# ARA-DAC Weekly Analysis Result: 2263 (GFA)

Technical Report

**GPS Week: 2263 (GFA)**

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

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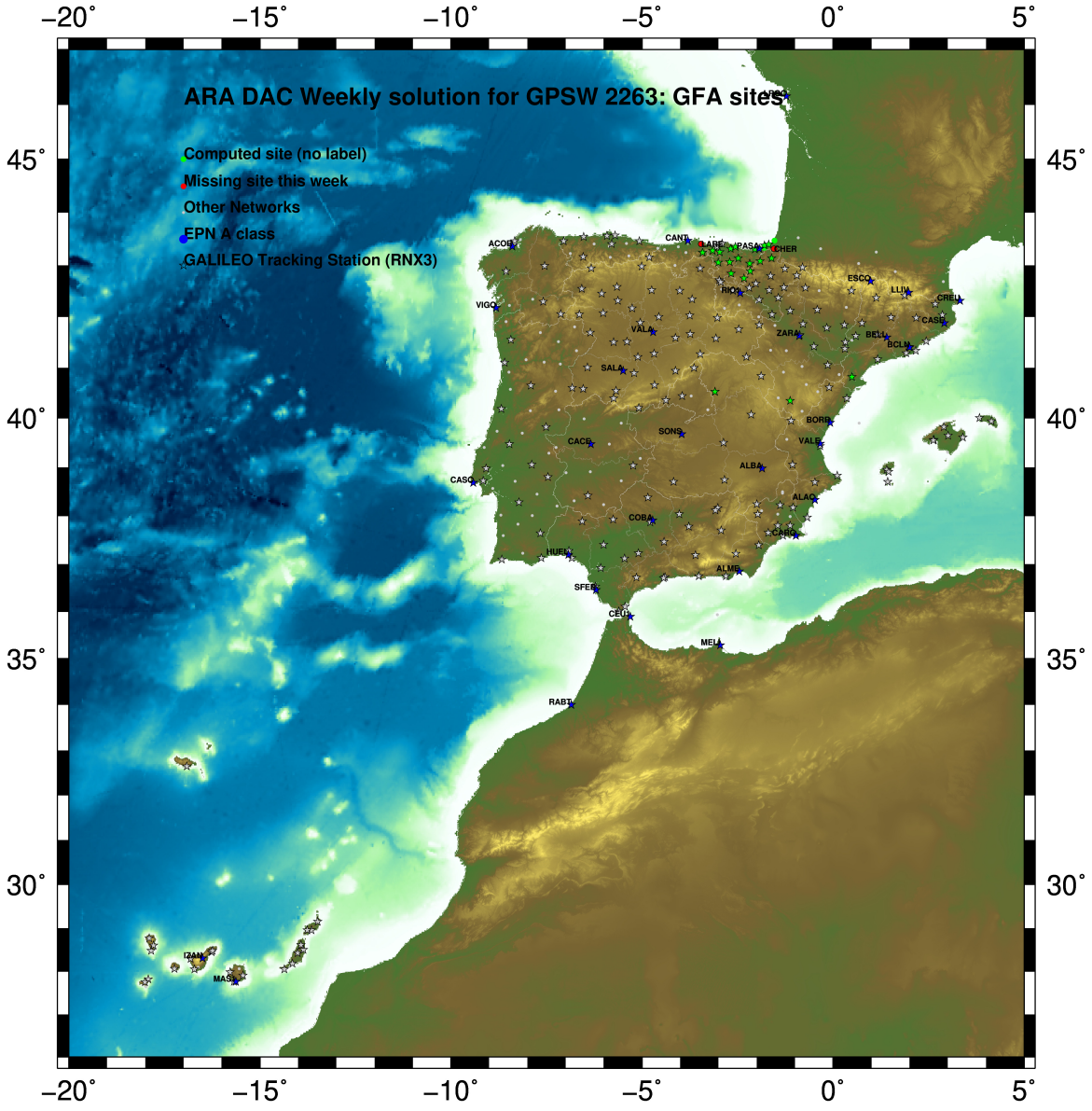
# 1 Introduction

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




GMT 2023 Jun 12 06:07:39

**Fig.1: Computed Sites for GPS Week2263 (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 is used if available starting GPS week 1986)
- 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.I20 file and individual calibrations from EPNC_20.ATX. EPN_A class sites (CRD + VEL) IGS20 used to define the reference frame (no EPN release is available at the time this report is generated). Following the EUREF guidelines, no other individual calibrations are included in the analysis starting GPSW 2238 (IGS20).
- Troposphere:
  - minimum elevation is 3 deg.; elevation dependent weighting.
  - VMF3 mapping function. ZPD parameters are estimated using the VMF3 mapping function.
  - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2014b (Scherneck).
- Atmospheric loading: not corrected, following the latest recommendations for IGS20 products.
- Tidal displacements:
  - Mean pole model : IERS2010_v1.2.0
  - Subdaily pole model: DESAI2016
  - Nutation model : IAU2000R06

# 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. DE421 planetary ephemeris and JGM3 Earth geopotential model is used.
- Ambiguity: an advanced ambiguity resolution (AR) scheme is included:
  - Code-Based Widelane (WL) and Narrow Line (NR) 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 IGS20

The Reference Frame considered in this section is a PRELIMINARY IGS20, based on the previously used IGb14 solution.

```
ARA FINAL WEEKLY COMBINATION: FINAL ORBITS                      12-JUN-23 05:03
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: IGS20             EPOCH: 2023-05-24 11:59:45

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

  4  ACOR 13434M001    4594489.51597  -678367.36024  4357066.32650    W      GRE
 39  ALDA 19383M001    4687280.11093  -190876.48987  4308106.99831    A      GRE
 50  ALSA 19419M001    4677250.78747  -176770.31942  4319079.92456    A      GRE
 53  AMUR 19388M001    4661499.40323  -244591.18148  4332269.93058    A      GRE
100  BIAZ 10074M002    4634455.99553  -124344.90059  4365785.49914    A      GR
101  BIDA 00000M000    4644177.77235  -145778.24838  4354832.52836    A      GR
113  BRZR 19387M001    4662220.94496  -220769.82344  4333309.48783    A      GRE
104  CACE 13447M001    4899866.46653  -544566.96194  4033770.25584    W      GRE
116  CANT 13438M001    4625924.27100  -307096.16205  4365771.60973    W      GRE
162  CREU 13432M001    4715420.07721   273178.13559  4271946.88957    W      GRE
204  EBRE 13410M001    4833519.94288    41537.46832  4147461.76578    A      GRE
180  ELGE 19353S001    4657557.34660  -202241.39611  4338991.93387    A      GRE
182  EMAZ 17001M001    4645924.17116  -276949.79491  4347759.62494    A      GRE
209  GERN 19389M001    4642811.27070  -217222.85024  4353278.92415    A      GRE
257  HOND 15012M002    4640529.26953  -145675.91062  4358781.80425    A      GRE
235  IGEL 19352S001    4645951.38130  -165574.42832  4352550.47035    A      GRE
240  ISPS 19484M001    4640596.43354  -206963.70249  4356391.96479    A      GRE
245  KAST 19499M001    4646949.03160  -240747.19425  4348015.04355    A      GRE
256  LAZK 19354S001    4666098.29093  -178186.11623  4330463.71759    A      GRE
261  LEIT 19428M001    4663520.88972  -155858.64442  4334519.93608    A      GRE
334  ORON 19427M001    4659695.73060  -130864.65986  4338948.93355    A      GRE
345  PAS2 19351S001    4644909.01156  -156644.99443  4353623.12442    A      GRE
493  PASA 19351S001    4644909.01170  -156644.99441  4353623.12450    W      GRE
553  RIO1 13448M002    4708446.78046  -199490.20764  4284089.78437    W      GRE
558  SALA 13469M001    4803054.44110  -462130.99661  4158379.12673    W      GRE
566  SCOA 10088M002    4639940.45747  -136224.86794  4359552.47215    A      GRE
418  SOPU 19386M001    4643997.85839  -255913.83271  4350063.18802    A      GRE
443  TERU 13487M001    4867391.27343   -95523.26935  4108341.73261    A      GRE
493  VITO 19385M001    4679397.65357  -218436.42957  4314898.41590    A      GRE
752  YEBE 13420M001    4848724.52446  -261631.85285  4123094.38016    A      GRE
755  ZARA 13462M001    4773803.12195   -73505.90900  4215454.14567    W      GRE
```

## 5.2 ETRF2000 (ETRS89) Coordinates

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

```
CONVERT TO ETRF2000                                             12-JUN-23 05:03
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2000          EPOCH: 2023-05-24 11:59:45

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

  4  ACOR 13434M001    4594489.85160  -678367.97621  4357065.85929    W
 39  ALDA 19383M001    4687280.50724  -190877.11589  4308106.52995    A
 50  ALSA 19419M001    4677251.18650  -176770.94422  4319079.45724    A
 53  AMUR 19388M001    4661499.79434  -244591.80459  4332269.46368    A
100  BIAZ 10074M002    4634456.40517  -124345.52020  4365785.03618    A
101  BIDA 00000M000    4644178.17829  -145778.86919  4354832.06428    A
113  BRZR 19387M001    4662221.33930  -220770.44658  4333309.02119    A
104  CACE 13447M001    4899866.79439  -544567.61345  4033769.76446    W
116  CANT 13438M001    4625924.65648  -307096.78111  4365771.14500    W
162  CREU 13432M001    4715420.53194   273177.50782  4271946.42506    W
204  EBRE 13410M001    4833520.35722    41536.82590  4147461.28810    A
180  ELGE 19353S001    4657557.74384  -202242.01865  4338991.46788    A
182  EMAZ 17001M001    4645924.55921  -276950.41627  4347759.15892    A
209  GERN 19389M001    4642811.66708  -217223.47108  4353278.45921    A
257  HOND 15012M002    4640529.67580  -145676.53100  4358781.34048    A
235  IGEL 19352S001    4645951.78445  -165575.04940  4352550.00585    A
240  ISPS 19484M001    4640596.83152  -206964.32304  4356391.50018    A
245  KAST 19499M001    4646949.42445  -240747.81564  4348014.57794    A
256  LAZK 19354S001    4666098.69067  -178186.73971  4330463.25120    A
261  LEIT 19428M001    4663521.29273  -155859.26754  4334519.47022    A
334  ORON 19427M001    4659696.13727  -130865.28246  4338948.46835    A
345  PAS2 19351S001    4644909.41597  -156645.61536  4353622.66013    A
493  PASA 19351S001    4644909.41611  -156645.61534  4353622.66021    W
553  RIO1 13448M002    4708447.17373  -199490.83615  4284089.31409    W
558  SALA 13469M001    4803054.78972  -462131.63675  4158378.64477    W
566  SCOA 10088M002    4639940.86505  -136225.48823  4359552.00856    A
418  SOPU 19386M001    4643998.24940  -255914.45378  4350062.72245    A
443  TERU 13487M001    4867391.66658   -95523.91615  4108341.25019    A
493  VITO 19385M001    4679398.04677  -218437.05472  4314897.94783    A
752  YEBE 13420M001    4848724.89682  -261632.49791  4123093.89707    A
755  ZARA 13462M001    4773803.52646   -73506.54482  4215453.67153    W
```

## 5.3 ETRF2014 (ETRS89) Coordinates

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

CONVERT TO ETRF2014 12-JUN-23 05:03

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2023-05-24 11:59:45

| NUM | STATION NAME | X (M) | Y (M) | Z (M) | FLAG | SYSTEM |
|---|---|---|---|---|---|---|
| 4 | ACOR 13434M001 | 4594489.81133 | -678368.01336 | 4357065.91132 | W | |
| 39 | ALDA 19383M001 | 4687280.46451 | -190877.15442 | 4308106.58185 | A | |
| 50 | ALSA 19419M001 | 4677251.14383 | -176770.98284 | 4319079.50918 | A | |
| 53 | AMUR 19388M001 | 4661499.75206 | -244591.84304 | 4332269.51563 | A | |
| 100 | BIAZ 10074M002 | 4634456.36278 | -124345.55920 | 4365785.08827 | A | |
| 101 | BIDA 00000M000 | 4644178.13587 | -145778.90808 | 4354832.11633 | A | |
| 113 | BRZR 19387M001 | 4662221.29694 | -220770.48512 | 4333309.07315 | A | |
| 104 | CACE 13447M001 | 4899866.75031 | -544567.64975 | 4033769.81566 | W | |
| 116 | CANT 13438M001 | 4625924.61479 | -307096.81949 | 4365771.19703 | W | |
| 162 | CREU 13432M001 | 4715420.48716 | 273177.46775 | 4271946.47721 | W | |
| 204 | EBRE 13410M001 | 4833520.31201 | 41536.78717 | 4147461.33973 | A | |
| 180 | ELGE 19353S001 | 4657557.70147 | -202242.05728 | 4338991.51987 | A | |
| 182 | EMAZ 17001M001 | 4645924.51721 | -276950.45467 | 4347759.21090 | A | |
| 209 | GERN 19389M001 | 4642811.62491 | -217223.50971 | 4353278.51123 | A | |
| 257 | HOND 15012M002 | 4640529.63342 | -145676.56990 | 4358781.39255 | A | |
| 235 | IGEL 19352S001 | 4645951.74208 | -165575.08820 | 4352550.05789 | A | |
| 240 | ISPS 19484M001 | 4640596.78935 | -206964.36172 | 4356391.55221 | A | |
| 245 | KAST 19499M001 | 4646949.38232 | -240747.85416 | 4348014.62993 | A | |
| 256 | LAZK 19354S001 | 4666098.64812 | -178186.77838 | 4330463.30317 | A | |
| 261 | LEIT 19428M001 | 4663521.25014 | -155859.30631 | 4334519.52221 | A | |
| 334 | ORON 19427M001 | 4659696.09462 | -130865.32133 | 4338948.52037 | A | |
| 345 | PAS2 19351S001 | 4644909.37358 | -156645.65420 | 4353622.71218 | A | |
| 493 | PASA 19351S001 | 4644909.37372 | -156645.65418 | 4353622.71226 | W | |
| 553 | RIO1 13448M002 | 4708447.13080 | -199490.87456 | 4284089.36592 | W | |
| 558 | SALA 13469M001 | 4803054.74654 | -462131.67379 | 4158378.69623 | W | |
| 566 | SCOA 10088M002 | 4639940.82264 | -136225.52716 | 4359552.06063 | A | |
| 418 | SOPU 19386M001 | 4643998.20735 | -255914.49227 | 4350062.77445 | A | |
| 443 | TERU 13487M001 | 4867391.62149 | -95523.95423 | 4108341.30164 | A | |
| 493 | VITO 19385M001 | 4679398.00421 | -218437.09319 | 4314897.99974 | A | |
| 752 | YEBE 13420M001 | 4848724.85250 | -261632.53548 | 4123093.94848 | A | |
| 755 | ZARA 13462M001 | 4773803.48236 | -73506.58339 | 4215453.72325 | 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 IGS20 solution and are given with respect to the Local frame (North-East-Up).

Comparison of individual solutions:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ACOR 13434M001 | N | 1.36 | 1.03 | 1.55 | -1.55 | -2.21 | 0.25 | -0.50 | -0.10 |
| ACOR 13434M001 | E | 1.26 | -1.29 | -0.34 | -1.02 | -0.58 | -0.05 | 2.49 | 0.36 |
| ACOR 13434M001 | U | 2.38 | -0.63 | 0.85 | -1.18 | 2.88 | -1.54 | -1.49 | -4.29 |
| ALDA 19383M001 | N | 1.33 | 0.81 | 1.47 | 1.36 | 0.30 | 1.29 | -1.04 | -1.78 |
| ALDA 19383M001 | E | 1.17 | 0.18 | 0.45 | -1.05 | -1.53 | -0.30 | 1.30 | 1.65 |
| ALDA 19383M001 | U | 2.15 | -0.33 | 0.73 | 3.30 | -0.07 | -1.32 | 3.78 | -0.29 |
| ALSA 19419M001 | N | 1.52 | 0.80 | 1.29 | 0.81 | -2.08 | 0.64 | -1.46 | -2.03 |
| ALSA 19419M001 | E | 0.55 | 0.14 | 1.28 | 0.33 | 0.15 | -0.07 | -0.18 | 0.04 |
| ALSA 19419M001 | U | 2.98 | -4.68 | -1.15 | -0.32 | 2.31 | -2.94 | 3.98 | -0.40 |
| AMUR 19388M001 | N | 0.98 | -0.23 | 0.32 | -0.04 | -2.10 | -0.46 | 0.44 | -0.90 |
| AMUR 19388M001 | E | 0.59 | 0.03 | 0.07 | -0.21 | 1.19 | 0.04 | -0.09 | 0.80 |
| AMUR 19388M001 | U | 3.26 | -5.23 | 2.07 | 2.30 | 4.07 | -2.60 | -1.67 | -0.98 |
| BIAZ 10074M002 | N | 1.10 | -0.81 | 0.48 | 0.20 | -1.03 | -1.18 | -1.32 | 1.46 |
| BIAZ 10074M002 | E | 0.59 | -0.53 | -0.03 | 0.12 | 0.98 | -0.24 | 0.89 | -0.02 |
| BIAZ 10074M002 | U | 4.04 | -2.85 | 5.92 | -0.94 | 3.49 | -2.56 | -5.28 | 2.65 |
| BIDA 00000M000 | N | 1.32 | 1.15 | 0.56 | -0.25 | -2.44 | 0.69 | -1.04 | -1.12 |
| BIDA 00000M000 | E | 1.28 | -0.52 | -0.18 | -0.66 | -0.14 | -0.98 | 1.74 | 2.25 |
| BIDA 00000M000 | U | 4.09 | -3.84 | 2.16 | 1.68 | 0.73 | -6.95 | 1.37 | 5.27 |
| BRZR 19387M001 | N | 0.98 | -0.31 | 0.89 | -0.11 | -1.71 | -0.84 | -1.08 | 0.21 |
| BRZR 19387M001 | E | 0.91 | 0.39 | -0.03 | 1.95 | 0.26 | 0.29 | -0.06 | -0.93 |
| BRZR 19387M001 | U | 5.66 | -4.32 | -3.04 | 11.34 | 2.77 | -2.59 | -1.66 | -4.30 |
| CACE 13447M001 | N | 0.64 | 0.00 | -0.47 | -0.38 | | 0.05 | -0.68 | 1.10 |
| CACE 13447M001 | E | 0.72 | -0.89 | -0.81 | -0.30 | | -0.55 | 0.20 | 0.82 |
| CACE 13447M001 | U | 1.48 | -2.10 | -2.35 | 0.64 | | -0.03 | -0.24 | 0.74 |
| CANT 13438M001 | N | 0.82 | -0.52 | 0.46 | -0.35 | -1.69 | 0.48 | -0.53 | 0.24 |
| CANT 13438M001 | E | 0.55 | 0.33 | 0.12 | 0.83 | 0.83 | -0.04 | -0.56 | -0.15 |
| CANT 13438M001 | U | 2.52 | -1.39 | -1.38 | 0.64 | 0.75 | -4.02 | 4.09 | 0.58 |
| CREU 13432M001 | N | 1.07 | 0.70 | -0.24 | 0.42 | -2.24 | 0.11 | -0.13 | 1.05 |
| CREU 13432M001 | E | 1.13 | 1.71 | 1.18 | 1.39 | 0.69 | -0.15 | -0.54 | -0.78 |
| CREU 13432M001 | U | 2.57 | -3.14 | -2.71 | 0.92 | 0.53 | -0.10 | 1.46 | -4.38 |
| EBRE 13410M001 | N | 0.60 | 0.00 | -0.13 | 0.99 | -0.99 | 0.06 | -0.41 | 0.08 |
| EBRE 13410M001 | E | 1.06 | 1.87 | 1.10 | 0.08 | 1.16 | 0.04 | -0.78 | -0.29 |
| EBRE 13410M001 | U | 3.90 | -4.18 | -3.41 | -1.60 | 2.10 | 4.99 | 1.53 | -5.30 |
| ELGE 19353S001 | N | 1.45 | 0.20 | 0.62 | -1.63 | -2.92 | -0.43 | 0.28 | 0.89 |
| ELGE 19353S001 | E | 0.82 | 0.39 | 0.06 | 0.48 | 1.81 | 0.13 | -0.43 | -0.46 |
| ELGE 19353S001 | U | 3.54 | -5.17 | -1.16 | -0.63 | 1.40 | -3.48 | 5.47 | 1.61 |
| EMAZ 17001M001 | N | 1.29 | -0.13 | 1.29 | -0.70 | -2.48 | -0.37 | -0.81 | 0.95 |
| EMAZ 17001M001 | E | 0.66 | 0.19 | 0.28 | -0.80 | 0.87 | 1.07 | -0.07 | -0.02 |
| EMAZ 17001M001 | U | 8.32 | -11.09 | -9.04 | 10.30 | 8.42 | 2.75 | -2.96 | -4.10 |
| GERN 19389M001 | N | 0.73 | -0.42 | 0.10 | 0.05 | -1.70 | -0.11 | -0.11 | -0.23 |
| GERN 19389M001 | E | 0.77 | 0.33 | 0.17 | 0.90 | 0.72 | 0.60 | -0.36 | -1.28 |
| GERN 19389M001 | U | 5.27 | -5.03 | -4.21 | -1.07 | 5.66 | -7.48 | 1.85 | 5.57 |
| HOND 15012M002 | N | 1.25 | -0.69 | 0.60 | 0.70 | -2.67 | -0.10 | -0.79 | 0.53 |
| HOND 15012M002 | E | 0.39 | 0.76 | -0.07 | 0.02 | 0.00 | 0.21 | 0.53 | -0.12 |
| HOND 15012M002 | U | 3.37 | -5.28 | 2.57 | 0.56 | 1.72 | -3.67 | 0.45 | 4.08 |
| IGEL 19352S001 | N | 1.51 | -0.49 | 0.33 | 0.53 | -3.14 | -0.92 | -0.22 | 1.48 |
| IGEL 19352S001 | E | 0.58 | 0.63 | 0.73 | -0.10 | 0.37 | -0.42 | -0.55 | 0.69 |
| IGEL 19352S001 | U | 2.75 | -2.73 | 1.23 | -1.11 | 0.92 | -3.51 | 0.34 | 4.68 |
| ISPS 19484M001 | N | 1.43 | -0.09 | -0.17 | -0.68 | -2.49 | -1.35 | 0.59 | 1.86 |
| ISPS 19484M001 | E | 1.24 | 0.04 | 0.68 | 0.41 | 0.96 | 0.80 | 0.80 | -2.55 |
| ISPS 19484M001 | U | 2.84 | -3.63 | -0.61 | -1.10 | 1.93 | -2.80 | -2.63 | 3.87 |
| KAST 19499M001 | N | 0.96 | 0.27 | 0.38 | -0.11 | -0.68 | -0.44 | -1.22 | -1.78 |
| KAST 19499M001 | E | 0.46 | -0.05 | 0.01 | 0.92 | -0.61 | 0.08 | 0.11 | 0.12 |
| KAST 19499M001 | U | 6.40 | -8.22 | -5.89 | 6.68 | 9.05 | -2.36 | 0.02 | -3.36 |
| LAZK 19354S001 | N | 0.79 | 0.12 | 0.40 | -0.11 | -1.58 | -0.12 | 0.21 | -0.98 |
| LAZK 19354S001 | E | 1.67 | 1.97 | 1.51 | 0.91 | 1.00 | -0.21 | -0.70 | -2.86 |
| LAZK 19354S001 | U | 5.97 | -6.98 | -3.12 | -4.88 | -1.41 | -1.89 | 9.78 | 5.53 |
| LEIT 19428M001 | N | 0.76 | -0.03 | 0.48 | -0.48 | -0.61 | 0.44 | -1.43 | -0.65 |
| LEIT 19428M001 | E | 0.75 | 0.77 | 0.18 | 0.40 | 0.50 | -0.85 | -0.58 | 1.14 |
| LEIT 19428M001 | U | 4.63 | -3.84 | -2.12 | -4.16 | -3.79 | 0.85 | 4.79 | 7.33 |
| ORON 19427M001 | N | 1.03 | -0.80 | 0.08 | 0.58 | -1.79 | -0.55 | -1.25 | 0.61 |
| ORON 19427M001 | E | 0.94 | -0.62 | -0.06 | 0.42 | -0.58 | -1.52 | 1.31 | 0.60 |
| ORON 19427M001 | U | 3.09 | -1.59 | -1.47 | -0.69 | 3.93 | -5.98 | 0.24 | 0.89 |
| PAS2 19351S001 | N | 1.01 | 0.50 | 0.75 | 0.20 | -1.89 | -0.86 | -0.93 | -0.27 |
| PAS2 19351S001 | E | 0.61 | 0.13 | 0.58 | -0.42 | 0.24 | -0.05 | -0.32 | 1.24 |
| PAS2 19351S001 | U | 2.19 | -2.87 | 1.84 | -0.76 | 0.67 | -2.84 | 1.67 | 2.30 |
| PASA 19351S001 | N | 1.01 | 0.53 | 0.73 | 0.29 | -1.89 | -0.88 | -0.90 | -0.29 |
| PASA 19351S001 | E | 0.63 | 0.07 | 0.55 | -0.45 | 0.31 | -0.07 | -0.36 | 1.29 |
| PASA 19351S001 | U | 2.24 | -2.92 | 1.90 | -0.85 | 0.79 | -2.92 | 1.66 | 2.31 |
| RIO1 13448M002 | N | 0.97 | -1.22 | 0.72 | -0.02 | -1.86 | -0.20 | -0.38 | -0.13 |
| RIO1 13448M002 | E | 0.63 | -0.44 | 0.15 | 0.11 | 0.53 | -0.26 | 0.52 | 1.23 |
| RIO1 13448M002 | U | 2.85 | 0.04 | -1.80 | -0.28 | 4.59 | -4.92 | 0.27 | -0.13 |
| SALA 13469M001 | N | 0.68 | -0.43 | -0.54 | 0.15 | -0.84 | -0.40 | 0.05 | -1.18 |
| SALA 13469M001 | E | 0.60 | 1.11 | 0.59 | 0.31 | -0.16 | 0.32 | -0.13 | -0.62 |
| SALA 13469M001 | U | 2.20 | 1.44 | -1.13 | -4.15 | -1.47 | 1.76 | 0.64 | 1.67 |
| SCOA 10088M002 | N | 1.03 | -0.29 | -0.26 | 0.74 | -2.01 | -0.54 | -0.88 | 0.77 |
| SCOA 10088M002 | E | 1.66 | -0.18 | 0.08 | -1.57 | 0.16 | -0.35 | 0.36 | 3.70 |
| SCOA 10088M002 | U | 3.99 | -4.45 | 1.95 | 1.59 | 2.32 | -4.19 | -2.30 | 6.42 |
| SOPU 19386M001 | N | 1.06 | -0.13 | 0.11 | 0.31 | -2.38 | -0.11 | -0.92 | -0.34 |
| SOPU 19386M001 | E | 0.32 | 0.28 | 0.25 | 0.53 | -0.27 | -0.30 | 0.13 | -0.07 |
| SOPU 19386M001 | U | 3.63 | -3.11 | -5.15 | -0.97 | 2.32 | 0.22 | 5.36 | -2.76 |
| TERU 13487M001 | N | 0.72 | -0.33 | 1.06 | 0.65 | | -0.48 | -0.26 | 0.78 |
| TERU 13487M001 | E | 0.51 | -0.83 | 0.01 | 0.73 | | 0.06 | 0.04 | -0.29 |
| TERU 13487M001 | U | 2.76 | 1.37 | 1.63 | 4.43 | | -3.53 | -0.11 | -1.22 |
| VITO 19385M001 | N | 0.87 | -0.40 | -0.02 | 0.17 | -1.84 | -0.56 | -0.70 | 0.32 |
| VITO 19385M001 | E | 0.78 | 1.46 | -0.04 | 0.49 | 0.28 | -0.41 | 0.45 | -0.90 |
| VITO 19385M001 | U | 2.47 | -2.88 | 0.23 | -0.05 | 3.24 | -2.94 | 2.28 | -1.98 |
| YEBE 13420M001 | N | 1.13 | 0.01 | 0.20 | 0.05 | -2.58 | 0.54 | -0.55 | -0.63 |
| YEBE 13420M001 | E | 0.69 | 0.38 | -0.22 | -0.93 | 0.36 | 0.06 | 1.13 | 0.63 |
| YEBE 13420M001 | U | 1.52 | -1.26 | 0.86 | 2.13 | -2.13 | 0.35 | -0.74 | -1.32 |
| ZARA 13462M001 | N | 0.79 | -0.03 | 0.42 | 0.28 | -1.30 | -0.70 | -0.54 | -0.99 |
| ZARA 13462M001 | E | 0.74 | 0.31 | 1.01 | -0.58 | 1.18 | -0.09 | -0.11 | 0.66 |
| ZARA 13462M001 | U | 2.51 | -2.60 | -1.77 | 1.27 | 0.22 | -0.93 | 2.96 | -4.08 |

## 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.

TRANSFORMATION IN EQUATORIAL SYSTEM (X, Y, Z):
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

LIST OF REMOVED STATIONS:

OUTLIER CRITERIA: 15.00 15.00 20.00

| NUM | NAME | FLG | RESIDUALS IN MILLIMETERS | | |
|---|---|---|---|---|---|
| 1 | ACOR 13434M001 | I W | -1.29 | 3.18 | 1.07 |
| 2 | ALAC 13433M001 | I W | -2.24 | 1.74 | 3.03 |
| 3 | ALBA 13452M001 | I W | 3.45 | -1.39 | -7.39 |
| 4 | ALME 13437M001 | I W | -1.94 | 0.35 | 4.68 |
| 5 | BCLN 13412M001 | I W | 1.29 | -1.44 | 0.04 |
| 6 | BELL 13431M001 | I W | -0.22 | -0.28 | 1.33 |
| 7 | BORR 13480M001 | I W | -3.39 | 0.20 | 0.59 |
| 8 | BRST 10004M004 | I W | -4.60 | -0.59 | -1.36 |
| 9 | CACE 13447M001 | I W | 1.13 | 1.73 | 0.61 |
| 10 | CANT 13438M001 | I W | -4.16 | 2.95 | -8.76 |
| 11 | CARG 19412M001 | I W | 2.23 | -0.04 | -4.82 |
| 12 | CASE 13494M001 | I W | -5.08 | -0.16 | 0.91 |
| 13 | CEU1 13449M002 | I W | 1.62 | -0.76 | -2.79 |
| 14 | COBA 13453M001 | I W | 1.95 | 1.31 | -5.53 |
| 15 | CREU 13432M001 | I W | -2.78 | 0.41 | 0.76 |
| 17 | ESCO 13435M001 | I W | -4.24 | -0.32 | 3.42 |
| 18 | HUEL 13451M001 | I W | 9.75 | -7.29 | 9.57 |
| 20 | IZAN 31309M002 | I W | 2.22 | 3.20 | 0.56 |
| 21 | LLIV 13436M001 | I W | -0.54 | 0.79 | 3.06 |
| 23 | LROC 10023M001 | I W | -0.53 | 1.00 | 9.16 |
| 25 | MAS1 31303M002 | I W | 1.65 | 0.96 | -2.44 |
| 26 | MELI 19379M001 | I W | 4.07 | 1.40 | -8.87 |
| 27 | PASA 19351S001 | I W | 0.06 | 0.44 | -3.72 |
| 28 | PDEL 31906M004 | I W | 2.32 | -0.44 | 10.58 |
| 29 | RABT 35001M002 | I W | 1.08 | 0.52 | -8.12 |
| 30 | RIO1 13448M002 | I W | -2.63 | -1.52 | -0.60 |
| 31 | SALA 13469M001 | I W | 0.75 | 2.88 | -2.40 |
| 33 | SFER 13402M004 | I W | -2.19 | -9.14 | 3.75 |
| 34 | SONS 13446M001 | I W | 0.08 | 2.93 | -2.56 |
| 35 | VALA 13463M002 | I W | 0.05 | 1.31 | -3.31 |
| 36 | VALE 13439M001 | I W | -4.45 | 3.01 | -6.78 |
| 37 | VIGO 13450M001 | I W | 2.60 | 0.52 | 2.61 |
| 40 | ZARA 13462M001 | I W | -1.83 | 0.46 | -2.44 |
| 41 | ZIMM 14001M004 | I W | -1.52 | -1.57 | 6.10 |
| 297 | CASC 13909S001 | A W | 4.63 | -6.93 | 6.93 |
| | RMS / COMPONENT | | 3.12 | 2.79 | 5.10 |
| | IQR | | 4.19 | 1.99 | 6.38 |
| | MEAN | | -0.08 | -0.02 | -0.09 |
| | MEDIAN | | 0.05 | 0.44 | 0.56 |
| | MIN | | -5.08 | -9.14 | -8.87 |
| | MAX | | 9.75 | 3.20 | 10.58 |
| | OVERALL RMS/IQR/MAX(3D) | | 3.81 | 3.93 | 15.48 HUEL 13451M001 #SUM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ALL | RMS / COMPONENT | | 3.12 | 2.79 | 5.10 | | |
| ALL | IQR | | 4.19 | 1.99 | 6.38 | | |
| ALL | MEAN | | -0.08 | -0.02 | -0.09 | | |
| ALL | MEDIAN | | 0.05 | 0.44 | 0.56 | | |
| ALL | MIN | | -5.08 | -9.14 | -8.87 | | |
| ALL | MAX | | 9.75 | 3.20 | 10.58 | | |
| ALL | OVERALL RMS/IQR/MAX(3D) | | 3.81 | 3.93 | 15.48 | HUEL 13451M001 | #SUM_ALL |

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 35
NUMBER OF COORDINATES : 105
RMS OF TRANSFORMATION : 3.81 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.64 MM
TRANSLATION IN Y : 0.01 +- 0.64 MM
TRANSLATION IN Z : 0.00 +- 0.64 MM

NUMBER OF ITERATIONS : 1

## 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                      19611313
 NUMBER OF UNKNOWNS                            195547
 NUMBER OF DEGREES OF FREEDOM                19415766
 PHASE MEASUREMENTS SIGMA                     0.00100
 SAMPLING INTERVAL (SECONDS)                      180
 VARIANCE FACTOR                 2.128710105947512
```

# 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 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 ALDA  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 ALSA  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 BIAZ  A    1 P 23:141:00000 23:147:86370 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 23:141:00000 23:147:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 23:141:00000 23:147:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 23:141:00000 23:147:86370 LEICA GR10           ----- -----------
 CREU  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 EMAZ  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 HOND  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 IGEL  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 23:141:00000 23:147:86370 TRIMBLE NETR9        ----- -----------
 KAST  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 LAZK  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 LEIT  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 PAS2  A    1 P 23:141:00000 23:147:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 23:141:00000 23:147:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 SCOA  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 SOPU  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 VITO  A    1 P 23:141:00000 23:147:86370 LEICA GR30           ----- -----------
 YEBE  A    1 P 23:141:00000 23:147:86370 LEICA GR50           ----- -----------
 ZARA  A    1 P 23:141:00000 23:147:86370 TRIMBLE NETR9        ----- -----------
```

## 7.2 Antennas

Serial number ONLY provided in case individual calibrations are used.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__ DAZI
 ACOR  A    1 P 23:141:00000 23:147:86370 LEIAT504         LEIS -----
 ALDA  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 ALSA  A    1 P 23:141:00000 23:147:86370 LEIAR10          NONE -----
 AMUR  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 BIAZ  A    1 P 23:141:00000 23:147:86370 LEIAR25          LEIT -----
 BIDA  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 BRZR  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 CACE  A    1 P 23:141:00000 23:147:86370 TRM29659.00      NONE -----
 CANT  A    1 P 23:141:00000 23:147:86370 LEIAR25.R4       LEIT -----
 CREU  A    1 P 23:141:00000 23:147:86370 LEIAR25.R4       NONE -----
 EBRE  A    1 P 23:141:00000 23:147:86370 LEIAR25.R4       NONE -----
 ELGE  A    1 P 23:141:00000 23:147:86370 LEIAR25.R4       LEIT -----
 EMAZ  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 GERN  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 HOND  A    1 P 23:141:00000 23:147:86370 LEIAR20          LEIM -----
 IGEL  A    1 P 23:141:00000 23:147:86370 LEIAR20          LEIM -----
 ISPS  A    1 P 23:141:00000 23:147:86370 TRM59900.00      SCIS -----
 KAST  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 LAZK  A    1 P 23:141:00000 23:147:86370 LEIAR25.R4       LEIT -----
 LEIT  A    1 P 23:141:00000 23:147:86370 LEIAR10          NONE -----
 ORON  A    1 P 23:141:00000 23:147:86370 LEIAR10          NONE -----
 PAS2  A    1 P 23:141:00000 23:147:86370 LEIAR20          LEIM -----
 PASA  A    1 P 23:141:00000 23:147:86370 LEIAR20          LEIM -----
 RIO1  A    1 P 23:141:00000 23:147:86370 LEIAR25.R4       LEIT -----
 SALA  A    1 P 23:141:00000 23:147:86370 LEIAR25          NONE -----
 SCOA  A    1 P 23:141:00000 23:147:86370 TRM55971.00      NONE -----
 SOPU  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 TERU  A    1 P 23:141:00000 23:147:86370 LEIAR20          LEIM -----
 VITO  A    1 P 23:141:00000 23:147:86370 LEIAS10          NONE -----
 YEBE  A    1 P 23:141:00000 23:147:86370 LEIAR20          LEIM -----
 ZARA  A    1 P 23:141:00000 23:147:86370 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 23:141:00000 23:147:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 23:141:00000 23:147:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 23:141:00000 23:147:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 23:141:00000 23:147:86370 UNE   3.0490   0.0000   0.0000
 CREU  A    1 P 23:141:00000 23:147:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 23:141:00000 23:147:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 EMAZ  A    1 P 23:141:00000 23:147:86370 UNE   0.0350   0.0000   0.0000
 GERN  A    1 P 23:141:00000 23:147:86370 UNE   0.0771   0.0000   0.0000
 HOND  A    1 P 23:141:00000 23:147:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 23:141:00000 23:147:86370 UNE   0.0350   0.0000   0.0000
 KAST  A    1 P 23:141:00000 23:147:86370 UNE   0.0350   0.0000   0.0000
 LAZK  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 LEIT  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 ORON  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 PAS2  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 23:141:00000 23:147:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 23:141:00000 23:147:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 23:141:00000 23:147:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 23:141:00000 23:147:86370 UNE   0.0600   0.0000   0.0000
 VITO  A    1 P 23:141:00000 23:147:86370 UNE   0.0000   0.0000   0.0000
 YEBE  A    1 P 23:141:00000 23:147:86370 UNE   0.0600   0.0000   0.0000
 ZARA  A    1 P 23:141:00000 23:147:86370 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:

```
2023-06-11 06:42 UTC | ALSA1410.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-11 10:05 UTC | ALSA1420.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-11 13:32 UTC | ALSA1430.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-11 16:34 UTC | ALSA1440.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-11 19:38 UTC | ALSA1450.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-12 00:54 UTC | ALSA1460.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-12 04:38 UTC | ALSA1470.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: alsa00esp_20181108.log
2023-06-11 06:42 UTC | ISPS1410.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-11 10:05 UTC | ISPS1420.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-11 13:32 UTC | ISPS1430.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-11 16:34 UTC | ISPS1440.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-11 19:38 UTC | ISPS1450.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-12 00:55 UTC | ISPS1460.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-12 04:38 UTC | ISPS1470.23O | RECEIVER FIRM. VERS. |  5.30 -> 5.22 (source: isps00esp_20220907.log
2023-06-11 06:42 UTC | LEIT1410.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-11 10:05 UTC | LEIT1420.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-11 13:32 UTC | LEIT1430.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-11 16:34 UTC | LEIT1440.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-11 19:38 UTC | LEIT1450.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-12 00:55 UTC | LEIT1460.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-12 04:38 UTC | LEIT1470.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: leit00esp_20181204.log
2023-06-11 06:42 UTC | ORON1410.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
2023-06-11 10:05 UTC | ORON1420.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
2023-06-11 13:32 UTC | ORON1430.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
2023-06-11 16:34 UTC | ORON1440.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
2023-06-11 19:38 UTC | ORON1450.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
2023-06-12 00:55 UTC | ORON1460.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
2023-06-12 04:38 UTC | ORON1470.23O | RECEIVER FIRM. VERS. |  4.31/7.403 -> 4.31 (source: oron00esp_20181101.log
```

# 9 References

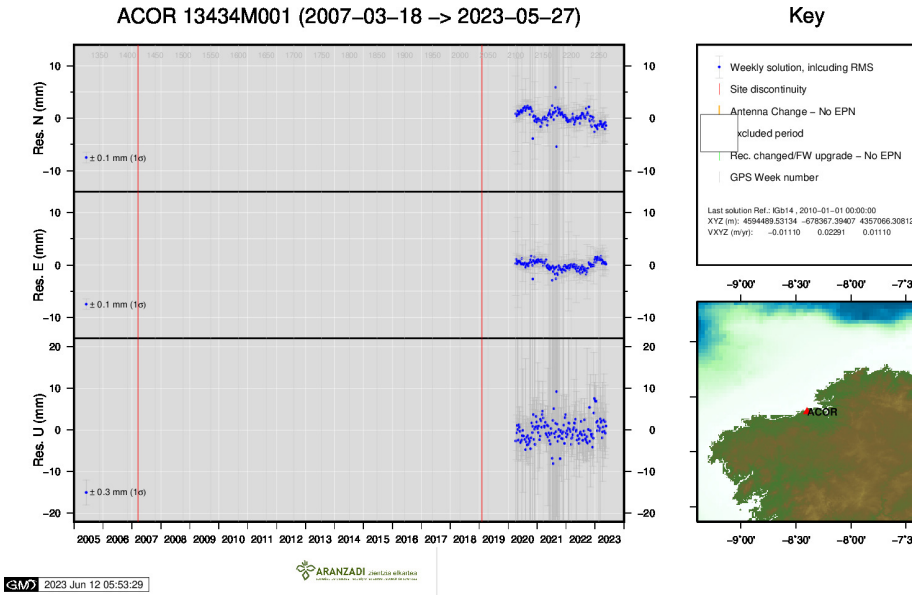
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

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*

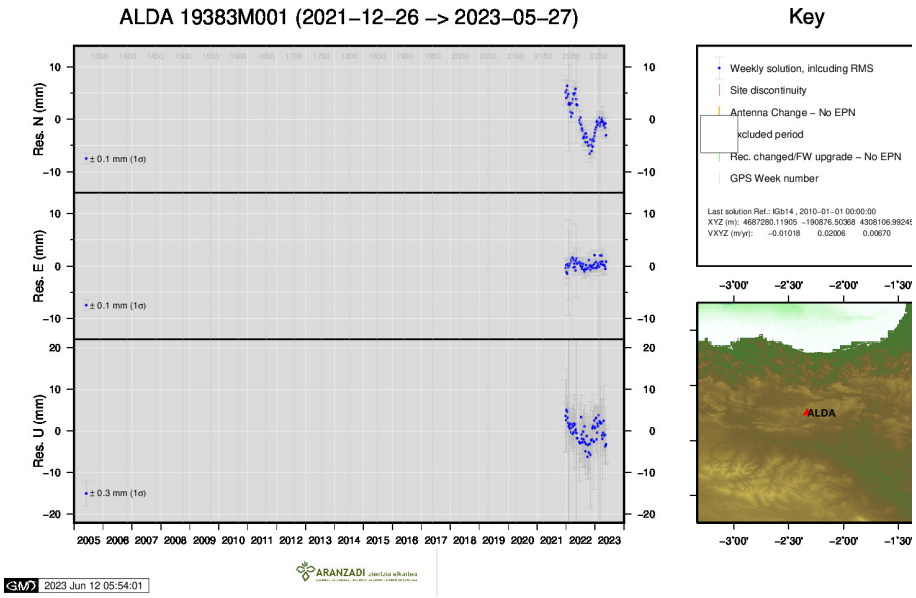
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

# 10 Cumulative Time Series

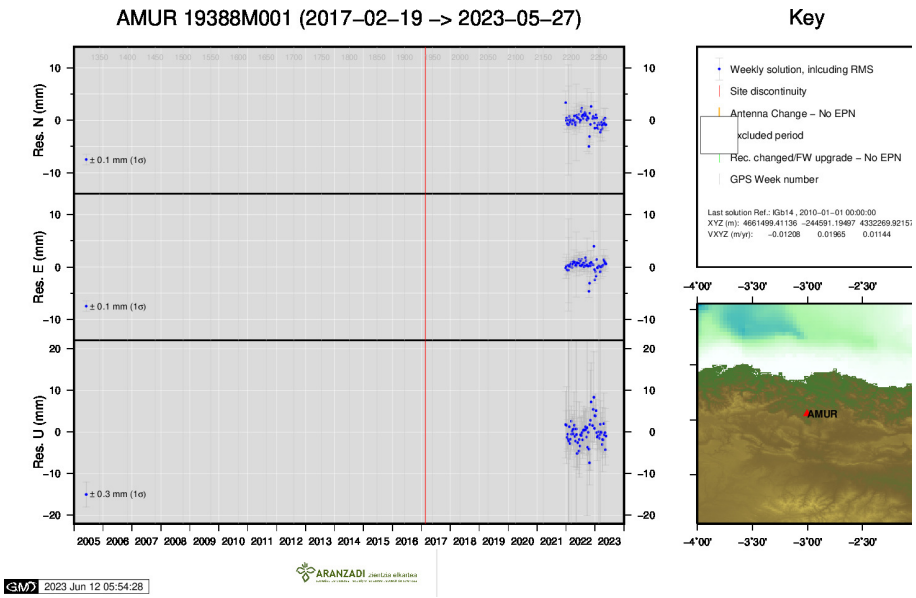
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



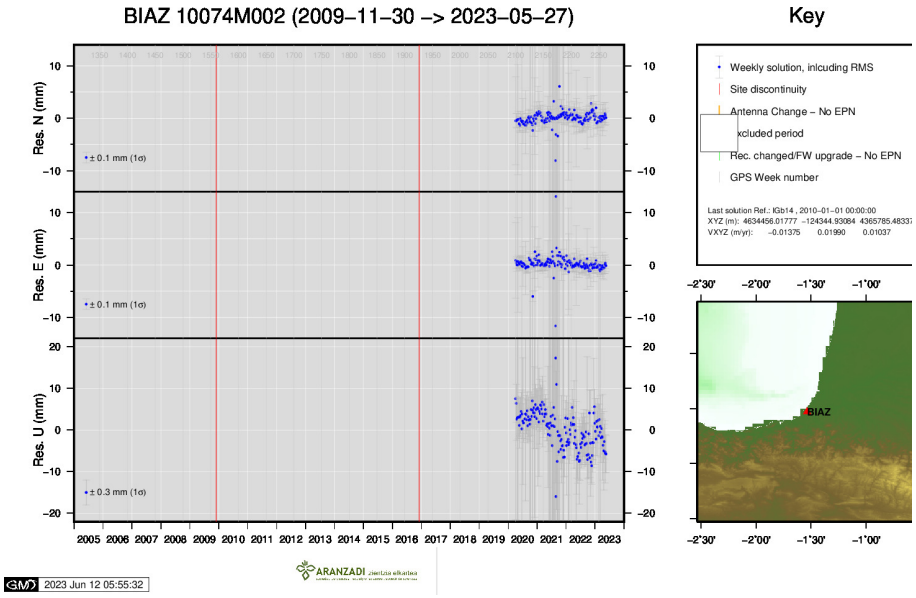

1 ) ACOR



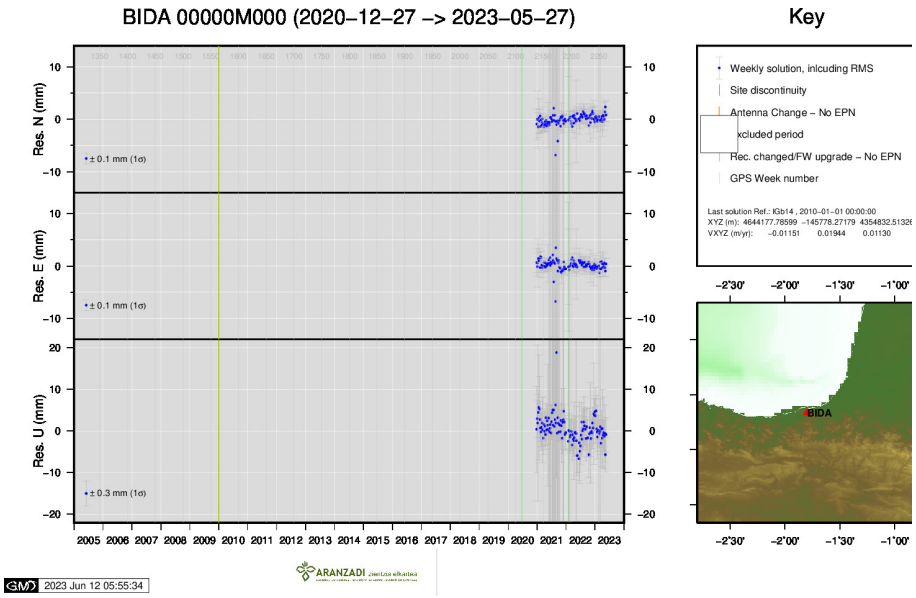

2 ) ALDA



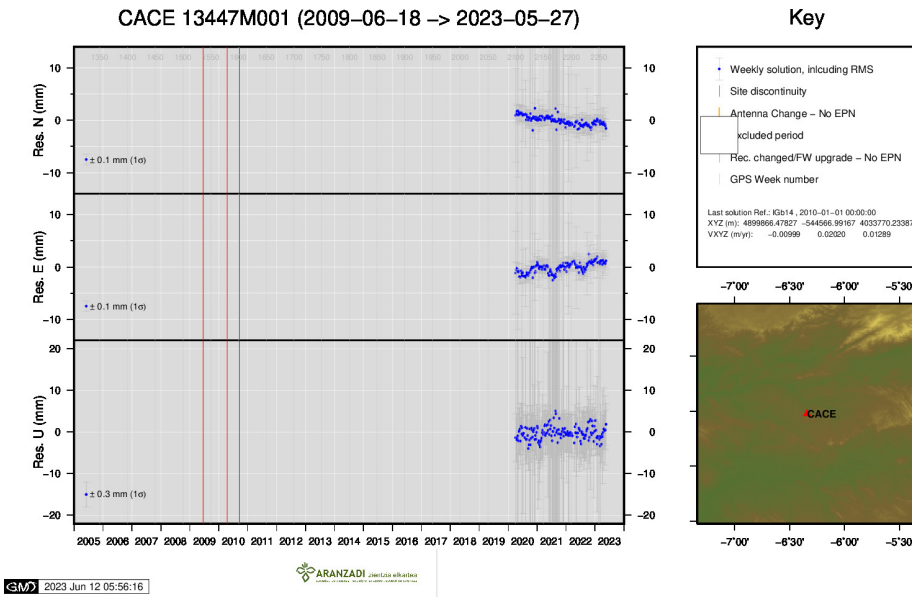

3 ) AMUR



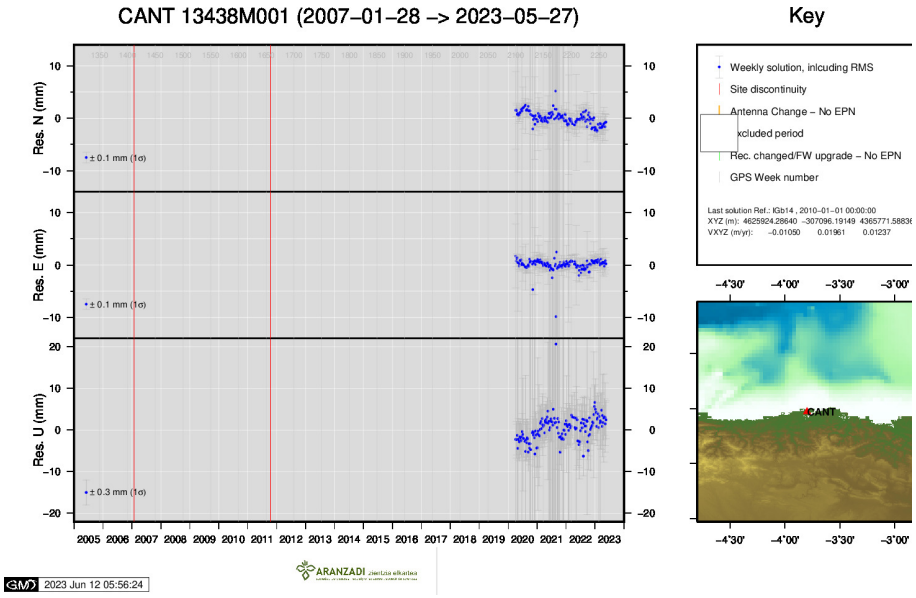

4 ) BIAZ



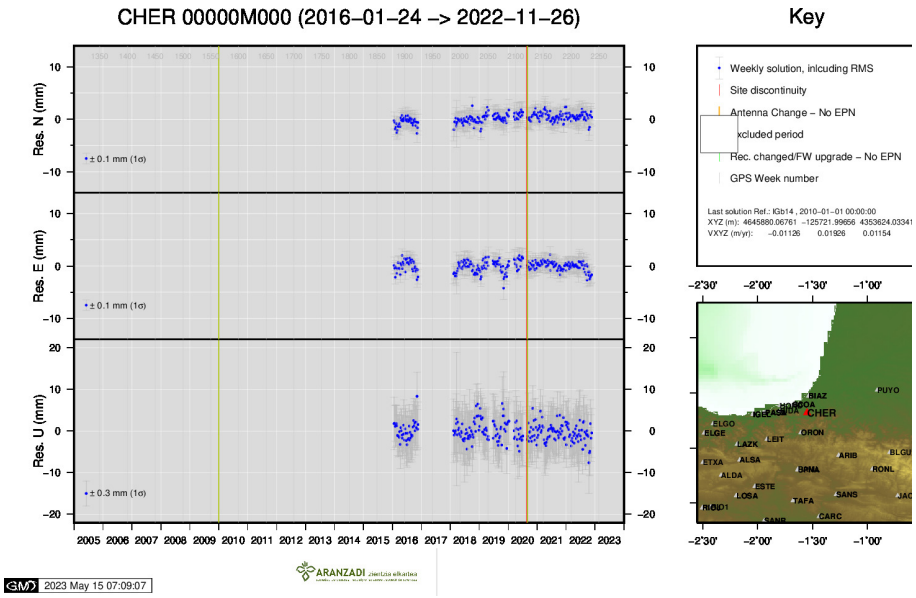

5 ) BIDA



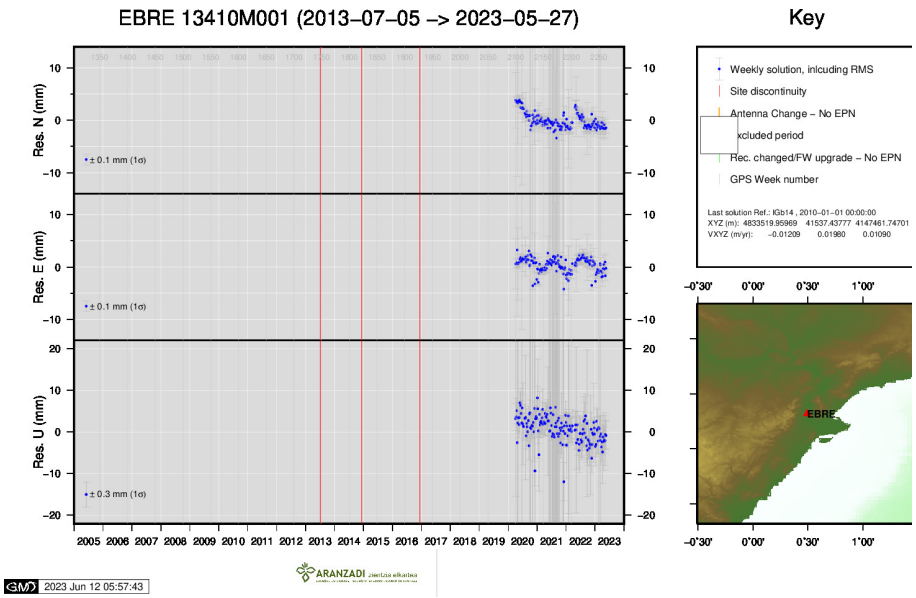

6 ) CACE



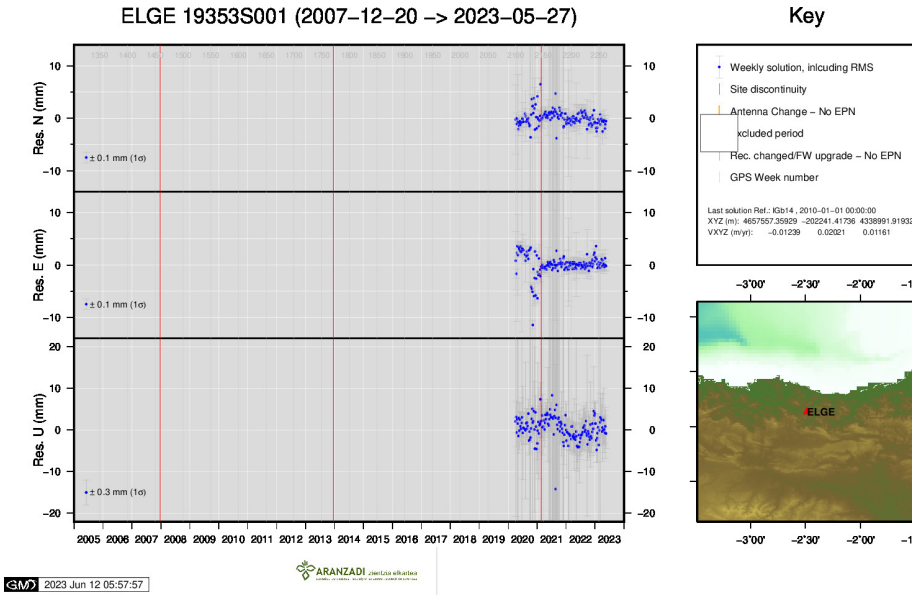

7 ) CANT



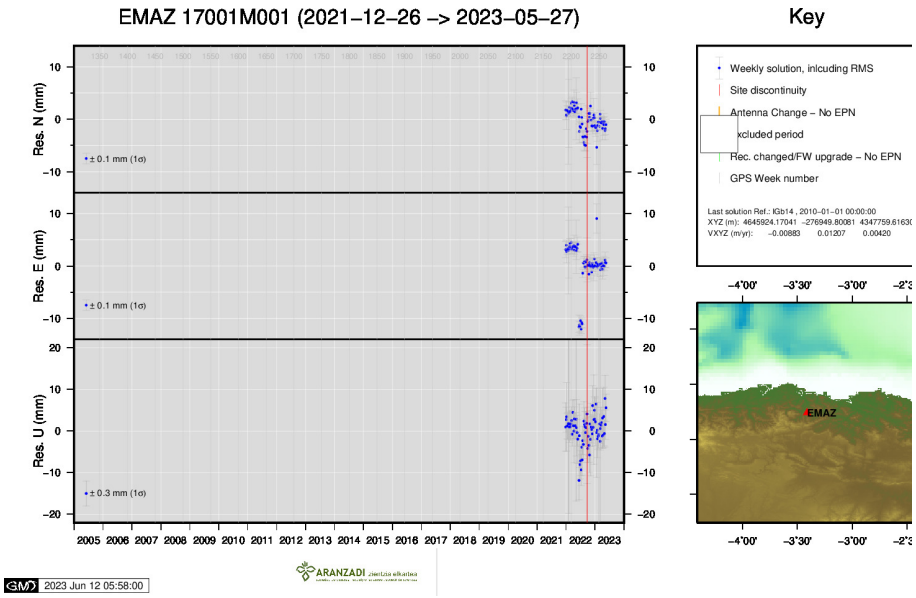

8 ) CHER



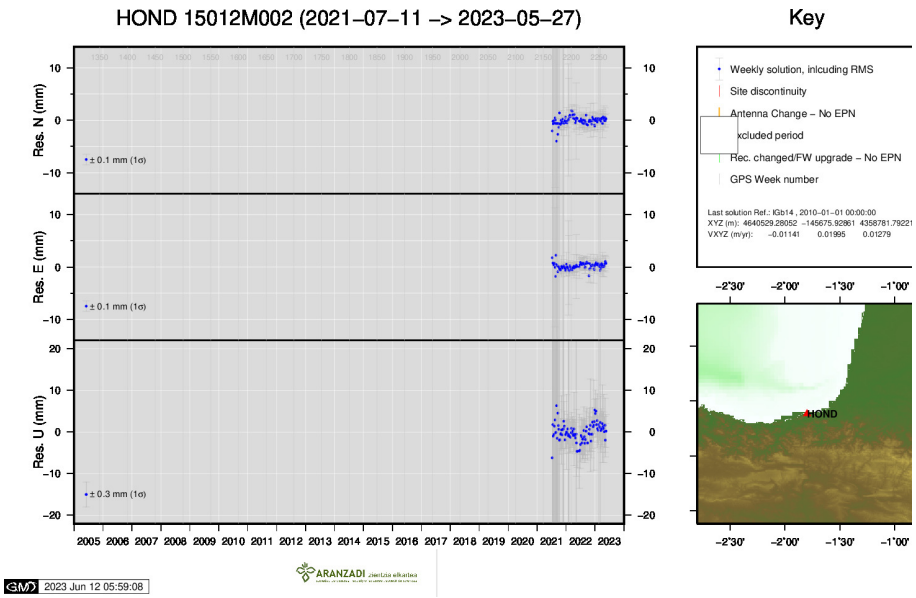

9 ) EBRE



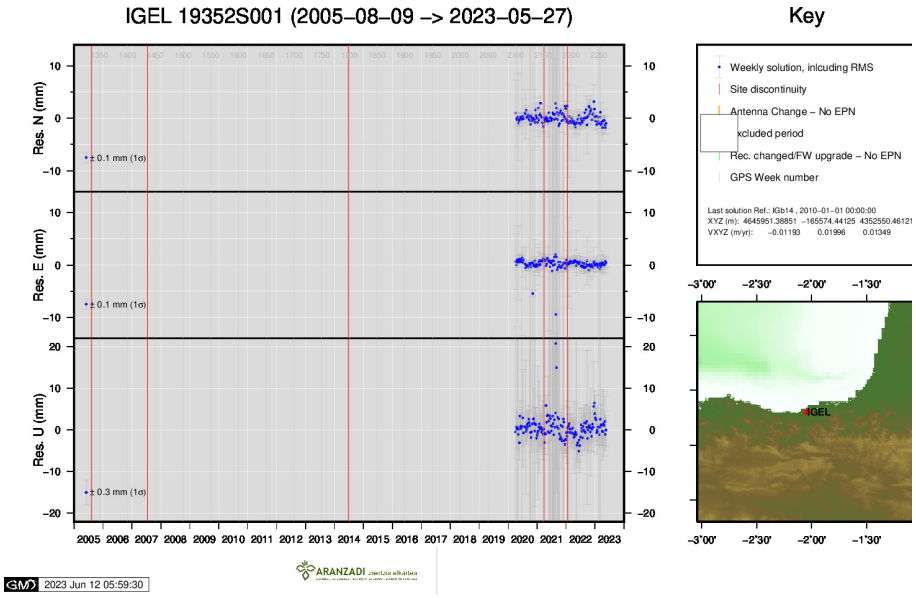

10 ) ELGE



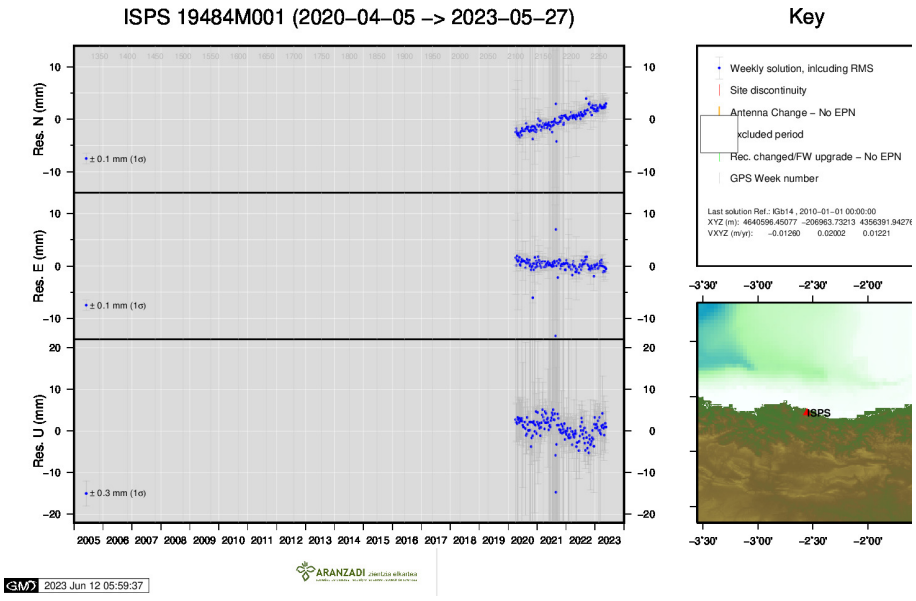

11 ) EMAZ



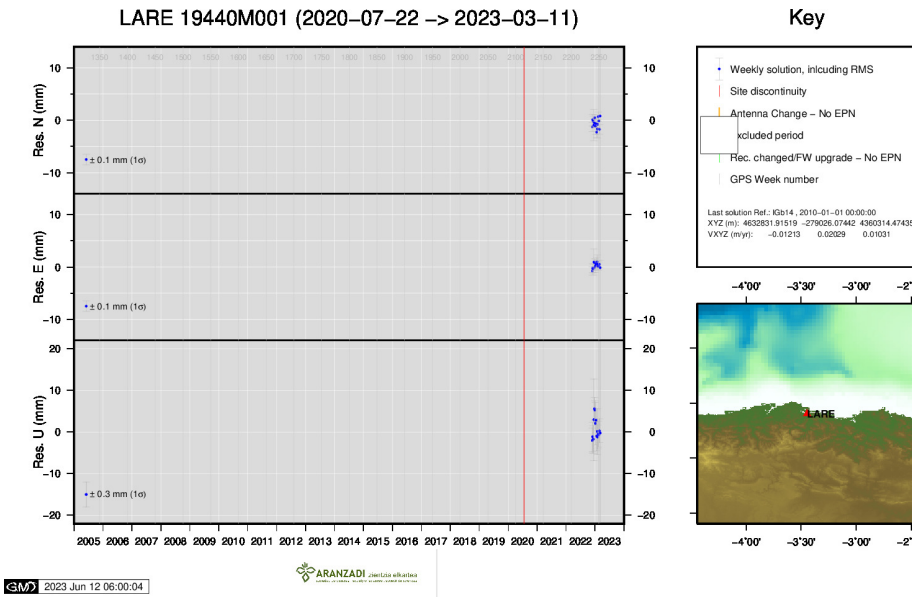

12 ) HOND



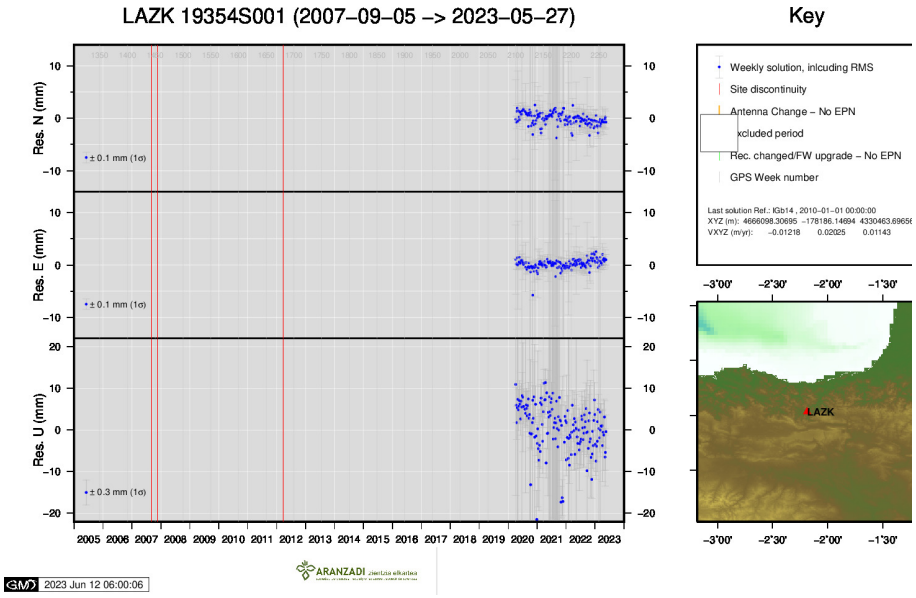

13 ) IGEL



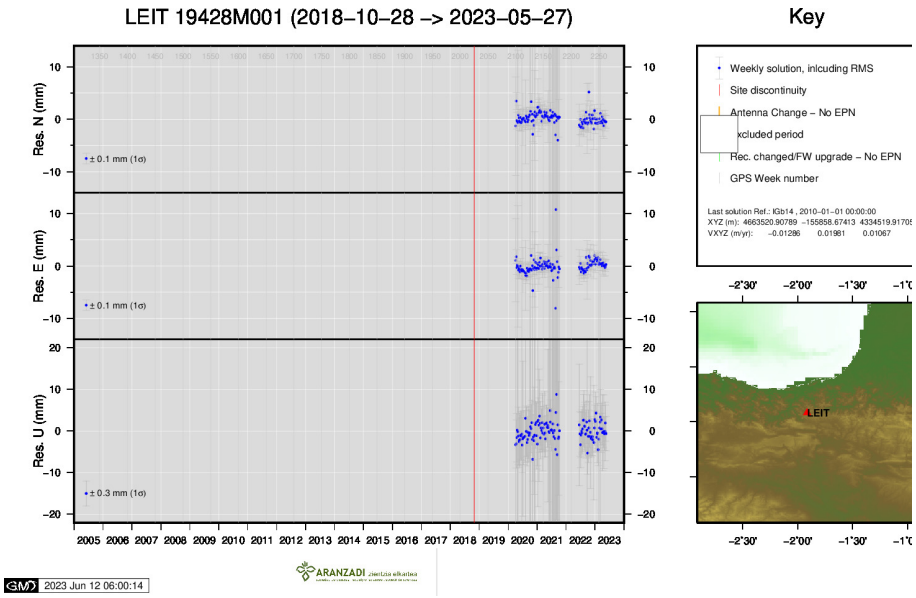

14 ) ISPS



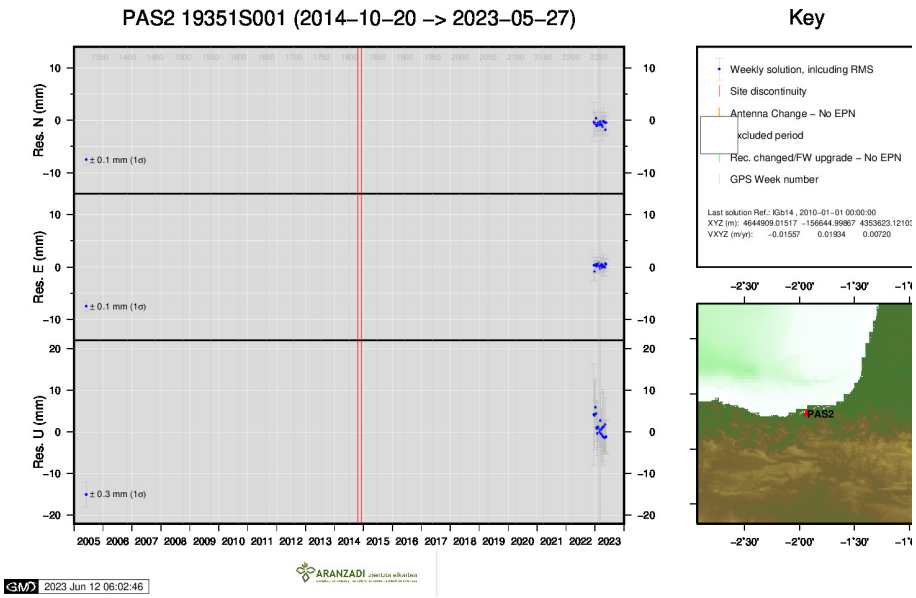

15 ) LARE



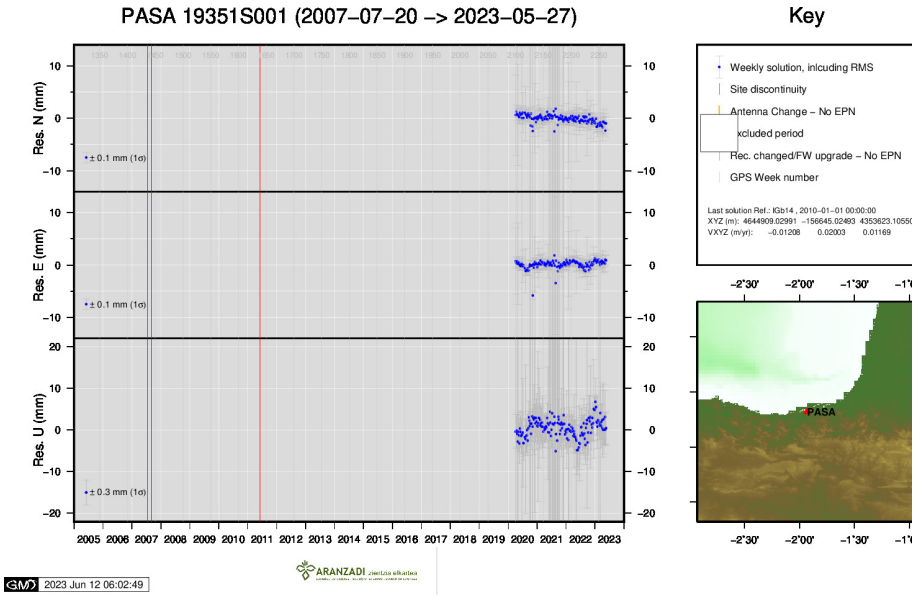

16 ) LAZK



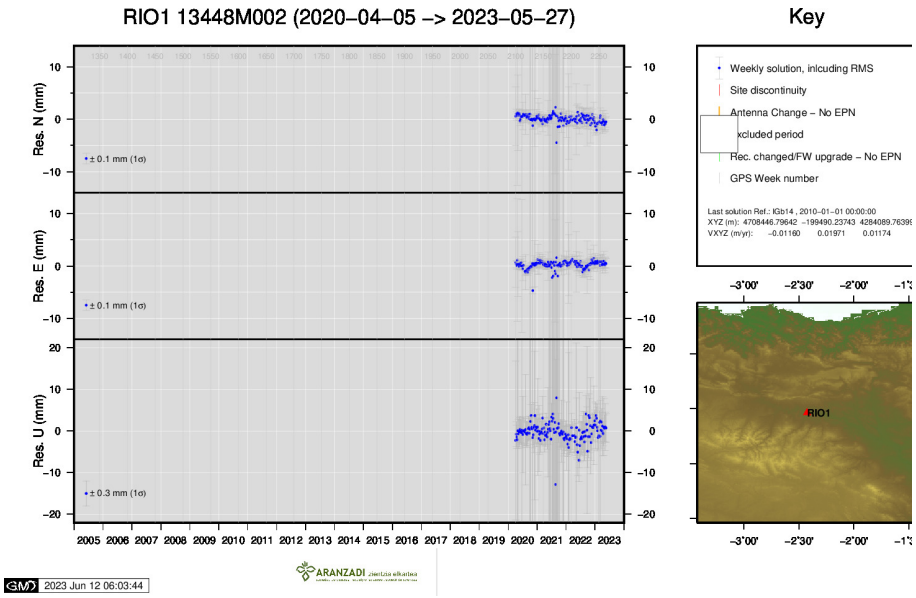

17 ) LEIT



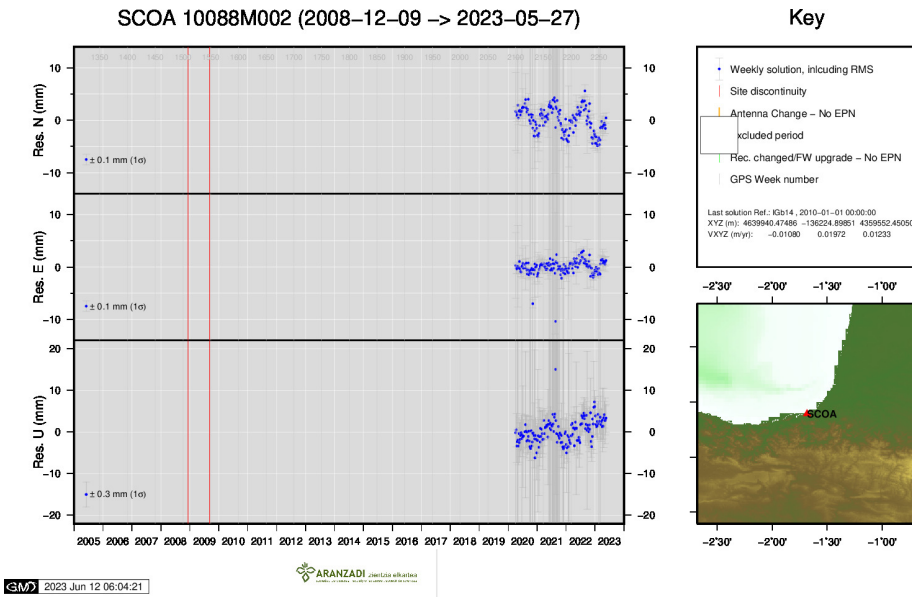

18 ) PAS2



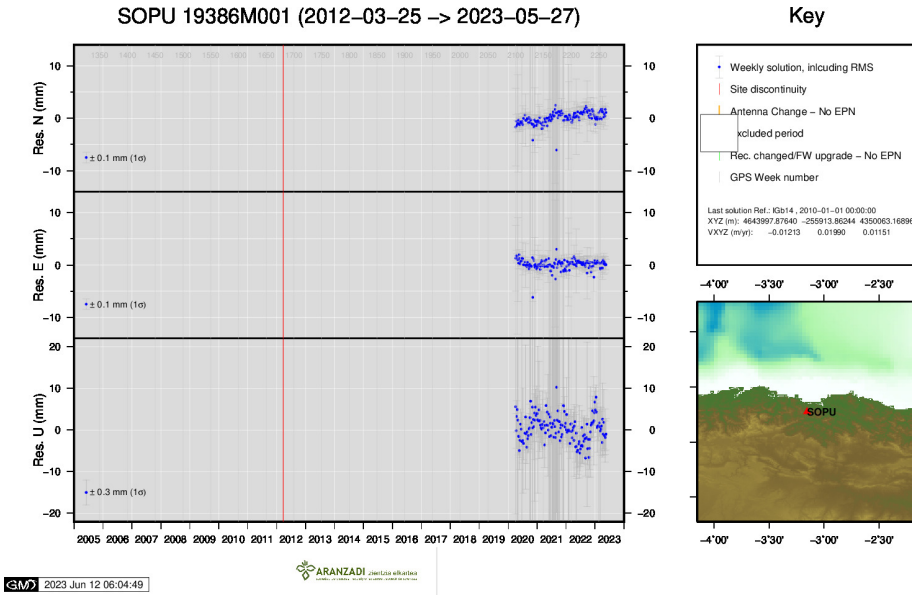

19 ) PASA



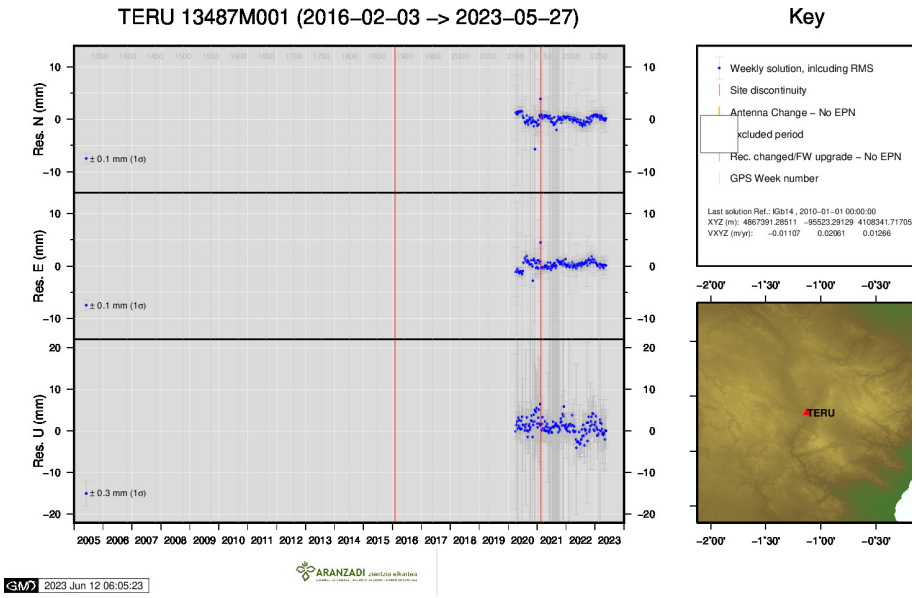

20 ) RIO1



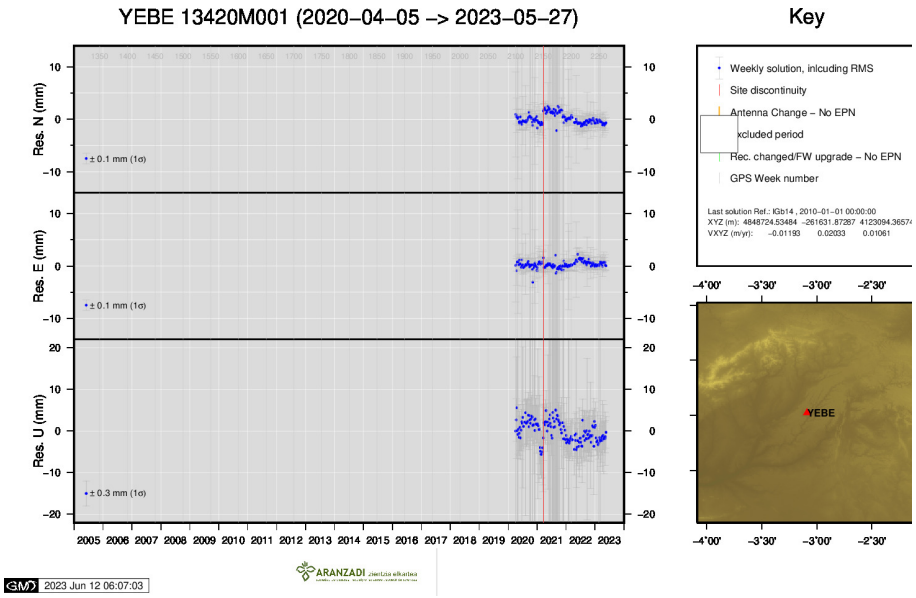

21 ) SCOA



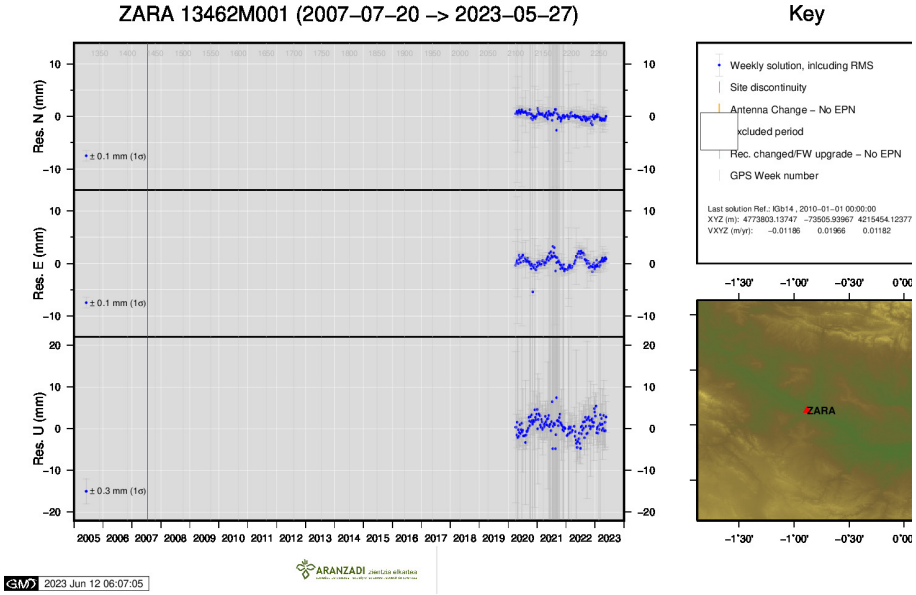

22 ) SOPU




23 ) TERU




24 ) YEBE




25 ) ZARA