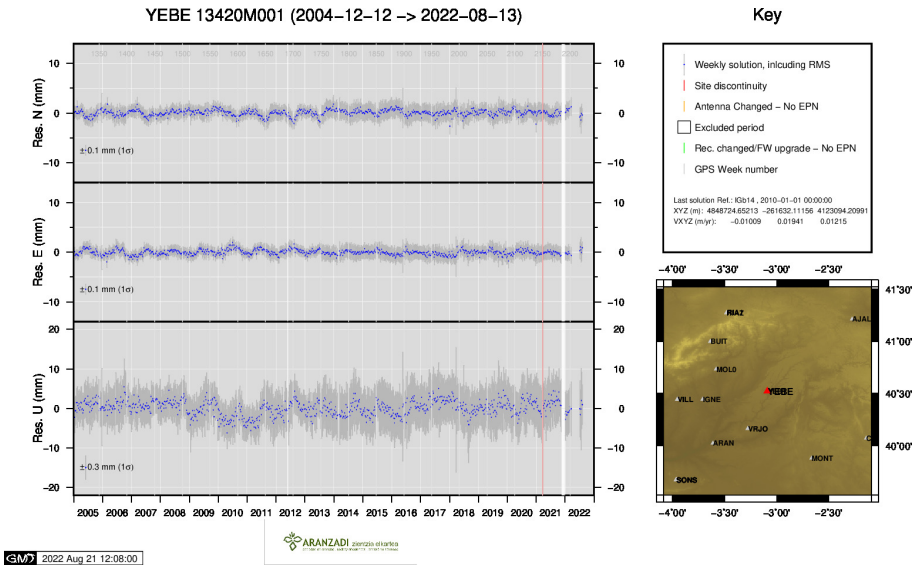
21) SCOA



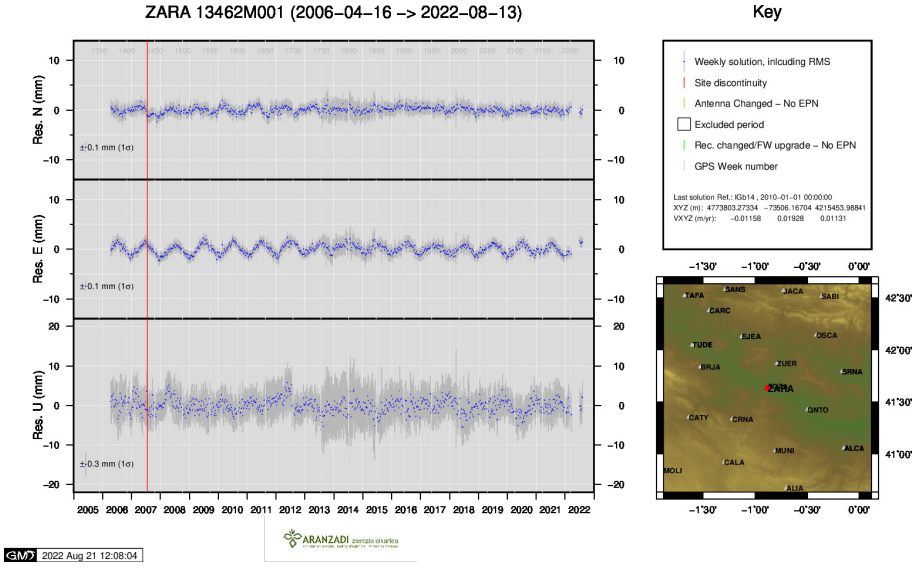
22) SOPU



23) TERU



24) YEBE



25) ZARA