

ARA-DAC Weekly Analysis Result: 2215 (GFA)

Technical Report

GPS Week: 2215 (GFA)

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

ARA-DAC details:

Contact person: J. Zurutuza

Contact mail: geodesia@aranzadi.eus

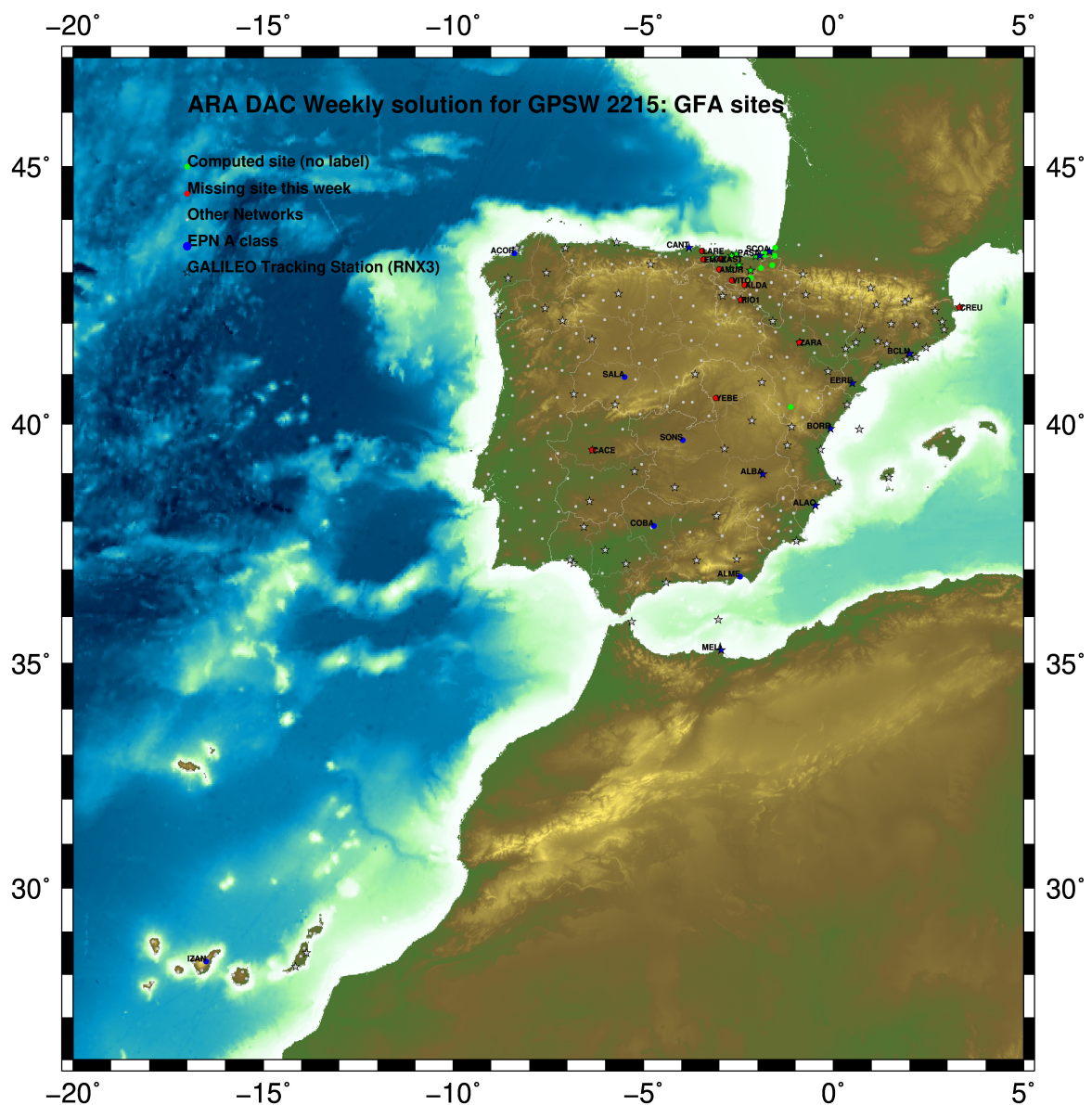
Report generated on 2022/07/10 at 14:47:29



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 10 14:47:20

Fig.1: Computed Sites for GPS Week2215 (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 2215 WEEK FINAL COMBINATION: PRECISE ORBITS 10-JUL-22 12:10

LOCAL GEODETIC DATUM: IGb14 EPOCH: 2022-06-22 12:00:00

| NUM | STATION NAME | X (M) | Y (M) | Z (M) | FLAG |
|-----|----------------|---------------|---------------|---------------|------|
| 4 | ACOR 13434M001 | 4594489.52489 | -678367.38025 | 4357066.31728 | W |
| 50 | ALSA 19419M001 | 4677250.79470 | -176770.33609 | 4319079.91245 | A |
| 100 | BLAZ 10074M002 | 4634456.00875 | -124344.91826 | 4365785.49156 | A |
| 101 | BIDA 00000M000 | 4644177.78367 | -145778.26577 | 4354832.51912 | A |
| 113 | BRZR 19387M001 | 4662220.95814 | -220769.84156 | 4333309.48132 | A |
| 116 | CANT 13438M001 | 4625924.27872 | -307096.17917 | 4365771.59441 | W |
| 154 | CHER 00000M000 | 4645879.98371 | -125721.85133 | 4353624.12196 | A |
| 204 | EBRE 13410M001 | 4833519.95061 | 41537.45118 | 4147461.75107 | W |
| 180 | ELGE 19353S001 | 4657557.35819 | -202241.41237 | 4338991.92374 | A |
| 209 | GERN 19389M001 | 4642811.28100 | -217222.86852 | 4353278.91885 | A |
| 257 | HOND 15012M002 | 4640529.27360 | -145676.92667 | 4358781.78819 | A |
| 235 | IGEL 19352S001 | 4645951.38801 | -165574.44608 | 4352550.45578 | A |
| 240 | ISPS 19484M001 | 4640596.44209 | -206963.72066 | 4356391.95227 | A |
| 256 | LAZK 19354S001 | 4666098.29811 | -178186.13231 | 4330463.70403 | A |
| 261 | LEIT 19428M001 | 4663520.90242 | -155858.66125 | 4334519.92270 | A |
| 334 | ORON 19427M001 | 4659695.74131 | -130864.67654 | 4338948.91911 | A |
| 345 | PASZ 19351S001 | 4644909.02176 | -156645.01129 | 4353623.11349 | A |
| 493 | PASA 19351S001 | 4644909.02200 | -156645.01135 | 4353623.11348 | W |
| 558 | SALA 13469M001 | 4803054.45117 | -462131.01333 | 4158379.11663 | W |
| 566 | SCDA 10088M002 | 4639940.45987 | -136224.88466 | 4359552.45320 | W |
| 418 | SOPU 19386M001 | 4643997.87201 | -255913.84988 | 4350063.18095 | A |
| 443 | TERU 13487M001 | 4867391.27876 | -95523.28611 | 4108341.71623 | 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 2215 10-JUL-22 12:10

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2022-06-22 12:00:00

| NUM | STATION NAME | X (M) | Y (M) | Z (M) | FLAG |
|-----|----------------|---------------|---------------|---------------|------|
| 4 | ACOR 13434M001 | 4594489.85617 | -678367.97699 | 4357065.86042 | W |
| 50 | ALSA 19419M001 | 4677251.18772 | -176770.94121 | 4319079.45547 | A |
| 100 | BLAZ 10074M002 | 4634456.41207 | -124345.51831 | 4365785.03883 | A |
| 101 | BIDA 00000M000 | 4644178.18340 | -145778.86700 | 4354832.06530 | A |
| 113 | BRZR 19387M001 | 4662221.34658 | -220770.44509 | 4333309.02500 | A |
| 116 | CANT 13438M001 | 4625924.65852 | -307096.77876 | 4365771.13996 | W |
| 154 | CHER 00000M000 | 4645880.38593 | -125722.45270 | 4353623.66826 | A |
| 204 | EBRE 13410M001 | 4833520.35859 | 41536.82899 | 4147461.28393 | W |
| 180 | ELGE 19353S001 | 4657557.74945 | -202242.01531 | 4338991.46806 | A |
| 209 | GERN 19389M001 | 4642811.67142 | -217223.46981 | 4353278.46419 | A |
| 257 | HOND 15012M002 | 4640529.67364 | -145676.52749 | 4358781.33467 | A |
| 235 | IGEL 19352S001 | 4645951.78502 | -165575.04758 | 4352550.00155 | A |
| 240 | ISPS 19484M001 | 4640596.83407 | -206964.32167 | 4356391.49793 | A |
| 256 | LAZK 19354S001 | 4666098.69181 | -178186.73615 | 4330463.24795 | A |
| 261 | LEIT 19428M001 | 4663521.29931 | -155859.26474 | 4334519.46714 | A |
| 334 | ORON 19427M001 | 4659696.14175 | -130865.27951 | 4338948.46420 | A |
| 345 | PASZ 19351S001 | 4644909.42000 | -156645.61264 | 4353622.65946 | A |
| 493 | PASA 19351S001 | 4644909.42024 | -156645.61270 | 4353622.65945 | W |
| 558 | SALA 13469M001 | 4803054.79517 | -462131.63351 | 4158378.64533 | W |
| 566 | SCDA 10088M002 | 4639940.86119 | -136225.48538 | 4359551.99986 | W |
| 418 | SOPU 19386M001 | 4643998.25720 | -255914.45141 | 4350062.72568 | A |
| 443 | TERU 13487M001 | 4867391.66613 | -95523.91262 | 4108341.24446 | 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 2215 10-JUL-22 12:10

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2022-06-22 12:00:00

| NUM | STATION NAME | X (M) | Y (M) | Z (M) | FLAG |
|-----|----------------|---------------|---------------|---------------|------|
| 4 | ACOR 13434M001 | 4594489.81559 | -678368.01449 | 4357065.91199 | W |
| 50 | ALSA 19419M001 | 4677251.14481 | -176770.98015 | 4319079.50695 | A |
| 100 | BLAZ 10074M002 | 4634456.36943 | -124345.55761 | 4365785.09047 | A |
| 101 | BIDA 00000M000 | 4644178.14073 | -145778.90619 | 4354832.11690 | A |

| | | | | | | |
|-----|------|-----------|---------------|---------------|---------------|---|
| 113 | BRZR | 19387M001 | 4662221.30398 | -220770.48394 | 4333309.07651 | A |
| 116 | CANT | 13438M001 | 4625924.61657 | -307096.81746 | 4365771.19153 | W |
| 154 | CHER | 00000M000 | 4645880.34317 | -125722.49194 | 4353623.71987 | A |
| 204 | EBRE | 13410M001 | 4833520.31321 | 41536.78996 | 4147461.33511 | W |
| 180 | ELGE | 19353S001 | 4657557.70683 | -202242.05424 | 4338991.51959 | A |
| 209 | GERN | 19389M001 | 4642811.62900 | -217223.50875 | 4353278.51576 | A |
| 257 | HOND | 15012M002 | 4640529.63101 | -145676.56669 | 4358781.38628 | A |
| 235 | IGEL | 19352S001 | 4645951.74240 | -165575.08669 | 4352550.05313 | A |
| 240 | ISPS | 19484M001 | 4640596.79164 | -206964.36065 | 4356391.54951 | A |
| 256 | LAZK | 19354S001 | 4666098.64902 | -178186.77513 | 4330463.29947 | A |
| 261 | LEIT | 19428M001 | 4663521.25647 | -155859.30380 | 4334519.51867 | A |
| 334 | ORON | 19427M001 | 4659696.09887 | -130865.31868 | 4338948.51576 | A |
| 345 | PAS2 | 19351S001 | 4644909.37736 | -156645.65178 | 4353622.71105 | A |
| 493 | PASA | 19351S001 | 4644909.37760 | -156645.65184 | 4353622.71104 | W |
| 558 | SALA | 13469M001 | 4803054.75177 | -462131.67089 | 4158378.69635 | W |
| 566 | SCDA | 10088M002 | 4639940.81853 | -136225.52461 | 4359552.05147 | W |
| 418 | SOPU | 19386M001 | 4643998.21490 | -255914.49021 | 4350062.77722 | A |
| 443 | TERU | 13487M001 | 4867391.62086 | -95523.95102 | 4108341.29546 | 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 2215 WEEK FINAL COMBINATION: PRECISE ORBITS 10-JUL-22 12:10

| Station | #Days | Weekday 0123456 | Repeatability (mm) | | |
|----------------|-------|--------------------|--------------------|------|------|
| | | | N | E | U |
| ACOR 13434M001 | 7 | XXXXXX | 0.59 | 0.61 | 5.00 |
| ALSA 19419M001 | 5 | XXXX | 1.36 | 0.64 | 2.85 |
| BIAZ 10074M002 | 7 | XXXXXX | 0.72 | 1.54 | 2.83 |
| BIDA 00000M000 | 6 | XXXXX | 1.51 | 1.69 | 3.33 |
| BRZR 19387M001 | 7 | XXXXXX | 0.87 | 0.70 | 4.73 |
| CANT 13438M001 | 7 | XXXXXX | 0.93 | 0.76 | 2.11 |
| CHER 00000M000 | 5 | XX XX X | 1.67 | 2.67 | 7.23 |
| EBRE 13410M001 | 7 | XXXXXX | 0.81 | 1.02 | 7.03 |
| ELGE 19353S001 | 7 | XXXXXX | 1.09 | 0.66 | 3.22 |
| GERN 19389M001 | 7 | XXXXXX | 1.08 | 1.06 | 4.35 |
| HOND 15012M002 | 7 | XXXXXX | 0.77 | 1.02 | 3.31 |
| IGEL 19352S001 | 7 | XXXXXX | 0.70 | 1.12 | 3.45 |
| ISPS 19484M001 | 7 | XXXXXX | 0.61 | 1.35 | 3.37 |
| LAZK 19354S001 | 7 | XXXXXX | 0.57 | 0.79 | 7.25 |
| LEIT 19428M001 | 5 | XXXX | 0.34 | 0.86 | 4.30 |
| ORON 19427M001 | 5 | XXXX | 0.97 | 1.26 | 2.78 |
| PAS2 19351S001 | 7 | XXXXXX | 0.63 | 0.84 | 3.36 |
| PASA 19351S001 | 6 | XXXXX | 0.71 | 0.86 | 3.71 |
| SALA 13469M001 | 7 | XXXXXX | 0.62 | 0.91 | 1.75 |
| SCOA 10088M002 | 7 | XXXXXX | 2.88 | 2.27 | 2.30 |
| SOPU 19386M001 | 7 | XXXXXX | 0.70 | 1.03 | 2.97 |
| TERU 13487M001 | 5 | XX XX | 1.66 | 1.32 | 2.86 |

Comparison of individual solutions:

| | | | | | | | | | |
|----------------|---|------|-------|-------|--------|-------|-------|-------|--------|
| ACOR 13434M001 | N | 0.59 | -0.26 | -0.22 | 1.30 | -0.42 | 0.06 | -0.26 | -0.13 |
| ACOR 13434M001 | E | 0.61 | 0.33 | -0.61 | -0.76 | 0.48 | 0.46 | 0.53 | 0.68 |
| ACOR 13434M001 | U | 5.00 | -2.74 | 4.97 | 2.05 | 0.75 | -0.35 | -1.71 | -10.49 |
| ALSA 19419M001 | N | 1.36 | 1.40 | -0.09 | 1.64 | -0.86 | -1.43 | | |
| ALSA 19419M001 | E | 0.64 | 0.84 | -0.11 | -0.90 | 0.34 | -0.12 | | |
| ALSA 19419M001 | U | 2.85 | 0.04 | 0.73 | -4.07 | 2.74 | 2.83 | | |
| BIAZ 10074M002 | N | 0.72 | -0.08 | 1.49 | -0.31 | 0.40 | 0.18 | -0.43 | 0.65 |
| BIAZ 10074M002 | E | 1.54 | -0.19 | 1.69 | 0.15 | 2.20 | 0.27 | 1.32 | -2.15 |
| BIAZ 10074M002 | U | 2.83 | 0.88 | 3.72 | 3.12 | -3.87 | -1.55 | 2.09 | -1.45 |
| BIDA 00000M000 | N | 1.51 | 0.13 | 2.11 | 1.32 | 1.31 | -1.39 | 1.25 | |
| BIDA 00000M000 | E | 1.69 | 1.96 | 3.02 | -0.40 | -0.05 | -0.51 | 0.96 | |
| BIDA 00000M000 | U | 3.33 | -5.61 | 3.94 | 0.71 | 1.62 | 2.23 | -0.66 | |
| BRZR 19387M001 | N | 0.87 | 1.32 | 1.07 | -0.72 | -0.67 | -0.66 | 0.22 | 0.37 |
| BRZR 19387M001 | E | 0.70 | 0.38 | 0.81 | -1.02 | -0.41 | 0.59 | 0.01 | 0.75 |
| BRZR 19387M001 | U | 4.73 | -8.38 | 1.53 | -0.53 | 0.37 | -6.12 | -2.20 | 4.33 |
| CANT 13438M001 | N | 0.93 | -1.52 | 0.68 | 0.42 | 0.27 | -0.08 | -0.31 | -1.42 |
| CANT 13438M001 | E | 0.76 | -0.10 | -0.87 | 0.13 | 0.25 | 0.44 | 1.28 | 0.86 |
| CANT 13438M001 | U | 2.11 | -1.73 | 0.54 | -1.37 | -0.13 | 3.59 | 2.68 | -1.20 |
| CHER 00000M000 | N | 1.67 | 2.93 | 1.05 | | 0.66 | -0.99 | | 0.33 |
| CHER 00000M000 | E | 2.67 | 1.98 | 4.86 | | -0.77 | -0.63 | | -0.29 |
| CHER 00000M000 | U | 7.23 | 0.08 | 9.73 | | -9.37 | 3.71 | | -3.57 |
| EBRE 13410M001 | N | 0.81 | -0.56 | 0.46 | -0.04 | 1.15 | 0.17 | -0.31 | 1.39 |
| EBRE 13410M001 | E | 1.02 | -1.42 | -1.33 | 0.11 | -0.20 | 0.67 | 0.25 | 1.38 |
| EBRE 13410M001 | U | 7.03 | -5.12 | 3.98 | 0.60 | 0.00 | 0.44 | 12.72 | -9.60 |
| ELGE 19353S001 | N | 1.09 | 1.94 | 0.77 | -0.43 | 0.14 | -0.91 | 0.57 | -1.19 |
| ELGE 19353S001 | E | 0.66 | 0.00 | -0.00 | -0.95 | 0.27 | 0.43 | 0.20 | 1.19 |
| ELGE 19353S001 | U | 3.22 | -2.01 | -3.50 | -0.47 | -3.76 | -4.14 | -1.78 | 3.37 |
| GERN 19389M001 | N | 1.08 | 1.41 | 1.55 | -0.16 | -0.61 | -1.36 | -0.37 | -0.40 |
| GERN 19389M001 | E | 1.06 | 1.60 | -0.73 | -0.23 | -0.12 | 1.38 | 0.17 | 1.27 |
| GERN 19389M001 | U | 4.35 | -3.92 | -5.99 | -0.13 | -1.70 | -1.72 | 0.88 | 7.47 |
| HOND 15012M002 | N | 0.77 | -0.88 | 1.49 | 0.20 | 0.36 | -0.01 | -0.20 | 0.57 |
| HOND 15012M002 | E | 1.02 | 0.72 | 1.05 | -1.52 | 0.23 | -0.19 | 1.16 | -0.90 |
| HOND 15012M002 | U | 3.31 | -4.56 | -3.67 | -2.07 | 1.29 | 3.15 | -1.78 | 3.53 |
| IGEL 19352S001 | N | 0.70 | 0.96 | -0.13 | 0.45 | 0.78 | 0.64 | -0.52 | -0.71 |
| IGEL 19352S001 | E | 1.12 | 1.72 | -0.08 | -0.48 | 0.33 | -1.86 | -0.25 | 0.84 |
| IGEL 19352S001 | U | 3.45 | -0.61 | -4.66 | -5.29 | 2.38 | 3.04 | -2.14 | 1.33 |
| ISPS 19484M001 | N | 0.61 | 0.39 | 0.19 | 0.35 | -0.95 | -0.72 | 0.71 | -0.06 |
| ISPS 19484M001 | E | 1.35 | -0.99 | -0.05 | -0.65 | 0.18 | 1.33 | 2.66 | 0.82 |
| ISPS 19484M001 | U | 3.37 | -4.70 | -3.79 | -0.19 | 0.69 | -2.15 | 0.26 | 5.13 |
| LAZK 19354S001 | N | 0.57 | 0.24 | 0.46 | -0.80 | -0.06 | -0.50 | 0.89 | 0.02 |
| LAZK 19354S001 | E | 0.79 | 1.18 | 0.66 | -0.84 | -0.29 | -0.25 | -0.37 | 0.96 |
| LAZK 19354S001 | U | 7.25 | 12.53 | 0.50 | -11.84 | -0.86 | 3.85 | -1.60 | -0.13 |
| LEIT 19428M001 | N | 0.34 | 0.64 | 0.10 | -0.12 | 0.01 | -0.15 | | |
| LEIT 19428M001 | E | 0.86 | -0.35 | 1.27 | -1.08 | 0.20 | -0.02 | | |
| LEIT 19428M001 | U | 4.30 | 5.99 | 2.22 | -5.75 | 0.09 | -0.09 | | |
| ORON 19427M001 | N | 0.97 | 1.69 | 0.01 | 0.61 | -0.74 | -0.12 | | |
| ORON 19427M001 | E | 1.26 | 1.27 | -0.20 | -0.13 | 0.97 | -1.94 | | |
| ORON 19427M001 | U | 2.78 | -3.21 | -3.51 | -2.46 | 1.52 | 0.23 | | |
| PAS2 19351S001 | N | 0.63 | -0.35 | 1.07 | 0.78 | 0.36 | -0.18 | -0.47 | 0.37 |
| PAS2 19351S001 | E | 0.84 | -1.08 | 1.13 | -0.79 | 0.75 | -0.44 | 0.24 | 0.58 |
| PAS2 19351S001 | U | 3.36 | -1.11 | -2.31 | -4.27 | -0.25 | 5.00 | -3.27 | 2.67 |
| PASA 19351S001 | N | 0.71 | -0.24 | 1.13 | 0.96 | 0.47 | -0.11 | -0.19 | |
| PASA 19351S001 | E | 0.86 | -1.06 | 1.10 | -0.75 | 0.66 | -0.54 | 0.31 | |
| PASA 19351S001 | U | 3.71 | -0.44 | -2.63 | -4.53 | -0.05 | 5.31 | -3.61 | |
| SALA 13469M001 | N | 0.62 | -0.24 | -0.81 | 0.07 | -0.75 | 0.34 | -0.92 | -0.14 |
| SALA 13469M001 | E | 0.91 | 0.29 | 0.18 | -1.50 | 0.31 | -0.19 | 1.13 | 1.12 |
| SALA 13469M001 | U | 1.75 | -1.27 | -1.08 | 0.96 | 3.38 | 1.70 | 0.11 | 0.67 |
| SCOA 10088M002 | N | 2.88 | -3.49 | 2.16 | 3.53 | 2.43 | 0.01 | 1.39 | -3.56 |
| SCOA 10088M002 | E | 2.27 | 3.83 | -0.19 | -0.62 | 0.16 | -1.07 | 3.72 | -0.96 |
| SCOA 10088M002 | U | 2.30 | -3.10 | 1.15 | 1.30 | -0.42 | 1.63 | 3.88 | -1.13 |
| SOPU 19386M001 | N | 0.70 | -0.45 | -0.04 | 0.28 | -1.14 | -0.85 | 0.62 | -0.48 |
| SOPU 19386M001 | E | 1.03 | 1.88 | 0.38 | 0.24 | -0.18 | -0.42 | 1.57 | -0.10 |
| SOPU 19386M001 | U | 2.97 | -4.44 | 0.95 | -0.70 | -2.29 | 3.71 | 3.16 | 1.66 |
| TERU 13487M001 | N | 1.66 | 1.01 | -0.97 | -0.65 | | | 2.38 | 1.72 |
| TERU 13487M001 | E | 1.32 | -0.92 | -1.12 | 0.72 | | | -1.92 | 0.78 |
| TERU 13487M001 | U | 2.86 | -1.48 | -3.12 | 0.54 | | | -3.15 | -3.25 |

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 | -2.07 | 2.27 | 1.21 |
| 12 | ALAC 13433M001 | I W | 0.66 | -1.22 | 3.77 |
| 15 | ALBA 13452M001 | I W | 1.98 | -1.65 | -6.97 |
| 21 | ALME 13437M001 | I W | 0.07 | 0.95 | 10.95 |
| 47 | BCLN 13412M001 | I W | 0.24 | -4.25 | 3.38 |
| 71 | BORR 13480M001 | I W | 0.47 | -2.13 | -0.11 |
| 116 | CANT 13438M001 | I W | -2.61 | 2.56 | -3.88 |
| 143 | COBA 13453M001 | I W | 1.23 | 0.92 | -1.85 |
| 204 | EBRE 13410M001 | I W | -0.98 | -1.09 | 2.13 |
| 316 | IZAN 31309M002 | I W | 1.89 | 1.51 | -0.05 |
| 432 | MELI 19379M001 | I W | 3.90 | -1.31 | -1.97 |
| 493 | PASA 19351S001 | I W | -0.01 | -0.32 | -2.80 |
| 558 | SALA 13469M001 | I W | 0.20 | 1.60 | -3.73 |
| 566 | SCDA 10088M002 | I W | -3.67 | -0.46 | -4.99 |
| 599 | SONS 13446M001 | I W | -1.30 | 2.63 | 4.91 |
| | RMS / COMPONENT | | 1.93 | 1.99 | 4.58 |
| | MEAN | | -0.00 | 0.00 | -0.00 |
| | MIN | | -3.67 | -4.25 | -6.97 |
| | MAX | | 3.90 | 2.63 | 10.95 |

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 45
RMS OF TRANSFORMATION : 3.09 MM

BARYCENTER COORDINATES:

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

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.80 MM
TRANSLATION IN E : 0.00 +- 0.80 MM
TRANSLATION IN U : -0.00 +- 0.80 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          13624009
NUMBER OF UNKNOWN               166976
NUMBER OF DEGREES OF FREEDOM    13457033
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  2.293767621683520

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00260      0.0217  0.0230 -0.0200 -0.0005  0.0009  0.0006 -0.00054
 2  0.00231     -0.0139 -0.0229  0.0133  0.0005 -0.0006 -0.0005  0.00028
 3  0.00224     -0.0314 -0.0038  0.0423 -0.0000 -0.0017 -0.0002 -0.00025
 4  0.00179      0.0091 -0.0038 -0.0115  0.0002  0.0005 -0.0000 -0.00009
 5  0.00222      0.0007  0.0155  0.0018 -0.0002 -0.0000  0.0005  0.00007
 6  0.00204     -0.0148 -0.0066  0.0076  0.0001 -0.0005 -0.0002  0.00097
 7  0.00212     -0.0044  0.0065 -0.0022 -0.0001 -0.0001  0.0002  0.00049
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00156      1922615      2.45          1947598      3      687      24299      0
 2  0.00157      1940052      2.47          1965686      3      687      24950      0
 3  0.00155      1922668      2.39          1947647      3      675      24307      0
 4  0.00152      1948069      2.32          1973122      3      699      24357      0
 5  0.00149      1992880      2.21          2017964      3      708      24379      0
 6  0.00141      1862073      1.98          1884471      3      666      21735      0
 7  0.00147      1864623      2.17          1887521      3      669      22232      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 22:170:00000 22:176:86370 LEICA GR50 -----
ALSA  A  1 P 22:170:00000 22:174:86370 LEICA GR50 -----
BIAZ  A  1 P 22:170:00000 22:176:86370 SPECTRA SP90M -----
BIDA  A  1 P 22:170:00000 22:175:86370 LEICA GR10 -----
BRZR  A  1 P 22:170:00000 22:176:86370 LEICA GR30 -----
CANT  A  1 P 22:170:00000 22:176:86370 LEICA GR10 -----
CHER  A  1 P 22:170:00000 22:176:40200 LEICA GR30 -----
EBRE  A  1 P 22:170:00000 22:176:86370 LEICA GR50 -----
ELGE  A  1 P 22:170:00000 22:176:86370 LEICA GR30 -----
GERN  A  1 P 22:170:00000 22:176:86370 LEICA GR30 -----
HOND  A  1 P 22:170:00000 22:176:86370 LEICA GR50 -----
IGEL  A  1 P 22:170:00000 22:176:86370 LEICA GR30 -----
ISPS  A  1 P 22:170:00000 22:176:86370 TRIMBLE NETR9 -----
LAZK  A  1 P 22:170:00000 22:176:86370 LEICA GR30 -----
LEIT  A  1 P 22:170:00000 22:174:86370 LEICA GR50 -----
ORON  A  1 P 22:170:00000 22:174:86370 LEICA GR50 -----
PAS2  A  1 P 22:170:00030 22:176:86370 STONEX SC2200 -----
PASA  A  1 P 22:170:00000 22:175:86370 LEICA GR30 -----
SALA  A  1 P 22:170:00000 22:176:86370 LEICA GR50 -----
SCDA  A  1 P 22:170:00000 22:176:86370 LEICA GR50 -----
SOPU  A  1 P 22:170:00000 22:176:86370 LEICA GR30 -----
TERU  A  1 P 22:170:00000 22:176:86370 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 22:170:00000 22:176:86370 LEIAT504      LEIS -----
ALSA  A  1 P 22:170:00000 22:174:86370 LEIAR10      NONE -----
BIAZ  A  1 P 22:170:00000 22:176:86370 LEIAR25      LEIT -----
BIDA  A  1 P 22:170:00000 22:175:86370 LEIAS10      NONE -----
BRZR  A  1 P 22:170:00000 22:176:86370 LEIAS10      NONE -----
CANT  A  1 P 22:170:00000 22:176:86370 LEIAR25.R4   LEIT 25066
CHER  A  1 P 22:170:00000 22:176:40200 LEIAR10      NONE -----
EBRE  A  1 P 22:170:00000 22:176:86370 LEIAR25.R4   NONE 26359
ELGE  A  1 P 22:170:00000 22:176:86370 LEIAR25.R4   LEIT -----
GERN  A  1 P 22:170:00000 22:176:86370 LEIAS10      NONE -----
HOND  A  1 P 22:170:00000 22:176:86370 LEIAR20      LEIM 41012
IGEL  A  1 P 22:170:00000 22:176:86370 LEIAR20      LEIM 43011
ISPS  A  1 P 22:170:00000 22:176:86370 TRM59900.00 SCIS -----
LAZK  A  1 P 22:170:00000 22:176:86370 LEIAR25.R4   LEIT -----
```

```

LEIT A 1 P 22:170:00000 22:174:86370 LEIAR10 NONE -----
ORON A 1 P 22:170:00000 22:174:86370 LEIAR10 NONE -----
PAS2 A 1 P 22:170:00030 22:176:86370 LEIAR20 LEIM 73034
PASA A 1 P 22:170:00000 22:175:86370 LEIAR20 LEIM 73034
SALA A 1 P 22:170:00000 22:176:86370 LEIAR25 NONE -----
SCOA A 1 P 22:170:00000 22:176:86370 TRM55971.00 NONE -----
SOPU A 1 P 22:170:00000 22:176:86370 LEIAS10 NONE -----
TERU A 1 P 22:170:00000 22:176:86370 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 22:170:00000 22:176:86370 UNE 3.0460 0.0000 0.0000
ALSA A 1 P 22:170:00000 22:174:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 22:170:00000 22:176:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 22:170:00000 22:175:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 22:170:00000 22:176:86370 UNE 0.0771 0.0000 0.0000
CANT A 1 P 22:170:00000 22:176:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 22:170:00000 22:176:40200 UNE 0.0000 0.0000 0.0000
EBRE A 1 P 22:170:00000 22:176:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 22:170:00000 22:176:86370 UNE 0.0000 0.0000 0.0000
GERN A 1 P 22:170:00000 22:176:86370 UNE 0.0771 0.0000 0.0000
HOND A 1 P 22:170:00000 22:176:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 22:170:00000 22:176:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 22:170:00000 22:176:86370 UNE 0.0350 0.0000 0.0000
LAZK A 1 P 22:170:00000 22:176:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 22:170:00000 22:174:86370 UNE 0.0000 0.0000 0.0000
ORON A 1 P 22:170:00000 22:174:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 22:170:00030 22:176:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 22:170:00000 22:175:86370 UNE 0.0000 0.0000 0.0000
SALA A 1 P 22:170:00000 22:176:86370 UNE 0.0600 0.0000 0.0000
SCOA A 1 P 22:170:00000 22:176:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 22:170:00000 22:176:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 22:170:00000 22:176:86370 UNE 0.0600 0.0000 0.0000
    
```

8 References

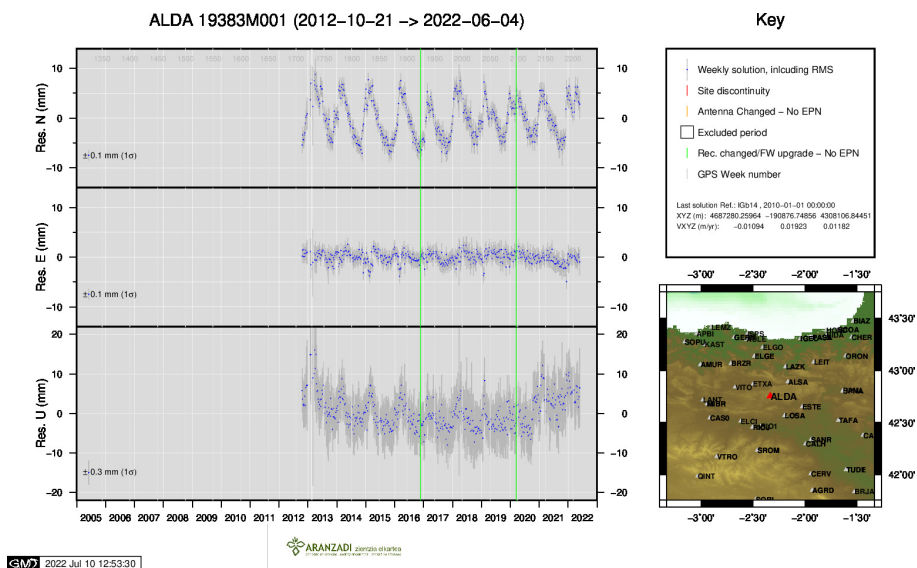
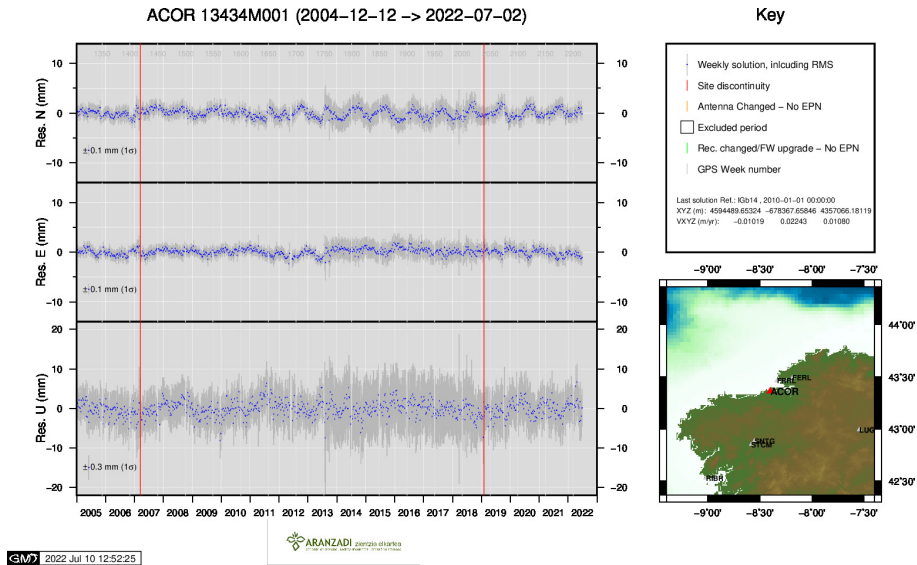
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. etrs89.ensg.ign.fr/memo-V8.pdf

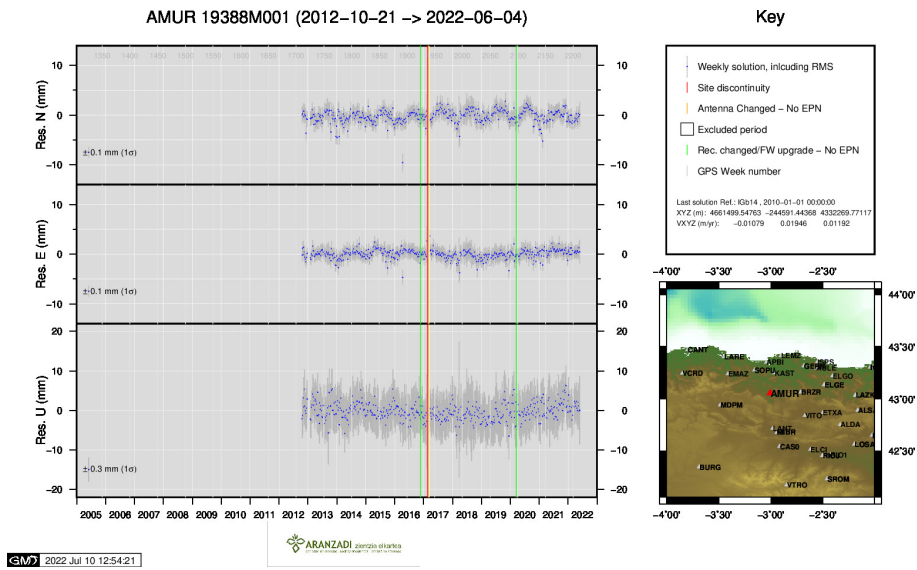
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

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

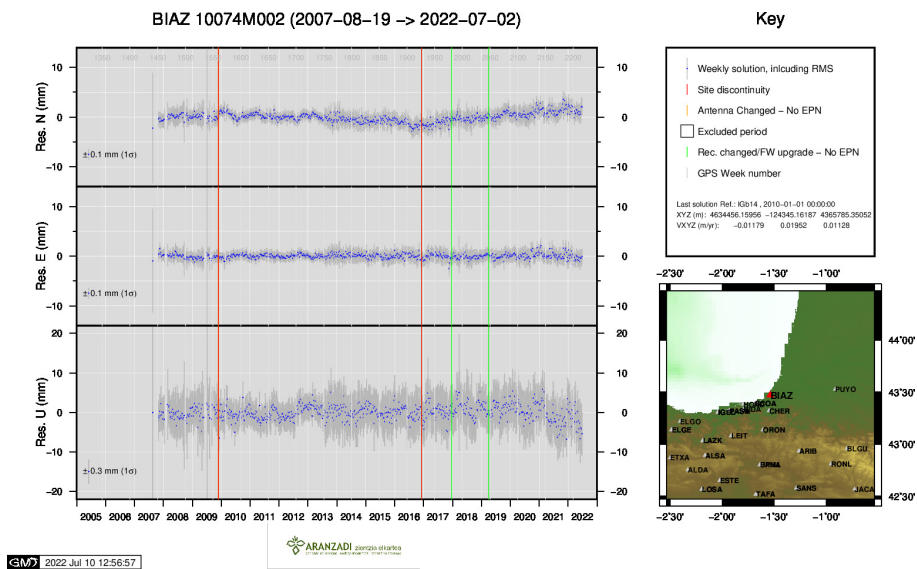
9 Cumulative Time Series

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

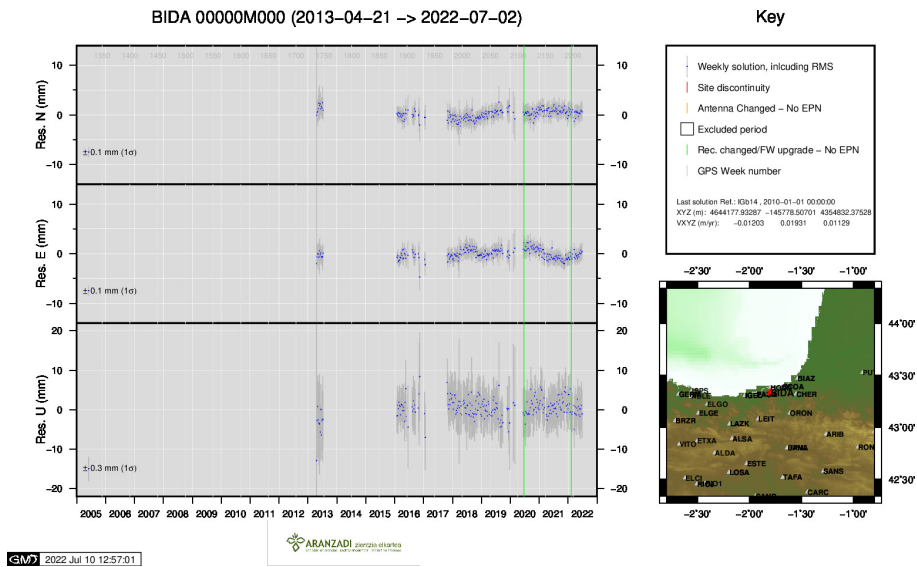




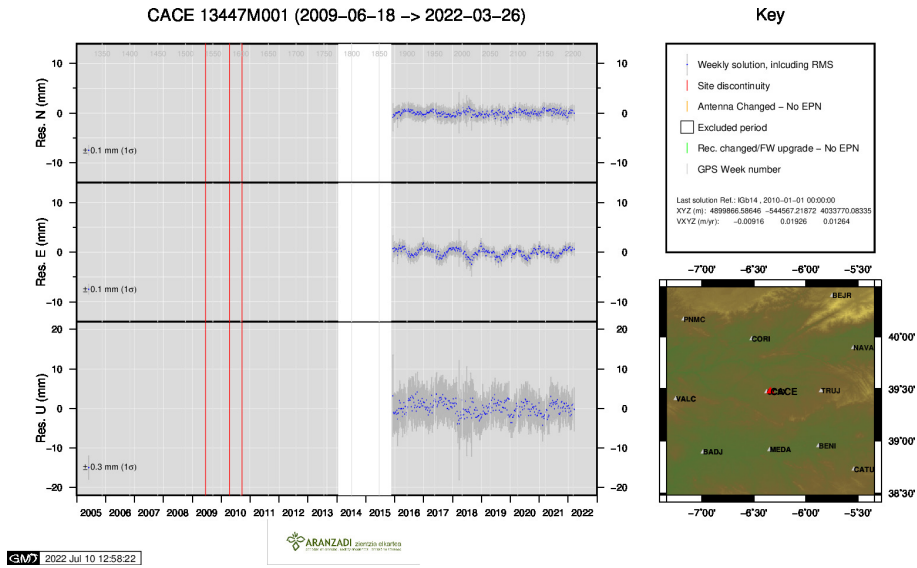
3) AMUR



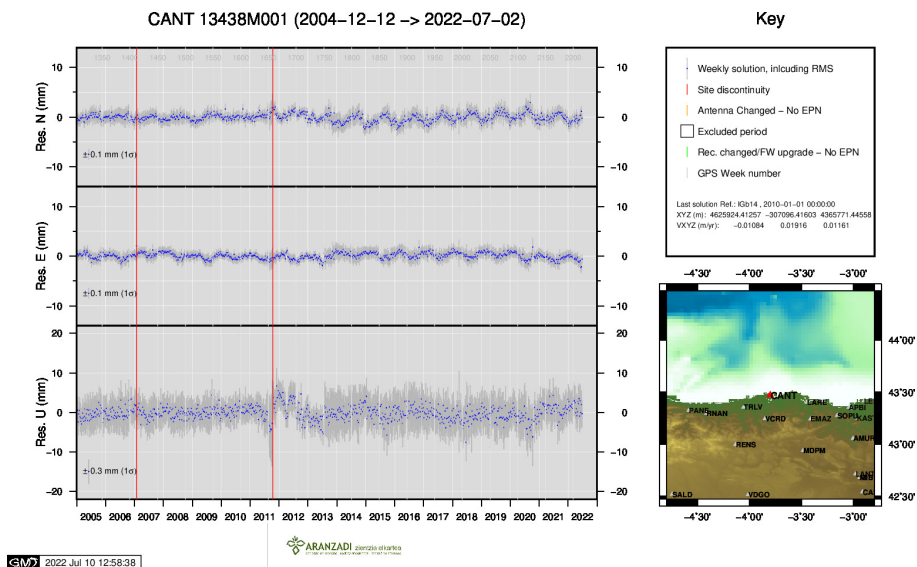
4) BIAZ



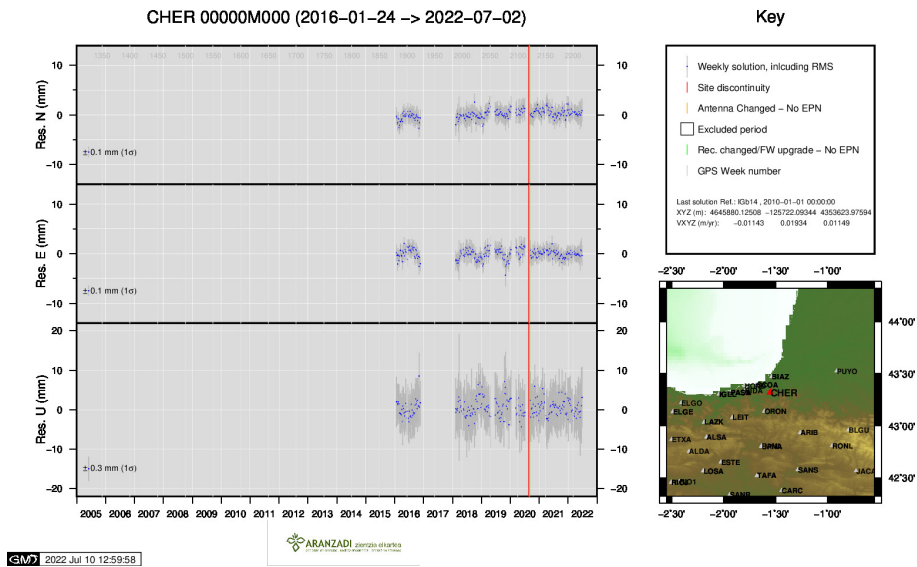
5) BIDA



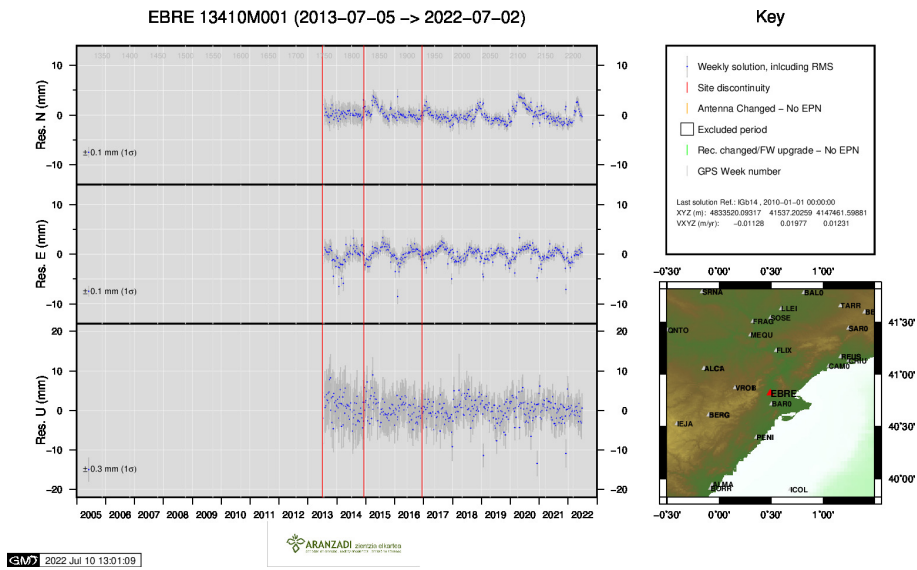
6) CACE



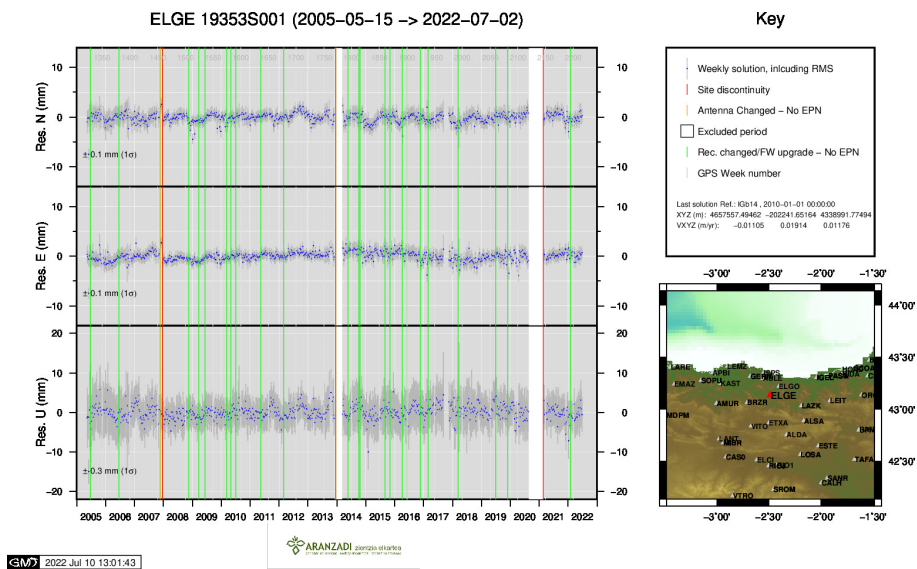
7) CANT



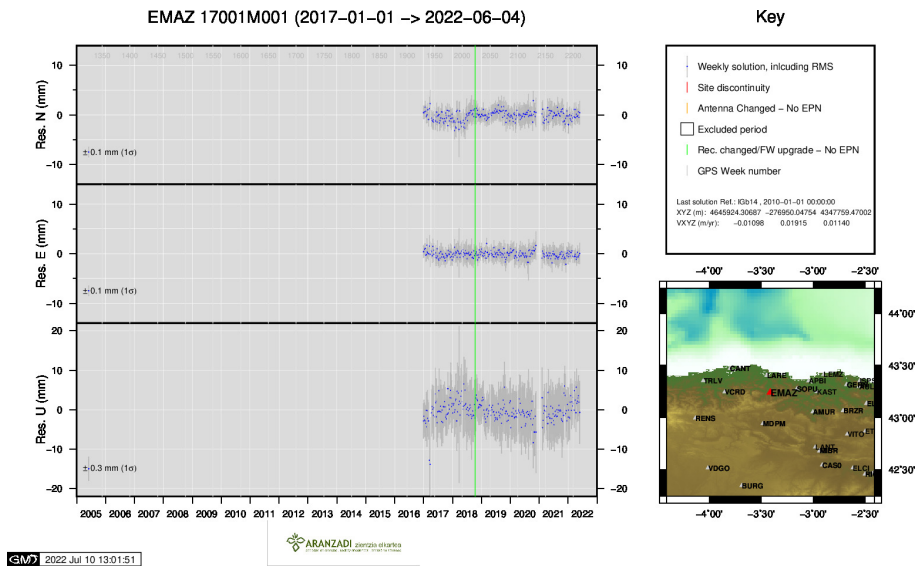
8) CHER



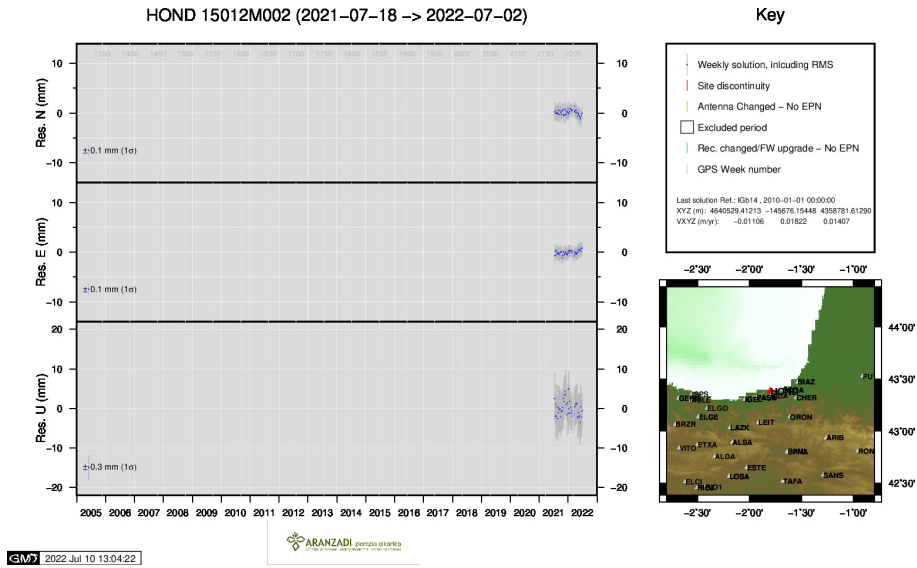
9) EBRE



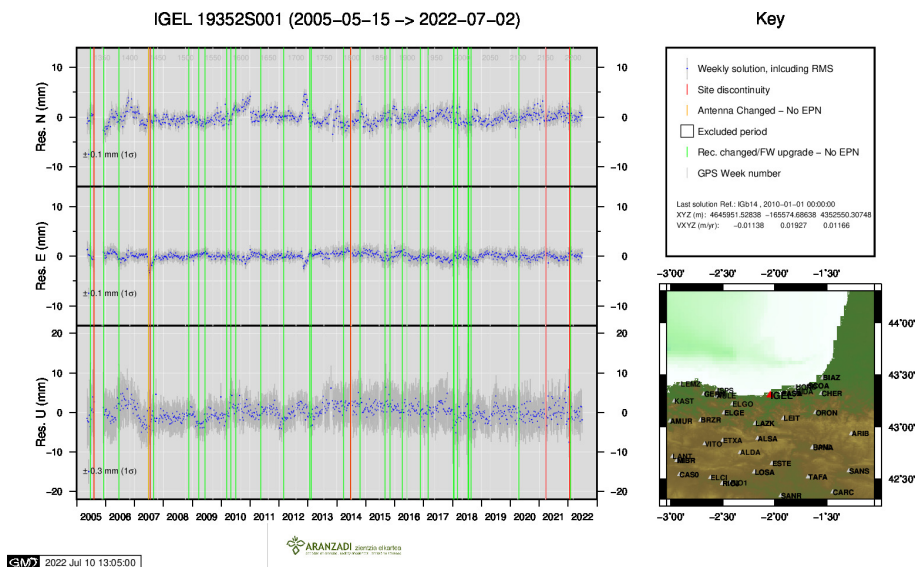
10) ELGE



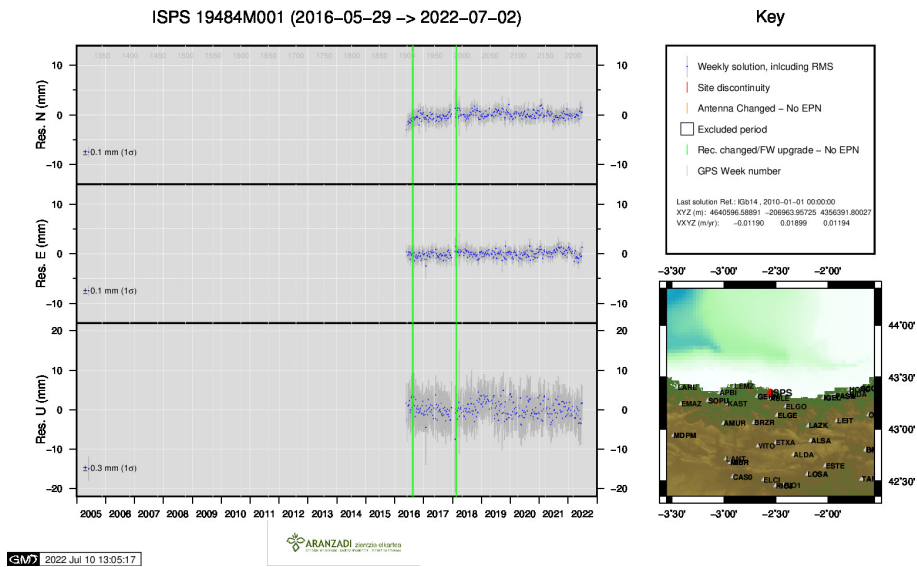
11) EMAZ



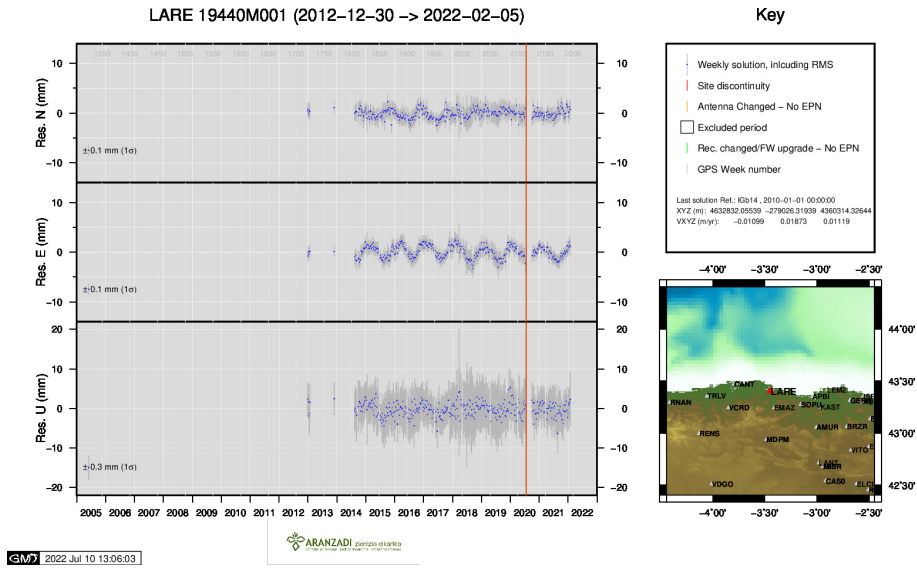
12) HOND



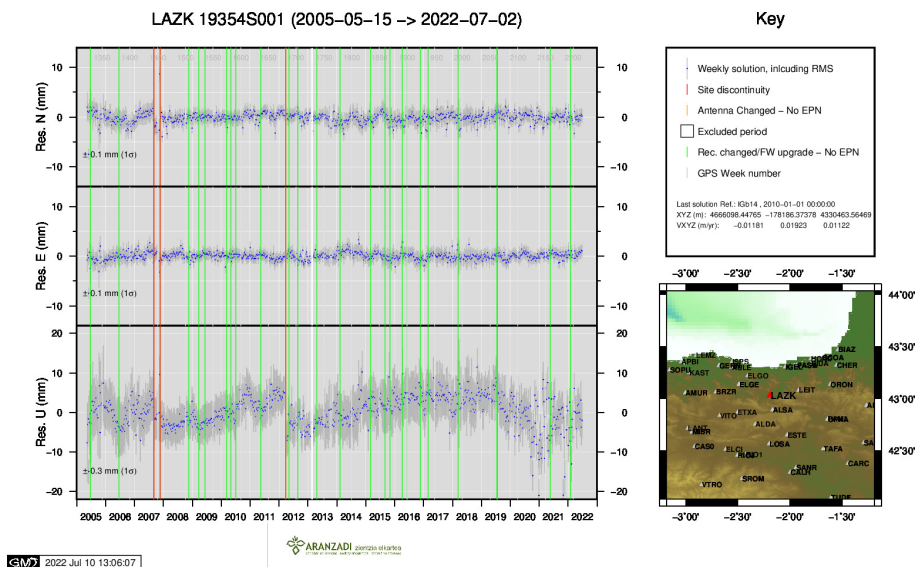
13) IGEL



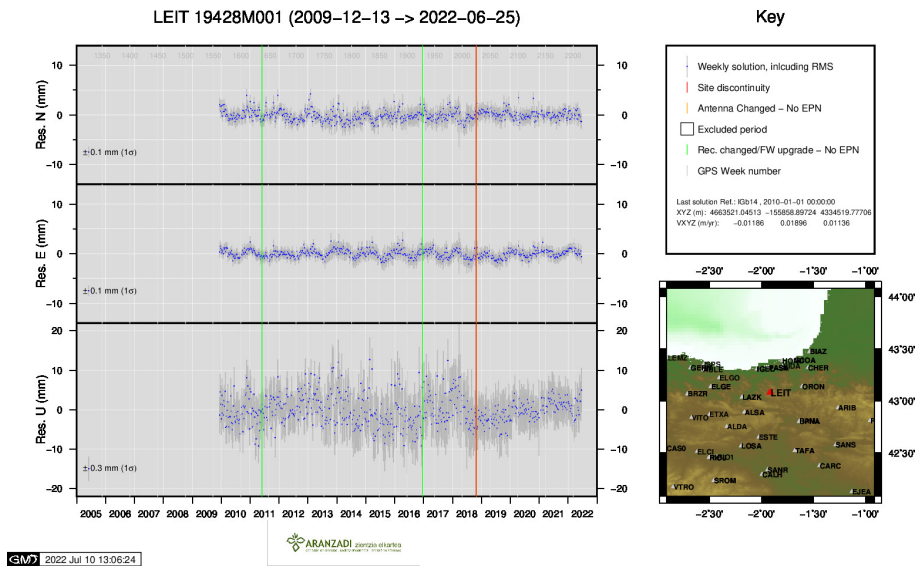
14) ISPS



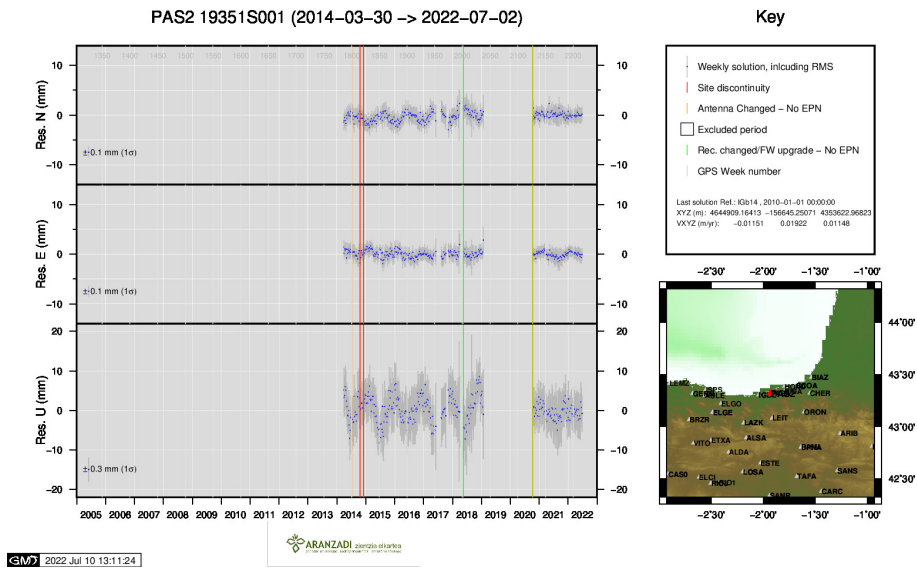
15) LARE



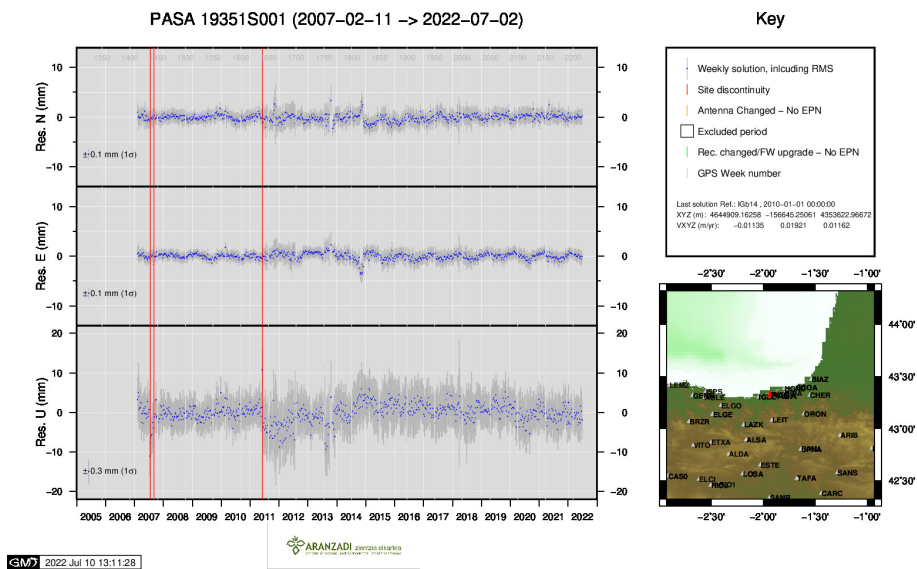
16) LAZK



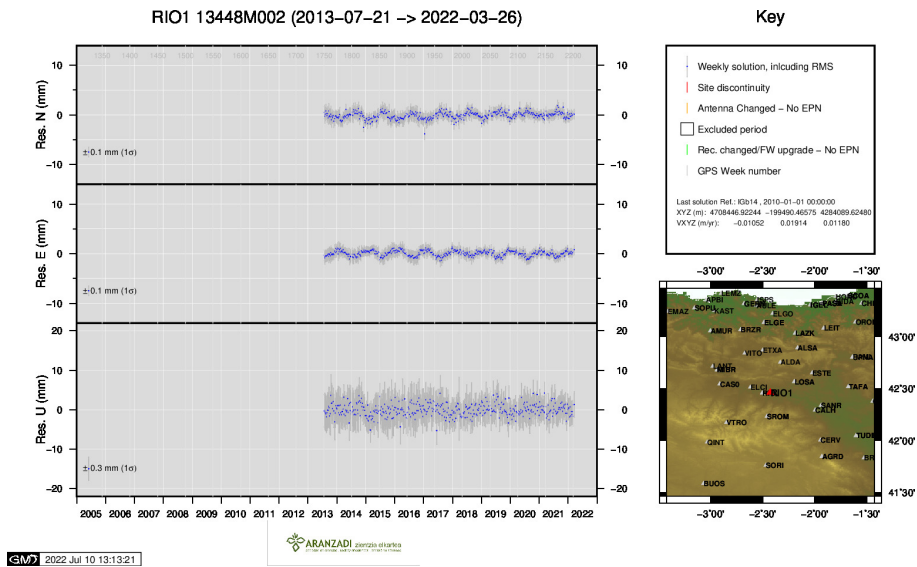
17) LEIT



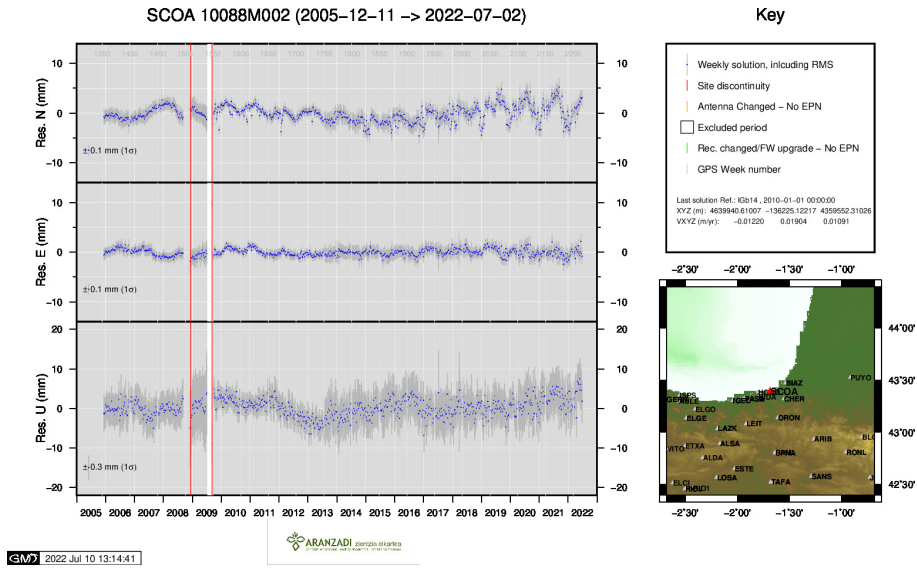
18) PAS2



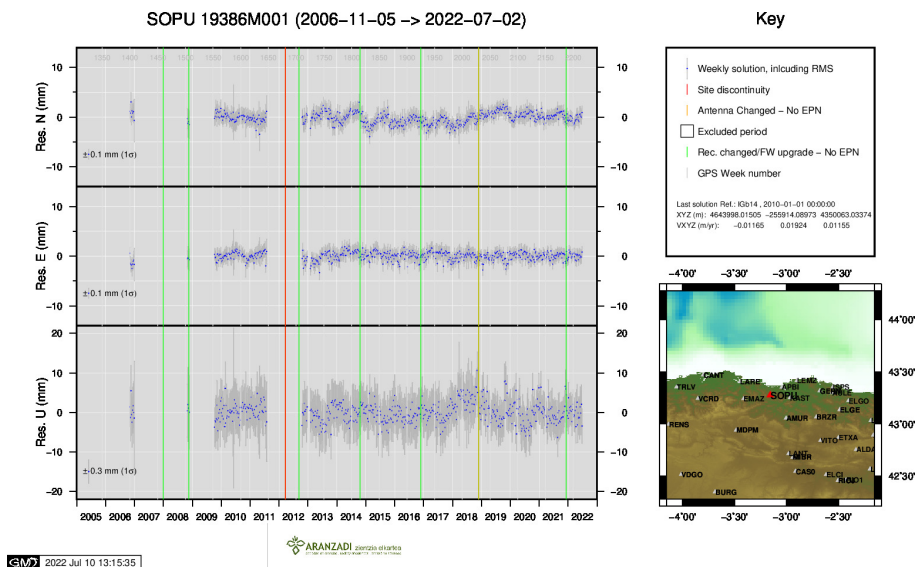
19) PASA



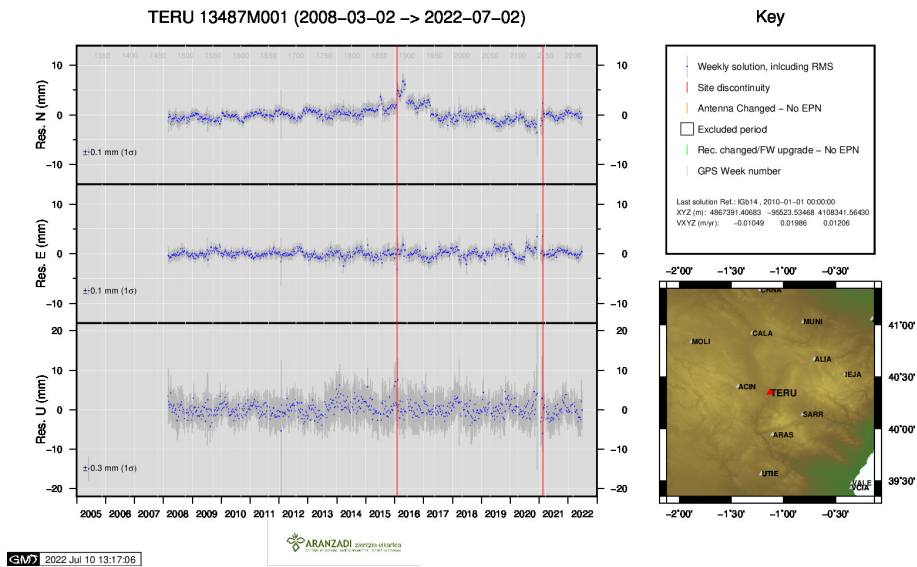
20) RIO1



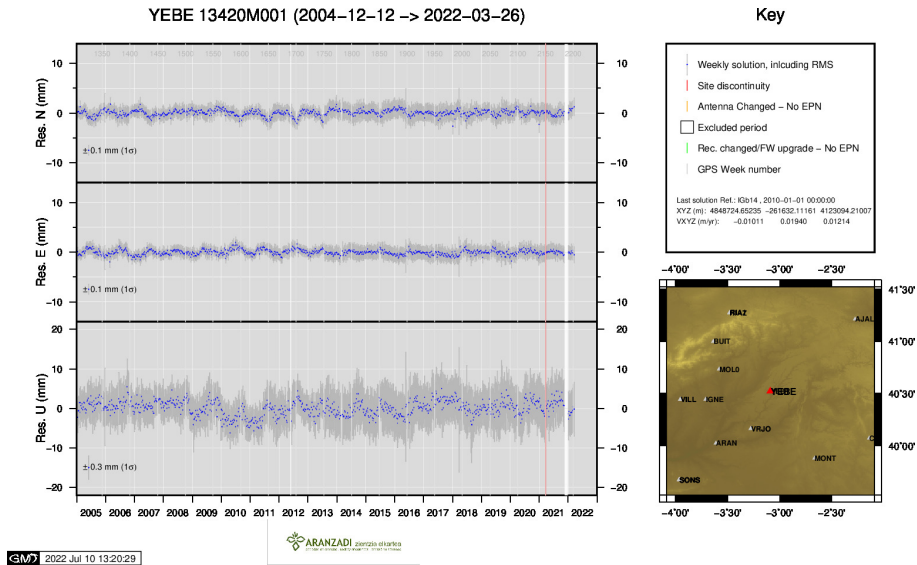
21) SCOA



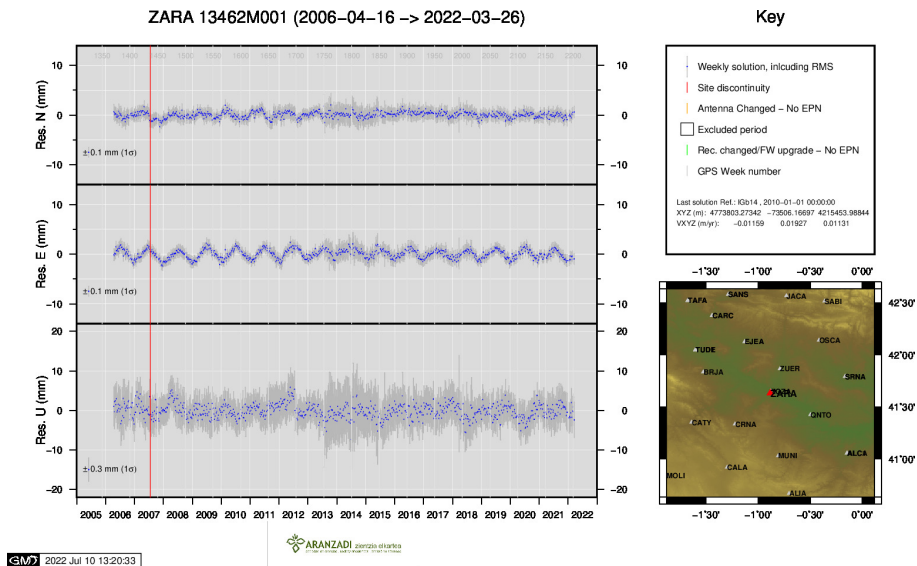
22) SOPU



23) TERU



24) YEBE



25) ZARA