ARA-DAC Weekly Analysis Result: 2304 (GFA)

Technical Report

GPS Week: 2304 (GFA)

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

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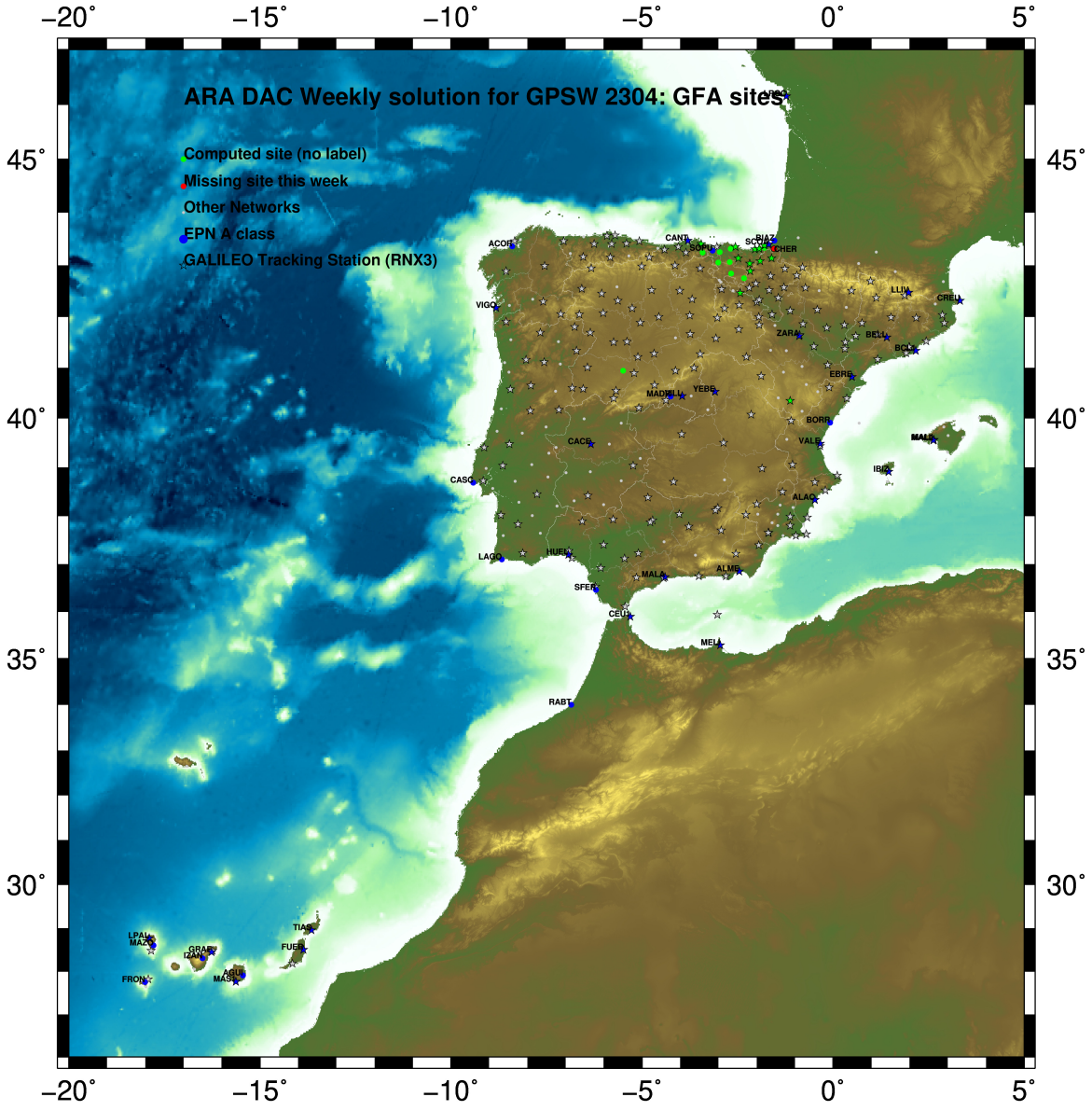
1 Introduction

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



2024 Mar 25 07:18:38

Fig.1: Computed Sites for GPS Week2304 (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. In case no calibration values of an antenna/radome pairs are not available for a certain GNSS system at some station, the observatione of this/theese GNSS/GNSSs are excluded from the analysis of that station.
- Reference sites: the latest IGS cumulative solution is used to align our solution to the latest IGS20 release, regularly updated and available at: IGS0OPSSNX_1994002_00U_00U_CRD.SNX.gz. Following the EUREF guidelines, no other individual calibrations are included in the analysis starting GPSW 2238 (IGS20); also applies to repro3 solutions, which are based on IGS20 standards.
- 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 IGS 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 (IGS cumulative solution) are the ones used in the Minimal Constraints condition.

5.1 IGS20

The Reference Frame considered in this section is the IGS20 (IGS cumulative solution), mapped from 2015.0 to the observation epoch.

ARA FINAL WEEKLY COMBINATION: FINAL ORBITS 25-MAR-24 05:56

LOCAL GEODETIC DATUM: IGS20 EPOCH: 2024-03-06 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.51763	-678367.33214	4357066.33317	W	G
39	ALDA 19383M001	4687280.11300	-190876.47710	4308107.02346	A	GR
50	ALSA 19419M001	4677250.78134	-176770.30400	4319079.93280	A	GRE
53	AMUR 19388M001	4661499.40071	-244591.16738	4332269.93712	A	GR
384	BIAZ 10074M002	4634456.00008	-124344.88488	4365785.51432	W	GR
101	BIDA 00000M000	4644177.76503	-145778.23325	4354832.53225	A	GR
113	BRZR 19387M001	4662220.93811	-220769.80989	4333309.48877	A	GR
573	CACE 13447M001	4899866.45912	-544566.94444	4033770.26218	W	GRE
592	CANT 13438M001	4625924.26870	-307096.14575	4365771.61682	W	GRE
908	CREU 13432M001	4715420.07166	273178.14966	4271946.89813	W	GRE
135	EBRE 13410M001	4833519.93964	41537.48347	4147461.77277	W	GRE
180	ELGE 19353S001	4657557.34550	-202241.37969	4338991.94024	A	GRE
182	EMAZ 17001M001	4645924.16089	-276949.77943	4347759.62650	A	GR
209	GERN 19389M001	4642811.27046	-217222.83438	4353278.92826	A	GR
257	HOND 15012M002	4640529.26633	-145675.89541	4358781.81223	A	GRE
235	IGEL 19352S001	4645951.37616	-165574.41278	4352550.47706	A	GRE
240	ISPS 19484M001	4640596.42668	-206963.68673	4356391.96933	A	GRE
245	KAST 19499M001	4646949.02333	-240747.17870	4348015.04385	A	GR
252	LARE 19440M001	4632831.90761	-279026.05228	4360314.48683	A	GRE
256	LAZK 19354S001	4666098.29535	-178186.10057	4330463.72840	A	GRE
261	LEIT 19428M001	4663520.88577	-155858.62767	4334519.94504	A	GRE
334	ORON 19427M001	4659695.73009	-130864.64741	4338948.93901	A	GRE
345	PAS2 19351S001	4644909.00892	-156644.97867	4353623.13362	A	GRE
493	PASA 19351S001	4644909.01158	-156644.97897	4353623.13499	A	GRE
553	RIO1 13448M002	4708446.77806	-199490.19128	4284089.79213	A	GRE
558	SALA 13469M001	4803054.43831	-462130.97955	4158379.13367	A	GR
526	SCOA 10088M002	4639940.45563	-136224.85480	4359552.47336	W	GRE
715	SOPU 19386M001	4643997.85605	-255913.81758	4350063.19459	W	GR
443	TERU 13487M001	4867391.27195	-95523.25544	4108341.74172	A	GRE
493	VITO 19385M001	4679397.65142	-218436.41411	4314898.42039	A	GR
616	YEBE 13420M001	4848724.51898	-261631.83677	4123094.38596	W	GRE
655	ZARA 13462M001	4773803.11721	-73505.89467	4215454.15272	W	GRE

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).

CONVERT TO ETRF2000 25-MAR-24 05:56

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2024-03-06 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.83189	-678367.98753	4357065.88091	W	
39	ALDA 19383M001	4687280.48584	-190877.14210	4308106.56998	A	
50	ALSA 19419M001	4677251.15693	-176770.96783	4319079.48045	A	
53	AMUR 19388M001	4661499.76870	-244591.82960	4332269.48521	A	
384	BIAZ 10074M002	4634456.38639	-124345.54372	4365785.06668	W	
101	BIDA 00000M000	4644178.14765	-145778.89325	4354832.08340	A	
113	BRZR 19387M001	4662221.30926	-220770.47214	4333309.03715	A	
573	CACE 13447M001	4899866.76294	-544567.63387	4033769.78380	W	
592	CANT 13438M001	4625924.63151	-307096.80409	4365771.16726	W	
908	CREU 13432M001	4715420.50098	273177.48309	4271946.44885	W	
135	EBRE 13410M001	4833520.32858	41536.80280	4147461.30923	W	
180	ELGE 19353S001	4657557.71951	-202242.04136	4338991.48933	A	
182	EMAZ 17001M001	4645924.52605	-276950.43998	4347759.17555	A	
209	GERN 19389M001	4642811.64377	-217223.49442	4353278.47848	A	
257	HOND 15012M002	4640529.64930	-145676.55500	4358781.36372	A	
235	IGEL 19352S001	4645951.75604	-165575.07304	4352550.02776	A	
240	ISPS 19484M001	4640596.80157	-206964.34649	4356391.51990	A	
245	KAST 19499M001	4646949.39316	-240747.83927	4348014.59334	A	
252	LARE 19440M001	4632832.27357	-279026.71134	4360314.03705	A	
256	LAZK 19354S001	4666098.67172	-178186.76314	4330463.27706	A	
261	LEIT 19428M001	4663521.26536	-155859.28989	4334519.49426	A	
334	ORON 19427M001	4659696.11327	-130865.30912	4338948.48895	A	
345	PAS2 19351S001	4644909.39004	-156645.63878	4353622.68454	A	
493	PASA 19351S001	4644909.39270	-156645.63908	4353622.68591	A	
553	RIO1 13448M002	4708447.14773	-199490.85867	4284089.33657	A	
558	SALA 13469M001	4803054.76343	-462131.65811	4158378.66548	A	
526	SCOA 10088M002	4639940.83988	-136225.51430	4359552.02504	W	
715	SOPU 19386M001	4643998.22411	-255914.47785	4350062.74413	W	
443	TERU 13487M001	4867391.63994	-95523.94033	4108341.27305	A	
493	VITO 19385M001	4679398.02129	-218437.07829	4314897.96723	A	
616	YEBE 13420M001	4848724.86688	-261632.52002	4123093.91655	W	
655	ZARA 13462M001	4773803.49720	-73506.56904	4215453.69300	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).

CONVERT TO ETRF2014 25-MAR-24 05:56

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2024-03-06 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.81286	-678367.98765	4357065.91792	W	
39	ALDA 19383M001	4687280.46647	-190877.14402	4308106.60717	A	
50	ALSA 19419M001	4677251.13760	-176770.96979	4319079.51760	A	
53	AMUR 19388M001	4661499.74943	-244591.83132	4332269.52232	A	
384	BIAZ 10074M002	4634456.36722	-124345.54589	4365785.10366	W	
101	BIDA 00000M000	4644178.12844	-145778.89533	4354832.12042	A	
113	BRZR 19387M001	4662221.28998	-220770.47394	4333309.07425	A	
573	CACE 13447M001	4899866.74279	-544567.63449	4033769.82200	W	
592	CANT 13438M001	4625924.61237	-307096.80558	4365771.20423	W	
908	CREU 13432M001	4715420.48151	273177.47947	4271946.48617	W	
135	EBRE 13410M001	4833520.30868	41536.80003	4147461.34701	W	
180	ELGE 19353S001	4657557.70025	-202242.04324	4338991.52640	A	
182	EMAZ 17001M001	4645924.50683	-276950.44158	4347759.21259	A	
209	GERN 19389M001	4642811.62456	-217223.49624	4353278.51550	A	
257	HOND 15012M002	4640529.63011	-145676.55708	4358781.40072	A	
235	IGEL 19352S001	4645951.73683	-165575.07505	4352550.06478	A	
240	ISPS 19484M001	4640596.78238	-206964.34835	4356391.55692	A	
245	KAST 19499M001	4646949.37394	-240747.84100	4348014.63038	A	
252	LARE 19440M001	4632832.25440	-279026.71293	4360314.07405	A	
256	LAZK 19354S001	4666098.65244	-178186.76510	4330463.31416	A	
261	LEIT 19428M001	4663521.24608	-155859.29194	4334519.53136	A	
334	ORON 19427M001	4659696.09401	-130865.31126	4338948.52603	A	
345	PAS2 19351S001	4644909.37083	-156645.64083	4353622.72157	A	
493	PASA 19351S001	4644909.37349	-156645.64113	4353622.72294	A	
553	RIO1 13448M002	4708447.12829	-199490.86056	4284089.37385	A	
558	SALA 13469M001	4803054.74364	-462131.65902	4158378.70322	A	
526	SCOA 10088M002	4639940.82069	-136225.51641	4359552.06204	W	
715	SOPU 19386M001	4643998.20490	-255914.47952	4350062.78116	W	
443	TERU 13487M001	4867391.61991	-95523.94260	4108341.31097	A	
493	VITO 19385M001	4679398.00195	-218437.08010	4314898.00439	A	
616	YEBE 13420M001	4848724.84692	-261632.52168	4123093.95442	W	
655	ZARA 13462M001	4773803.47751	-73506.57139	4215453.73053	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).

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GFA FINAL WEEKLY COMBINATION: FINAL ORBITS                    25-MAR-24 05:56
-------------------------------------------------------------------------------

                    Weekday     Repeatability (mm)
Station        #Days 0123456      N      E      U
-----------------------------------------------------
ACOR 13434M001     6  X XXXXX     1.02   1.44   4.25
ALDA 19383M001     7  XXXXXXX     1.18   1.38   3.10
ALSA 19419M001     7  XXXXXXX     2.11   0.91   1.38
AMUR 19388M001     7  XXXXXXX     3.02   2.63   4.59
BIAZ 10074M002     7  XXXXXXX     1.35   1.89   4.71
BIDA 00000M000     7  XXXXXXX     1.55   1.16   2.54
BRZR 19387M001     7  XXXXXXX     2.14   3.45   6.30
CACE 13447M001     6  X XXXXX     0.98   0.80   2.28
CANT 13438M001     7  XXXXXXX     1.03   1.33   1.41
CREU 13432M001     7  XXXXXXX     1.29   1.35   4.43
EBRE 13410M001     6   XXXXXX     1.12   2.28   4.67
ELGE 19353S001     7  XXXXXXX     1.97   2.19   3.99
EMAZ 17001M001     7  XXXXXXX     1.73   1.18   3.15
GERN 19389M001     7  XXXXXXX     1.32   1.47   4.88
HOND 15012M002     7  XXXXXXX     1.88   1.58   2.74
IGEL 19352S001     7  XXXXXXX     1.18   1.11   1.89
ISPS 19484M001     7  XXXXXXX     2.08   1.43   2.31
KAST 19499M001     7  XXXXXXX     2.23   1.10   6.73
LARE 19440M001     7  XXXXXXX     1.43   0.85   1.47
LAZK 19354S001     7  XXXXXXX     1.11   1.49   6.68
LEIT 19428M001     7  XXXXXXX     2.46   1.38   6.27
ORON 19427M001     7  XXXXXXX     3.86   1.99   4.87
PAS2 19351S001     2    X   X     2.03   0.39   2.39
PASA 19351S001     7  XXXXXXX     0.55   0.96   2.90
RIO1 13448M002     7  XXXXXXX     0.68   0.70   3.84
SALA 13469M001     7  XXXXXXX     0.54   1.11   1.42
SCOA 10088M002     7  XXXXXXX     0.76   1.26   3.36
SOPU 19386M001     7  XXXXXXX     1.42   1.18   4.52
TERU 13487M001     1   X          0.08   0.05   1.95
VITO 19385M001     7  XXXXXXX     2.04   1.79   3.25
YEBE 13420M001     7  XXXXXXX     0.68   0.80   2.14
ZARA 13462M001     7  XXXXXXX     0.93   0.70   2.77

Comparison of individual solutions:
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ACOR 13434M001   N    1.02     -1.49           0.39   -0.33   -0.60    0.14    1.53
ACOR 13434M001   E    1.44      1.35           2.33   -0.36   -1.39    0.70    0.77
ACOR 13434M001   U    4.25     -3.17          -3.38    6.42   -2.07    4.60   -1.55
ALDA 19383M001   N    1.18      0.33    0.11  -0.30   -1.69    2.00   -0.58   -0.94
ALDA 19383M001   E    1.38      2.20   -1.05  -0.50   -0.26    1.35    1.81   -0.07
ALDA 19383M001   U    3.10     -2.50   -4.00  -0.21    0.48    0.89   -2.33    5.38
ALSA 19419M001   N    2.11      0.15   -1.52  -0.03   -2.10    4.30   -1.03   -0.63
ALSA 19419M001   E    0.91     -0.42    1.21   0.05    1.38    1.09   -0.49   -0.11
ALSA 19419M001   U    1.38      2.51   -0.44  -0.46   -0.45   -0.97    0.99    1.63
AMUR 19388M001   N    3.02      1.95    0.94   1.40    0.09    2.05   -3.41   -5.67
AMUR 19388M001   E    2.63      1.48    2.36   1.45    0.30    2.56   -0.24   -4.99
AMUR 19388M001   U    4.59      5.82    6.74   1.65   -2.41    0.65   -5.47   -2.88
BIAZ 10074M002   N    1.35      2.18    0.18   0.05   -0.96   -1.08   -1.13    1.66
BIAZ 10074M002   E    1.89      3.22    1.95   1.43    0.36   -1.89   -0.80   -0.93
BIAZ 10074M002   U    4.71      0.96   -1.87  -1.51   -6.56    5.97    3.31    6.07
BIDA 00000M000   N    1.55      0.91    0.61   1.61    0.60   -3.19   -0.03   -0.31
BIDA 00000M000   E    1.16     -0.83   -0.06  -0.66    0.90    2.15    1.15    0.41
BIDA 00000M000   U    2.54      2.97    0.28   3.45    0.40   -3.41    0.50    2.44
BRZR 19387M001   N    2.14      1.38    0.44   1.63    1.13    0.13   -4.52   -1.00
BRZR 19387M001   E    3.45      3.79    3.65   2.70    2.39   -1.69   -2.38   -4.71
BRZR 19387M001   U    6.30      9.99    7.68   1.33    3.09   -2.98   -2.40   -7.31
CACE 13447M001   N    0.98     -1.23           -0.57    0.25   -1.24   -0.14   -1.16
CACE 13447M001   E    0.80      0.97           1.31    0.64   -0.07    0.28   -0.25
CACE 13447M001   U    2.28     -0.33           -0.71   -1.86   -4.33    0.18    1.75
CANT 13438M001   N    1.03     -0.99   -0.72  -0.73    0.42   -1.81   -0.01    0.96
CANT 13438M001   E    1.33      2.21    0.81   0.80    0.34   -1.03    1.77   -0.32
CANT 13438M001   U    1.41      2.83   -0.37   0.79   -0.77    0.78   -1.26   -0.59
CREU 13432M001   N    1.29     -2.35   -0.35   1.02    0.16    1.69   -0.48    0.46
CREU 13432M001   E    1.35      1.39    1.55   0.47    0.48    0.15   -1.09   -2.24
CREU 13432M001   U    4.43      2.10    3.58   2.24    0.58    3.75   -4.97   -7.51
EBRE 13410M001   N    1.12             -1.63   0.53   -0.25    1.70    0.54   -0.34
EBRE 13410M001   E    2.28              4.53  -2.07   -0.95    0.11   -0.44    0.35
EBRE 13410M001   U    4.67             -4.39  -4.07   -1.58    8.03    1.28    2.14
ELGE 19353S001   N    1.97     -1.57    0.56   0.69    2.22    1.84   -1.54   -3.06
ELGE 19353S001   E    2.19      2.95    2.19  -0.19   -0.06   -3.37    0.46    1.89
ELGE 19353S001   U    3.99      2.59    0.03  -0.36   -5.25    5.26    2.37    5.27
EMAZ 17001M001   N    1.73     -2.06   -2.96  -0.61   -1.13   -0.65   -0.64    1.56
EMAZ 17001M001   E    1.18      1.91    1.28   0.59    0.44    0.68   -0.43   -1.38
EMAZ 17001M001   U    3.15      2.05    2.86  -0.04    0.04   -6.78    0.87    0.67
GERN 19389M001   N    1.32      0.06    0.34   0.30    2.26   -1.37   -0.83   -1.60
GERN 19389M001   E    1.47      0.97    1.16   1.13    1.40    1.06    0.71   -2.41
GERN 19389M001   U    4.88      6.09    6.75   5.65   -3.67   -0.17   -3.37   -1.82
HOND 15012M002   N    1.88      0.44   -0.53  -1.87   -1.18    3.80   -0.99    0.58
HOND 15012M002   E    1.58      1.78    0.96   1.81    1.05   -0.14    0.23   -2.55
HOND 15012M002   U    2.74      0.58   -0.59  -1.10   -1.13    6.05    2.20    0.53
IGEL 19352S001   N    1.18     -1.25   -0.36  -1.45   -0.10    1.75    1.24    0.02
IGEL 19352S001   E    1.11      0.27    0.94   0.77    0.51   -0.99    2.06   -0.59
IGEL 19352S001   U    1.89      1.94   -0.62   3.66   -0.10   -0.42    0.65    1.81
ISPS 19484M001   N    2.08     -1.92   -1.32  -1.79   -0.61    2.11   -0.98    3.41
ISPS 19484M001   E    1.43      1.59    1.68   1.74    1.18   -1.54   -0.16   -0.45
ISPS 19484M001   U    2.31      1.01    1.50   4.62   -0.70    2.15    1.43   -0.37
KAST 19499M001   N    2.23      1.64    0.62   1.51    1.23   -2.43   -4.07    0.77
KAST 19499M001   E    1.10      1.44    0.81   0.50    1.38   -0.03   -1.08    1.08
KAST 19499M001   U    6.73     11.57    1.88   2.42    4.22    3.16   -5.65   -8.28
LARE 19440M001   N    1.43     -1.28   -2.24  -0.45    0.97   -1.90   -0.88   -0.40
LARE 19440M001   E    0.85      1.01    0.60  -0.17   -0.66    0.44    1.08    1.04
LARE 19440M001   U    1.47      1.97   -1.26  -1.40   -1.30    0.79    1.76   -0.23
LAZK 19354S001   N    1.11      0.88   -0.95   0.92    0.41    0.74   -0.91   -1.81
LAZK 19354S001   E    1.49      0.98    2.86   0.21   -0.52   -1.71    1.00   -0.01
```

LAZK 19354S001	U	6.68	-3.69	-1.02	-5.16	-4.69	-0.95	4.83	13.43
LEIT 19428M001	N	2.46	-2.10	-1.40	-1.18	-2.82	3.13	3.15	0.91
LEIT 19428M001	E	1.38	-0.04	-0.31	-0.64	-0.05	-1.49	2.18	2.01
LEIT 19428M001	U	6.27	-1.45	-0.04	-3.85	-4.19	-4.96	5.56	12.08
ORON 19427M001	N	3.86	4.40	3.18	3.54	2.74	-0.29	-0.72	-6.28
ORON 19427M001	E	1.99	1.68	1.21	2.07	-0.11	1.65	0.70	-3.46
ORON 19427M001	U	4.87	9.89	2.59	-2.11	0.29	3.85	-2.16	-3.73
PAS2 19351S001	N	2.03			-1.49				1.38
PAS2 19351S001	E	0.39			0.01				0.39
PAS2 19351S001	U	2.39			0.35				2.36
PASA 19351S001	N	0.55	0.23	-0.23	-0.74	-0.30	-0.06	0.19	1.02
PASA 19351S001	E	0.96	1.26	0.91	0.14	0.70	-1.18	1.04	0.24
PASA 19351S001	U	2.90	1.29	-2.60	-0.30	-1.68	5.11	2.37	2.71
RIO1 13448M002	N	0.68	-0.59	-0.57	-0.49	-0.56	0.83	-0.28	0.89
RIO1 13448M002	E	0.70	0.41	1.27	0.24	0.73	-0.10	0.67	-0.37
RIO1 13448M002	U	3.84	3.07	-2.45	-4.37	-3.69	2.84	5.04	2.63
SALA 13469M001	N	0.54	-0.38	-0.96	-0.44	-0.27	-0.56	0.11	-0.28
SALA 13469M001	E	1.11	1.45	1.43	1.02	1.08	-0.04	0.70	-0.77
SALA 13469M001	U	1.42	-0.64	-0.36	-2.74	-1.04	-0.69	1.59	0.12
SCOA 10088M002	N	0.76	0.71	0.03	0.14	0.28	-0.45	1.32	0.94
SCOA 10088M002	E	1.26	0.79	1.08	0.62	0.46	-1.73	2.02	-0.14
SCOA 10088M002	U	3.36	1.99	-1.53	0.29	-0.00	7.37	-0.16	2.63
SOPU 19386M001	N	1.42	-1.87	-1.47	-1.20	0.57	0.45	2.06	0.59
SOPU 19386M001	E	1.18	-0.09	-0.06	0.21	1.72	2.28	0.36	-0.29
SOPU 19386M001	U	4.52	7.72	5.36	1.55	-0.57	-3.46	-3.38	2.87
TERU 13487M001	N	0.08		-0.08					
TERU 13487M001	E	0.05		0.05					
TERU 13487M001	U	1.95		-1.95					
VITO 19385M001	N	2.04	1.40	1.27	1.76	2.41	-2.79	-1.79	-1.26
VITO 19385M001	E	1.79	1.32	2.64	2.14	1.24	-0.36	0.90	-1.85
VITO 19385M001	U	3.25	6.38	-0.78	-2.00	3.39	-0.70	-1.52	-1.89
YEBE 13420M001	N	0.68	-0.33	0.19	-0.12	-0.37	-1.46	-0.42	-0.38
YEBE 13420M001	E	0.80	0.62	0.74	0.52	1.12	0.52	0.95	0.46
YEBE 13420M001	U	2.14	2.68	-1.74	-2.11	-0.79	-3.27	1.20	0.12
ZARA 13462M001	N	0.93	-0.62	-0.76	0.04	-0.75	0.95	-1.45	0.79
ZARA 13462M001	E	0.70	0.45	1.29	0.36	0.17	0.39	0.60	-0.60
ZARA 13462M001	U	2.77	-1.64	-2.51	-0.76	-0.31	1.67	2.09	5.41

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

ITERATION   1: TIAS 31320M001         2.66    -17.67     12.89
```

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS			
1	ACOR 13434M001	I W	2.00	-9.18	1.30	
2	AGUI 31322M001	I W	-0.62	0.12	4.81	
3	ALAC 13433M001	I W	0.17	-0.87	5.10	
4	ALME 13437M001	I W	0.09	0.58	3.84	
5	BCL1 19482M001	I W	-0.90	-0.10	2.07	
6	BELL 13431M001	I W	0.01	-1.17	4.13	
7	BIAZ 10074M002	I W	0.69	0.38	-7.08	
8	BORR 13480M001	I W	-2.70	-2.74	-1.13	
9	BRST 10004M004	I W	0.99	-1.69	3.30	
10	CACE 13447M001	I W	0.37	0.93	5.41	
11	CANT 13438M001	I W	0.94	0.52	-3.38	
12	CASC 13909S001	I W	2.58	-0.56	0.25	
13	CEU1 13449M002	I W	0.02	4.00	1.39	
14	CREU 13432M001	A W	-2.49	-7.04	-12.36	
15	EBRE 13410M001	I W	1.22	1.82	0.31	
17	FLRS 31907M001	I W	-2.91	1.34	-9.73	
18	FRON 83214M001	I W	-4.04	-3.39	-1.05	
19	FUER 31330M001	I W	-1.36	0.76	0.62	
21	GRAF 31327M001	I W	9.53	0.49	-3.58	
22	HUEL 13451M001	I W	1.33	2.89	-6.53	
23	IBIZ 13454S001	I W	-0.80	1.74	7.24	
24	IZAN 31309M002	I W	-2.31	-0.28	-2.27	
25	LAGO 13903M001	I W	0.53	-0.50	1.19	
26	LLIV 13436M001	I W	-2.21	0.17	1.74	
27	LPAL 81701M001	I W	-0.39	1.00	-4.37	
28	LROC 10023M001	I W	0.32	0.21	1.85	
29	MADR 13407S012	I W	-1.91	-0.96	-3.15	
30	MAL1 13444M002	I W	1.77	0.96	0.80	
31	MALA 13443M001	I W	2.63	-0.89	5.41	
32	MALL 13444M001	I W	-2.19	1.65	9.57	
33	MAS1 31303M002	I W	-2.29	-1.32	-0.17	
34	MAZO 83207M001	I W	-2.24	-1.92	-16.48	
35	MELI 19379M001	I W	0.58	1.24	6.22	
36	PDEL 31906M004	I W	-0.62	-2.99	-3.92	
37	RABT 35001M002	I W	1.23	-1.01	-3.93	
38	SCOA 10088M002	I W	3.51	2.03	-7.45	
39	SFER 13402M004	I W	-0.73	-2.59	1.45	
40	SOPU 19386M001	I W	-0.01	1.58	2.59	
41	TIAS 31320M001	I W	2.72	-18.07	13.18	*
42	VALE 13439M001	I W	-0.12	2.56	-0.80	
43	VIGO 13450M001	I W	0.71	1.09	1.43	
44	VILL 13406M001	I W	-0.69	-0.92	2.61	
45	YEBE 13420M001	I W	-0.80	0.52	5.13	
46	ZARA 13462M001	I W	-1.15	1.16	-1.21	
47	ZIMM 14001M004	I W	-2.70	-1.17	9.47	
	RMS / COMPONENT		2.23	2.37	5.38	
	IQR		2.46	2.21	6.84	
	MEAN		-0.11	-0.26	0.01	
	MEDIAN		-0.06	0.19	1.00	
	MIN		-4.04	-9.18	-16.48	
	MAX		9.53	4.00	9.57	
	OVERALL RMS/IQR/MAX(3D)		3.63	2.75	16.74	MAZO 83207M001 #SUM
ALL	RMS / COMPONENT		2.24	3.59	5.68	
ALL	IQR		2.30	2.25	6.99	
ALL	MEAN		-0.05	-0.66	0.31	
ALL	MEDIAN		-0.01	0.17	1.19	
ALL	MIN		-4.04	-18.07	-16.48	
ALL	MAX		9.53	4.00	13.18	
ALL	OVERALL RMS/IQR/MAX(3D)		4.09	2.80	22.53	TIAS 31320M001 #SUM_ALL

```
NUMBER OF PARAMETERS  :     3
NUMBER OF STATIONS    :    44
NUMBER OF COORDINATES :   132
RMS OF TRANSFORMATION :    3.63 MM


PARAMETERS:

TRANSLATION IN  X     :          -0.13     +-  0.55    MM
TRANSLATION IN  Y     :           0.46     +-  0.55    MM
TRANSLATION IN  Z     :          -0.19     +-  0.55    MM


NUMBER OF ITERATIONS  :     3


ACCEPTED STATIONS     :    44    97.78 %
VERIFIED STATIONS     :     0     0.00 %
REJECTED STATIONS     :     1     2.22 %


LIST OF VERIFIED/REJECTED STATIONS
```

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                       19900060
 NUMBER OF UNKNOWNS                             205074
 NUMBER OF DEGREES OF FREEDOM                 19694986
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                    7.737285454010913
```

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 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 ALDA  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 ALSA  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 BIAZ  A    1 P 24:063:00000 24:069:86370 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 24:063:00000 24:069:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 24:063:00000 24:069:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 24:063:00000 24:069:86370 LEICA GR10           ----- -----------
 CREU  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 24:064:00000 24:069:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 EMAZ  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 HOND  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 IGEL  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 24:063:00000 24:069:86370 TRIMBLE NETR9        ----- -----------
 KAST  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 LARE  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 LAZK  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 LEIT  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 PAS2  A    1 P 24:065:00000 24:069:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 24:063:00000 24:069:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 SCOA  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 SOPU  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 24:064:00000 24:064:86370 LEICA GR50           ----- -----------
 VITO  A    1 P 24:063:00000 24:069:86370 LEICA GR30           ----- -----------
 YEBE  A    1 P 24:063:00000 24:069:86370 LEICA GR50           ----- -----------
 ZARA  A    1 P 24:063:00000 24:069:86370 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 24:063:00000 24:069:86370 LEIAT504        LEIS -----
 ALDA  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 ALSA  A    1 P 24:063:00000 24:069:86370 LEIAR10         NONE -----
 AMUR  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 BIAZ  A    1 P 24:063:00000 24:069:86370 LEIAR25         LEIT -----
 BIDA  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 BRZR  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 CACE  A    1 P 24:063:00000 24:069:86370 TRM29659.00     NONE -----
 CANT  A    1 P 24:063:00000 24:069:86370 LEIAR25.R4      LEIT -----
 CREU  A    1 P 24:063:00000 24:069:86370 LEIAR25.R4      NONE -----
 EBRE  A    1 P 24:064:00000 24:069:86370 LEIAR25.R4      NONE -----
 ELGE  A    1 P 24:063:00000 24:069:86370 LEIAR25.R4      LEIT -----
 EMAZ  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 GERN  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 HOND  A    1 P 24:063:00000 24:069:86370 LEIAR20         LEIM -----
 IGEL  A    1 P 24:063:00000 24:069:86370 LEIAR20         LEIM -----
 ISPS  A    1 P 24:063:00000 24:069:86370 TRM59900.00     SCIS -----
 KAST  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 LARE  A    1 P 24:063:00000 24:069:86370 LEIAR20         LEIM -----
 LAZK  A    1 P 24:063:00000 24:069:86370 LEIAR25.R4      LEIT -----
 LEIT  A    1 P 24:063:00000 24:069:86370 LEIAR10         NONE -----
 ORON  A    1 P 24:063:00000 24:069:86370 LEIAR10         NONE -----
 PAS2  A    1 P 24:065:00000 24:069:86370 LEIAR20         LEIM -----
 PASA  A    1 P 24:063:00000 24:069:86370 LEIAR20         LEIM -----
 RIO1  A    1 P 24:063:00000 24:069:86370 LEIAR25.R4      LEIT -----
 SALA  A    1 P 24:063:00000 24:069:86370 LEIAR25         NONE -----
 SCOA  A    1 P 24:063:00000 24:069:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 TERU  A    1 P 24:064:00000 24:064:86370 LEIAR20         LEIM -----
 VITO  A    1 P 24:063:00000 24:069:86370 LEIAS10         NONE -----
 YEBE  A    1 P 24:063:00000 24:069:86370 LEIAR20         LEIM -----
 ZARA  A    1 P 24:063:00000 24:069:86370 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 24:063:00000 24:069:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 24:063:00000 24:069:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 24:063:00000 24:069:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 24:063:00000 24:069:86370 UNE   3.0490   0.0000   0.0000
 CREU  A    1 P 24:063:00000 24:069:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 24:064:00000 24:069:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 EMAZ  A    1 P 24:063:00000 24:069:86370 UNE   0.0350   0.0000   0.0000
 GERN  A    1 P 24:063:00000 24:069:86370 UNE   0.0771   0.0000   0.0000
 HOND  A    1 P 24:063:00000 24:069:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 24:063:00000 24:069:86370 UNE   0.0350   0.0000   0.0000
 KAST  A    1 P 24:063:00000 24:069:86370 UNE   0.0350   0.0000   0.0000
 LARE  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 LAZK  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 LEIT  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 ORON  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 PAS2  A    1 P 24:065:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 24:063:00000 24:069:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 24:063:00000 24:069:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 24:063:00000 24:069:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 24:064:00000 24:064:86370 UNE   0.0600   0.0000   0.0000
 VITO  A    1 P 24:063:00000 24:069:86370 UNE   0.0000   0.0000   0.0000
 YEBE  A    1 P 24:063:00000 24:069:86370 UNE   0.0600   0.0000   0.0000
 ZARA  A    1 P 24:063:00000 24:069:86370 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:

```
2024-03-24 03:14 UTC | LARE0630.24O | RECEIVER FIRM. VERS. |  4.70/7.813 -> 4.61/7.811 (source: lare00esp_20240308.log
2024-03-24 06:41 UTC | LARE0640.24O | RECEIVER FIRM. VERS. |  4.70/7.813 -> 4.61/7.811 (source: lare00esp_20240308.log
2024-03-24 10:21 UTC | LARE0650.24O | RECEIVER FIRM. VERS. |  4.70/7.813 -> 4.61/7.811 (source: lare00esp_20240308.log
2024-03-24 13:43 UTC | LARE0660.24O | RECEIVER FIRM. VERS. |  4.70/7.813 -> 4.61/7.811 (source: lare00esp_20240308.log
2024-03-24 17:02 UTC | LARE0670.24O | RECEIVER FIRM. VERS. |  4.70/7.813 -> 4.61/7.811 (source: lare00esp_20240308.log
2024-03-24 20:20 UTC | LARE0680.24O | RECEIVER FIRM. VERS. |  4.70/7.813 -> 4.80/7.900 (source: lare00esp_20240308.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

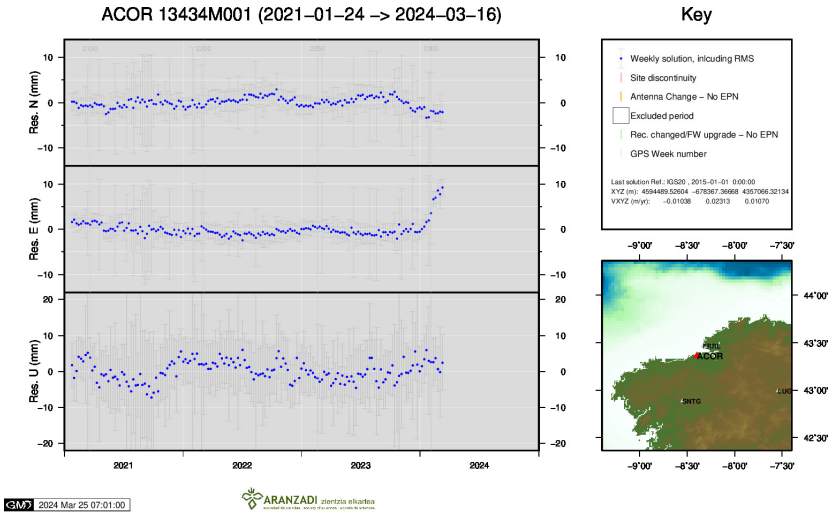
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres.* epncb.oma.be/$_d$*ocumentation/guidelines/guidelines*$_a$*nalysis*$_c$*entres.pdf*

Johnston, G., Riddell, A., Hausler, G. (2017). The International GNSS Service. Teunissen, Peter J.G., Montenbruck, O. (Eds.), Springer Handbook of Global Navigation Satellite Systems (1st ed., pp. 967-982). Cham, Switzerland: Springer International Publishing. DOI: 10.1007/978-3-319-42928-1

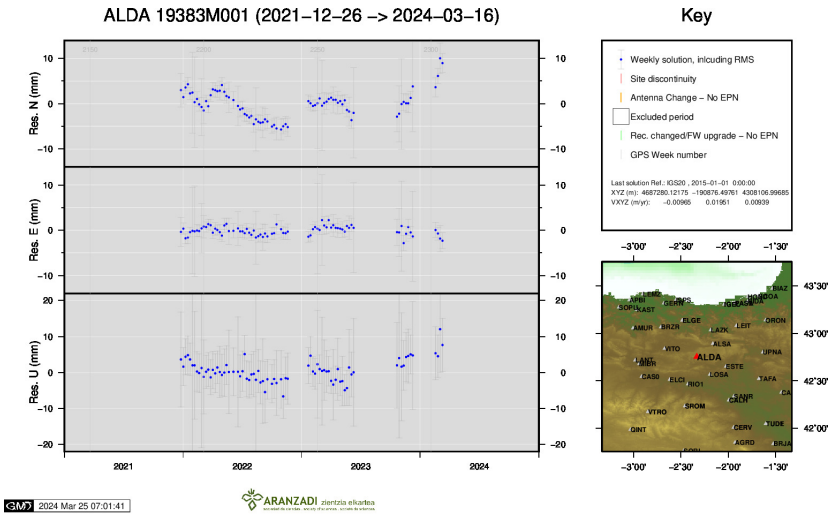
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

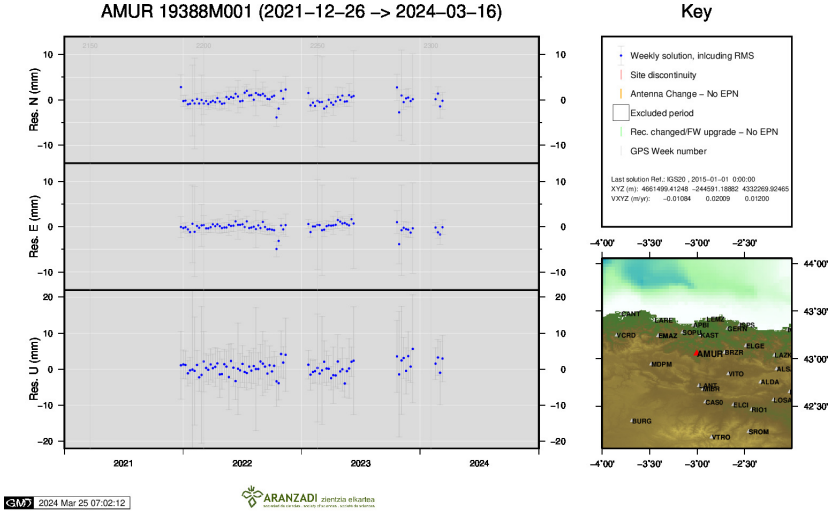
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



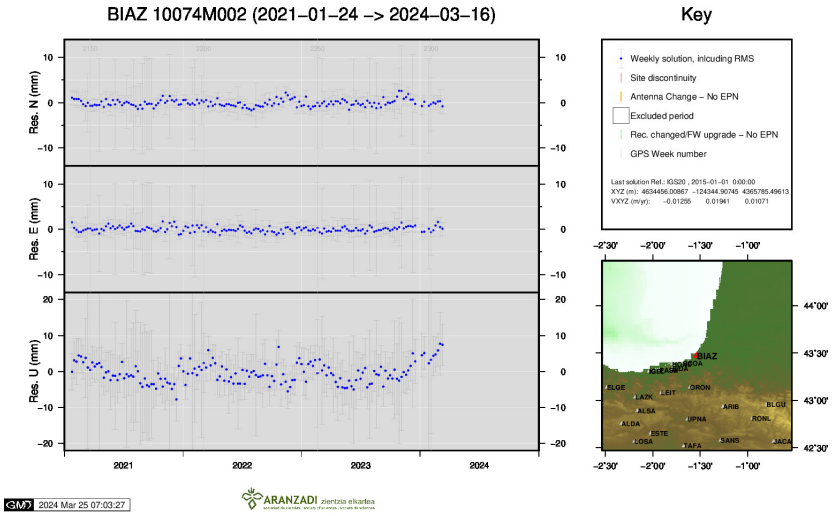
1) ACOR



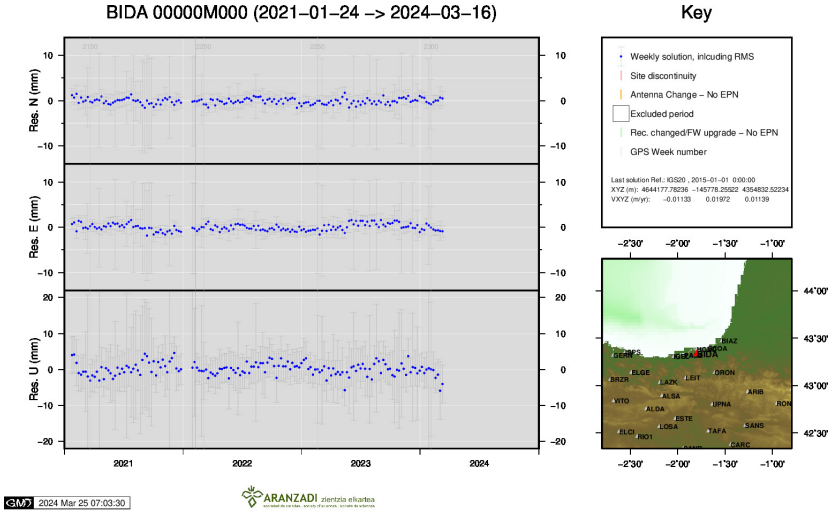
2) ALDA



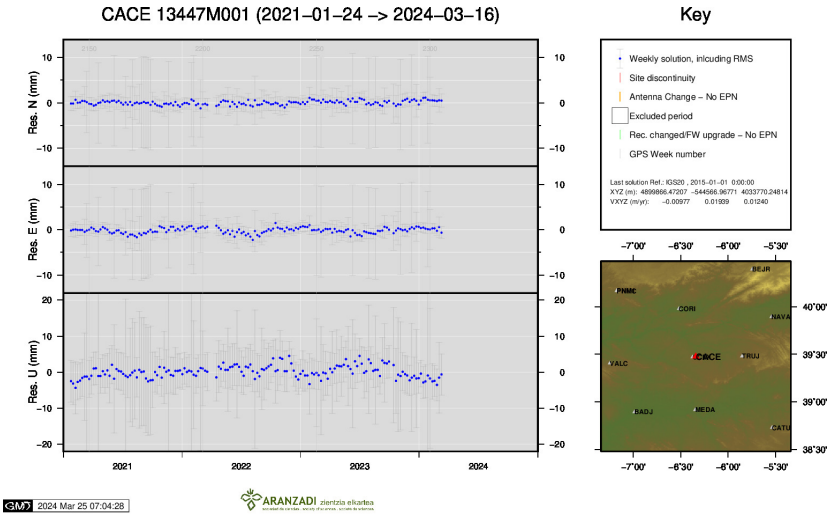
3) AMUR



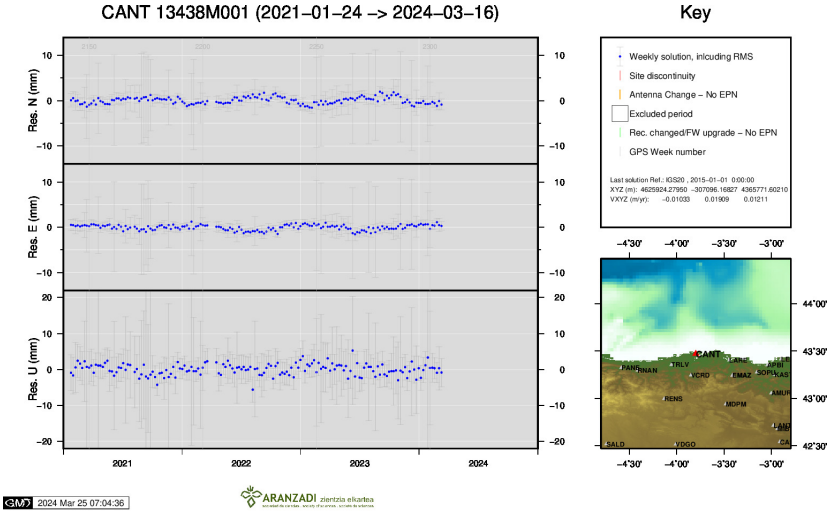
4) BIAZ



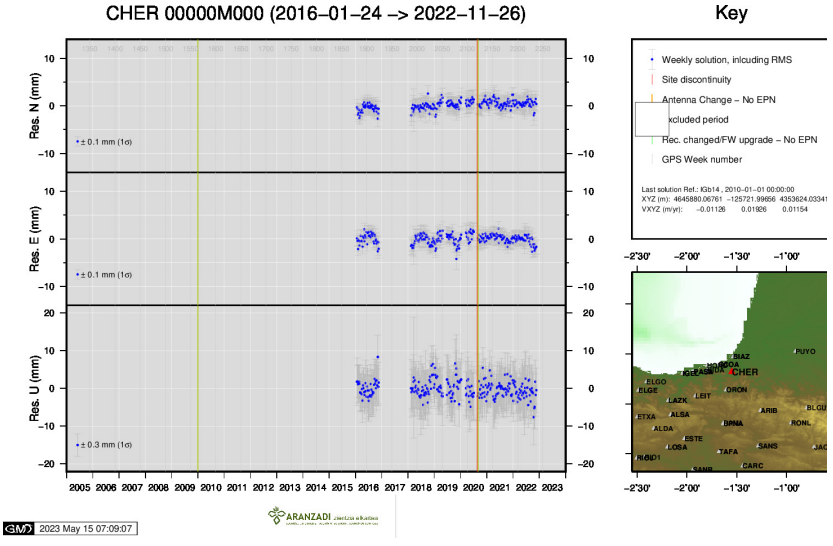
5) BIDA



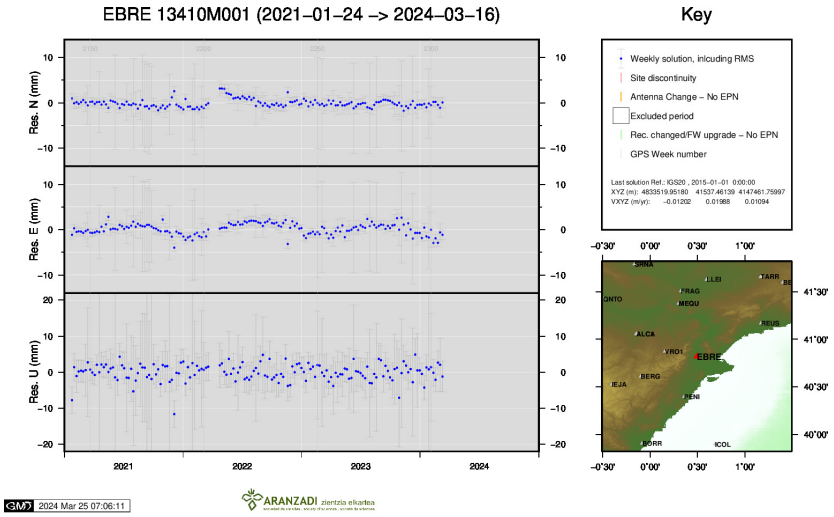
6) CACE



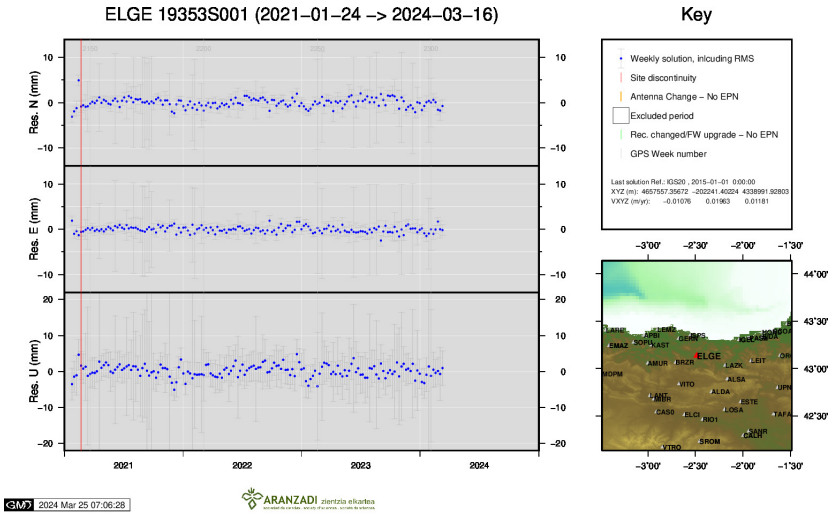
7) CANT



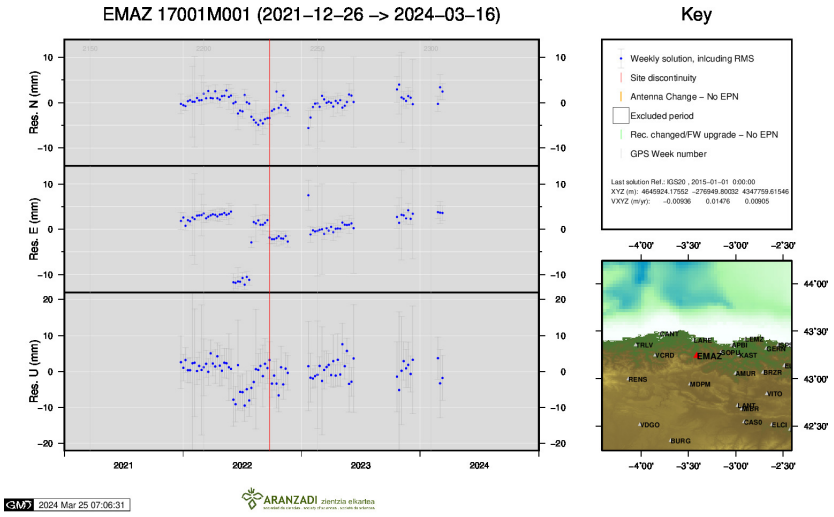
8) CHER



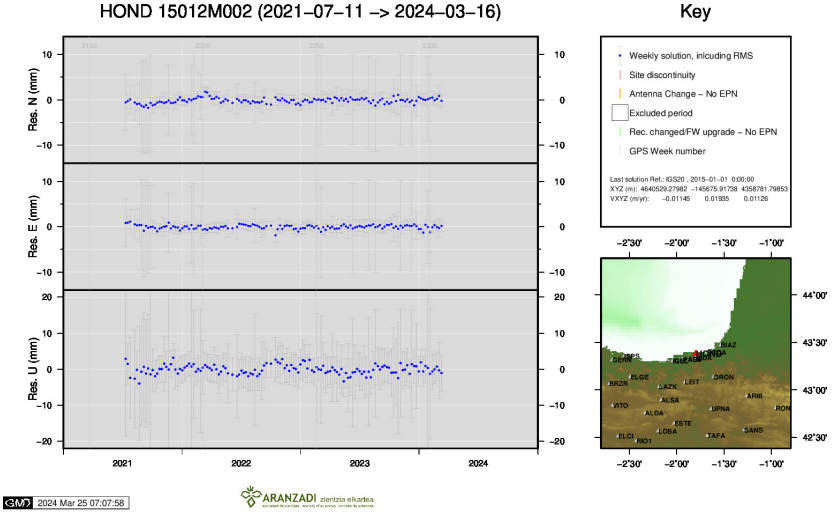
9) EBRE



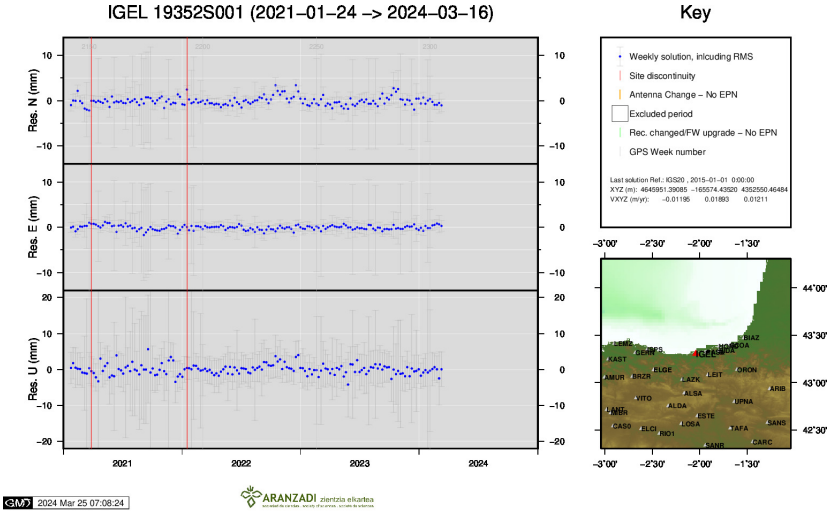
10) ELGE



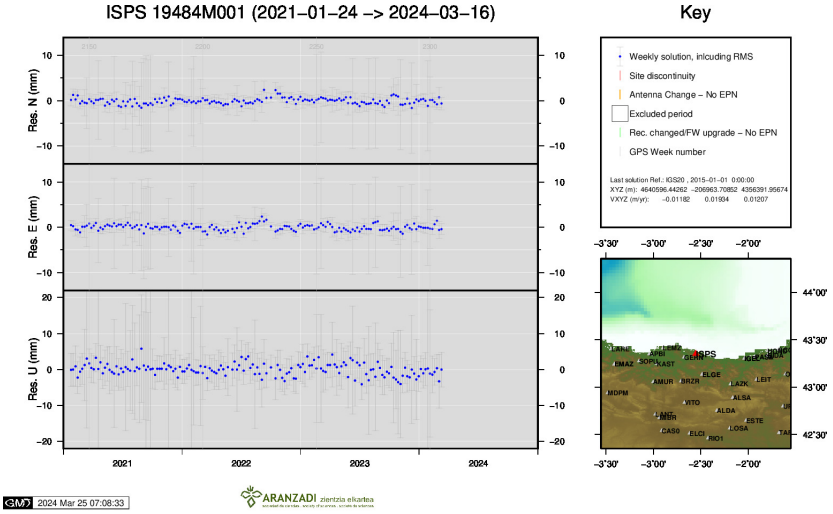
11) EMAZ



12) HOND



13) IGEL



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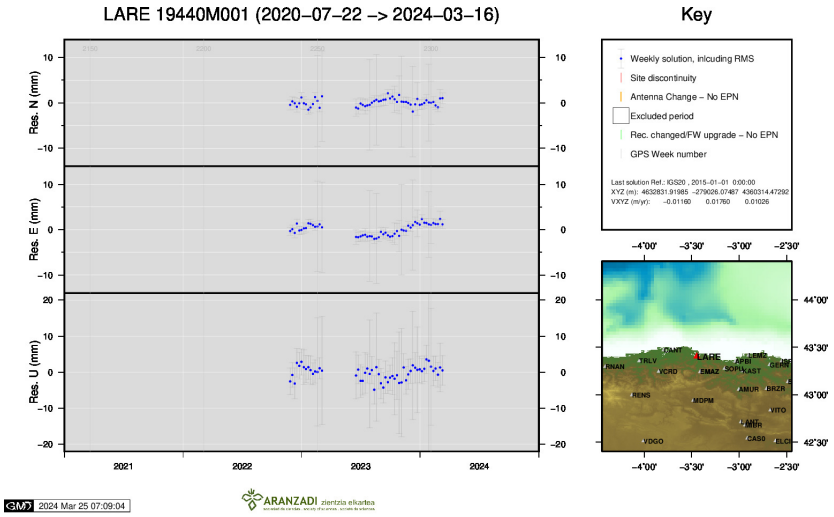
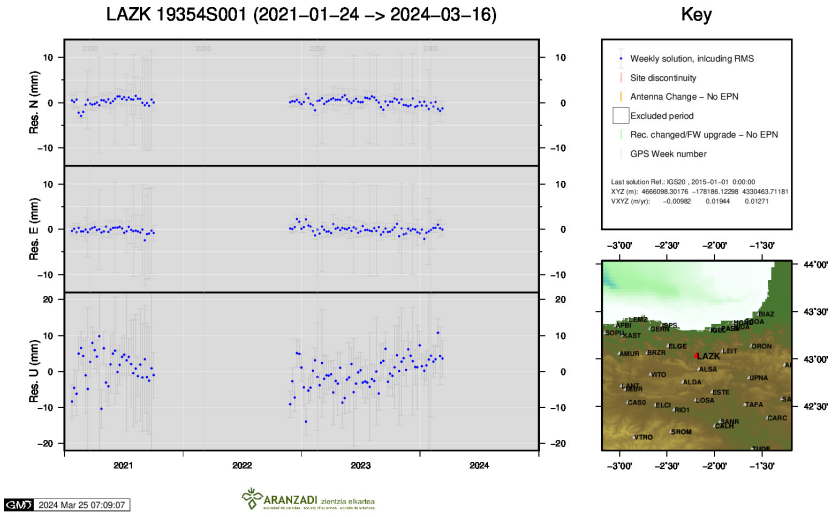
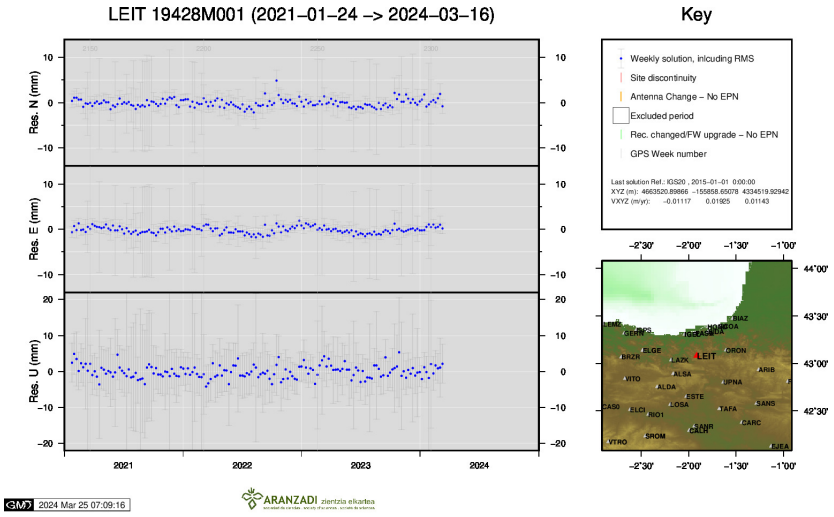


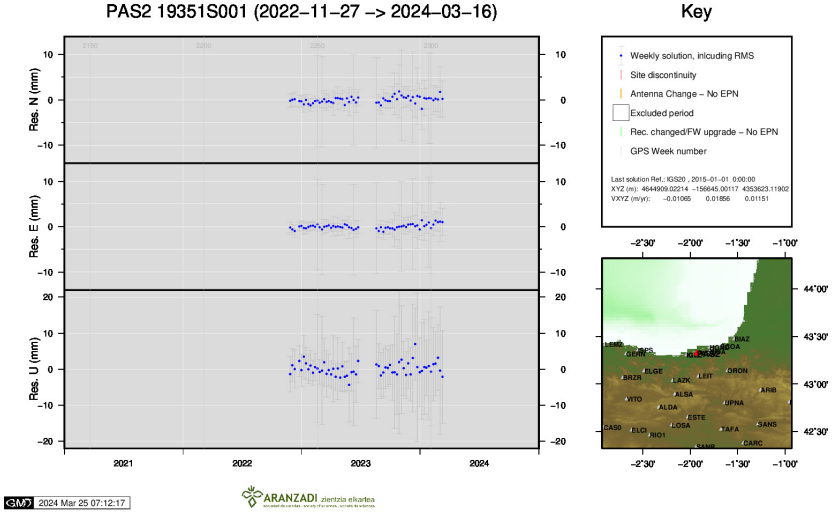
15) LARE



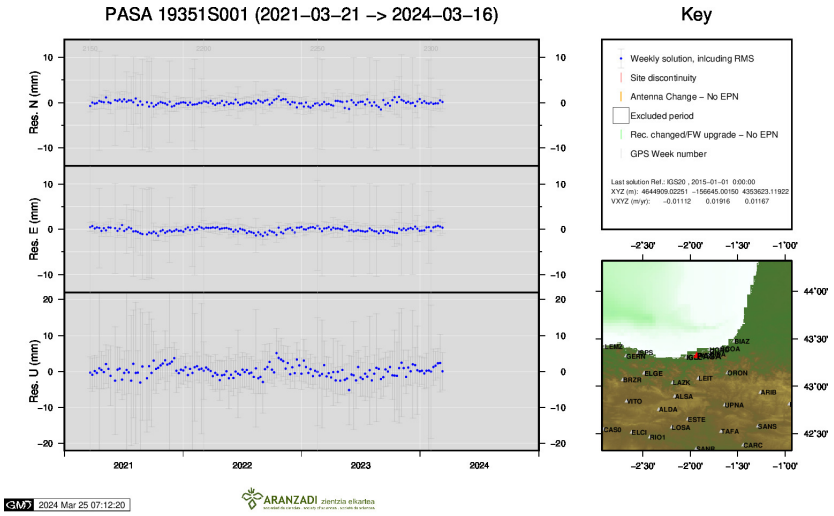
16) LAZK



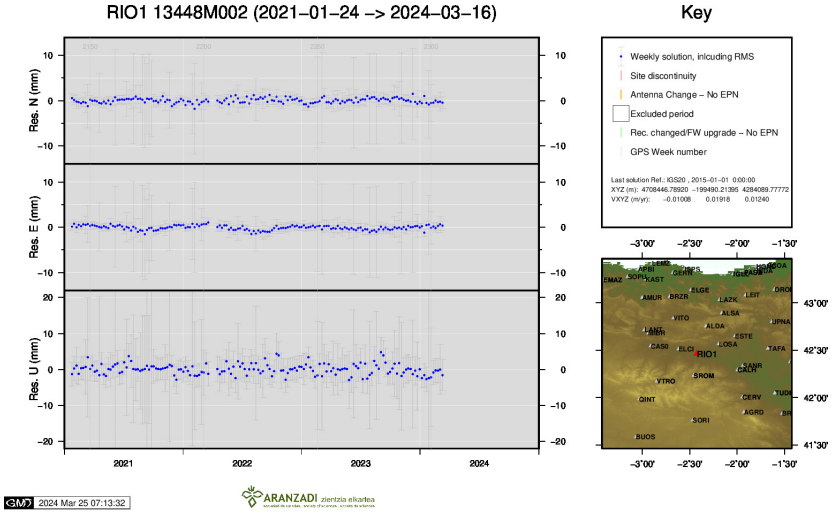
17) LEIT



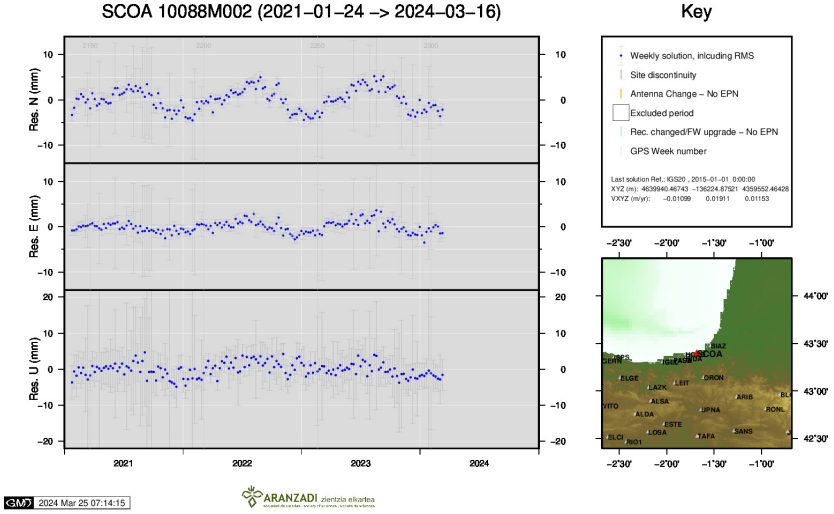
18) PAS2



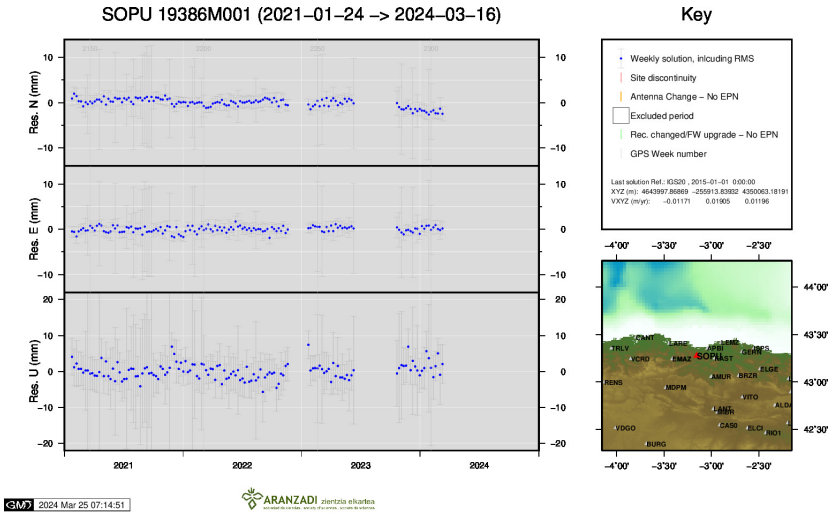
19) PASA



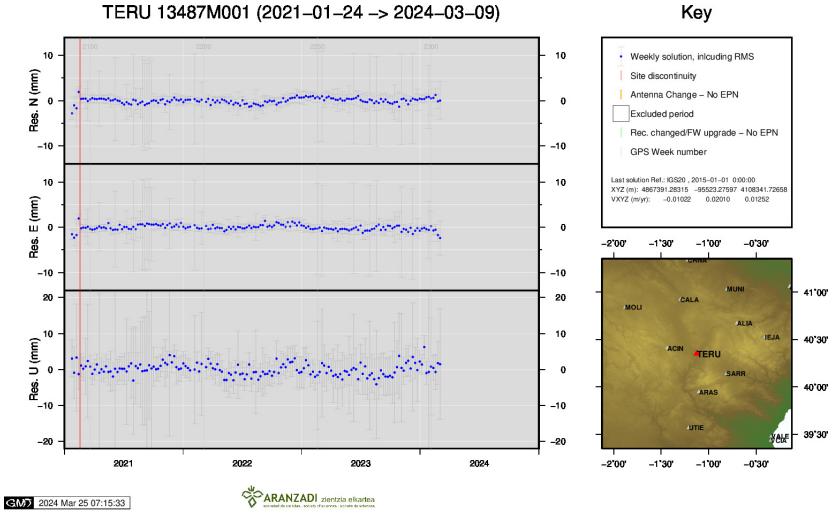
20) RIO1



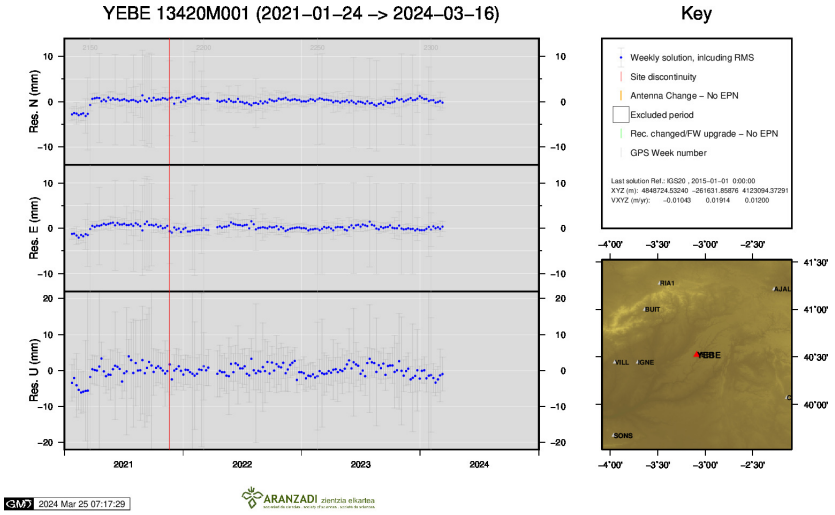
21) SCOA



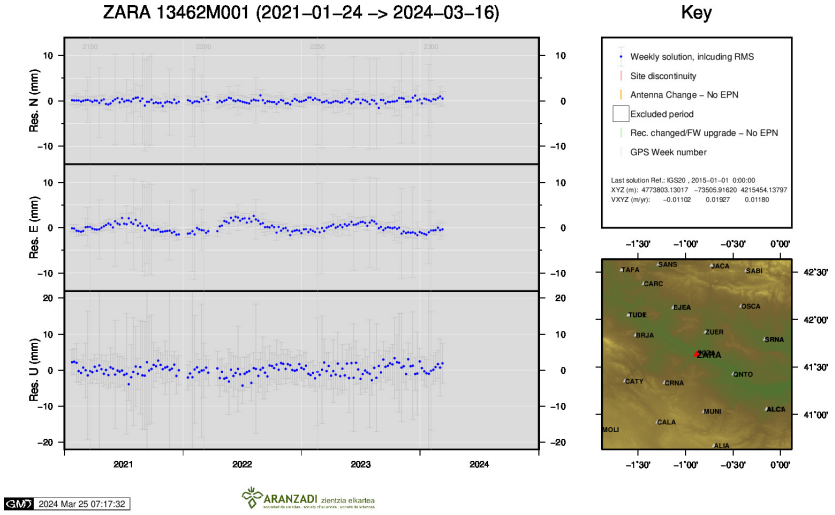
22) SOPU



23) TERU



24) YEBE



25) ZARA