

ARA-DAC Weekly Analysis Result: 2157 (GFA)

Technical Report

GPS Week: 2157 (GFA)

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

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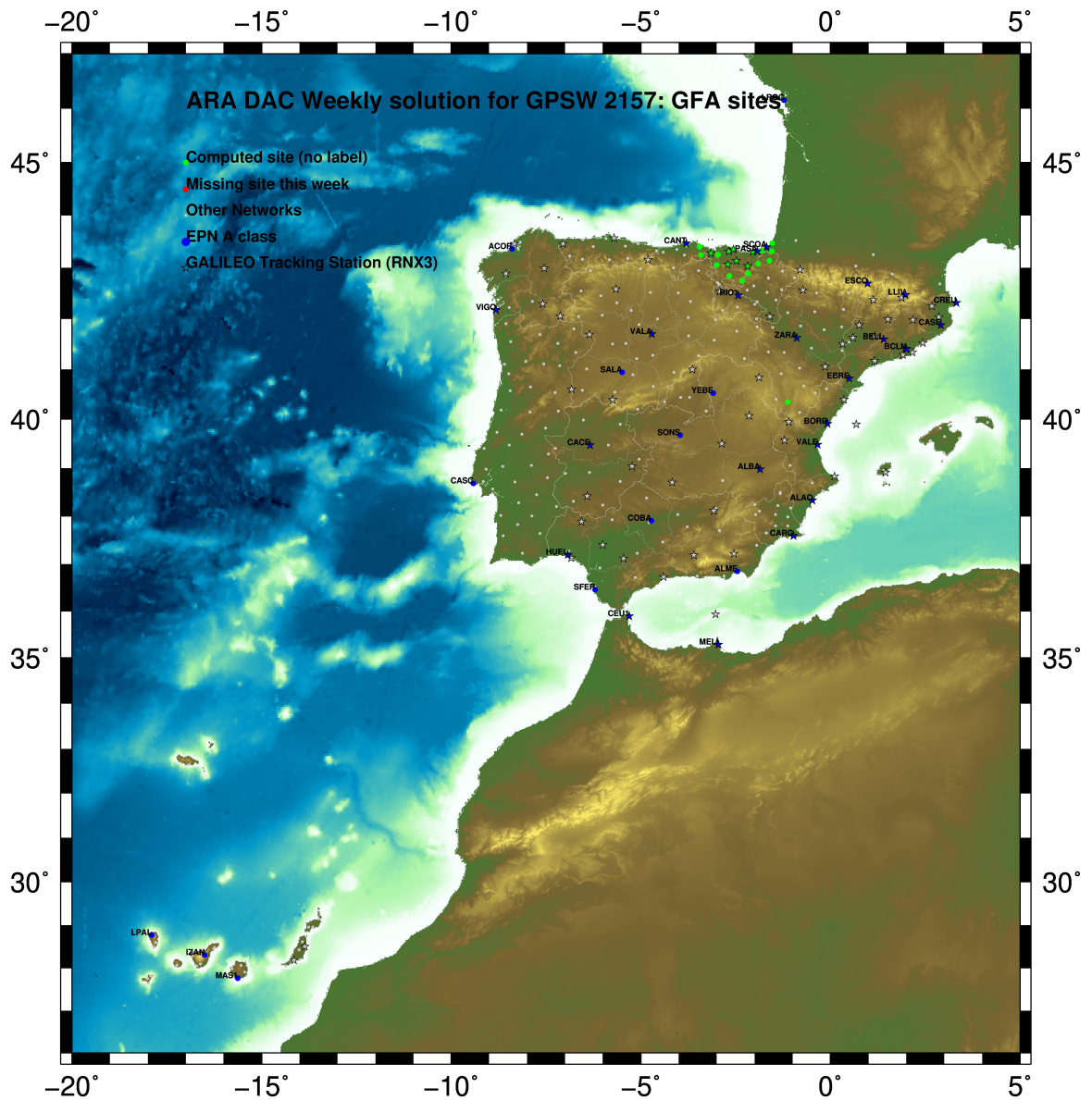
Report generated on 2021/05/30 at 03:01:33



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 2021 May 30 03:01:24

Fig.1: Computed Sites for GPS Week2157 (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 Widelane (WL) AR for baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane and narrow-lane AR is computed.
 - Phase-Based Widelane (L_5) AR for baselines shorter than 200km, the code-based wide-lane AR is replaced by a phase-only wide-lane with a subsequent narrow-lane AR.
 - Quasi-Ionosphere-Free (QIF)AR for the remaining real-valued ambiguities for baselines shorter than 2000km.
 - Direct L_1/L_2 AR for baselines shorter than 20km
- AR Verification: Each baseline is processed by introducing the resolved integer ambiguities and checking the residuals. If there is any problem, the ambiguities are re-initialized.

5 Computed Coordinates

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

5.1 IGB14

The Reference Frame considered in this section is IGB14, release C2130.

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ARA LAC 2157 WEEK FINAL COMBINATION: PRECISE ORBITS                29-MAY-21 23:28
-----
LOCAL GEODETIC DATUM: IGB14                EPOCH: 2021-05-12 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  4 ACRD 13434M001        4594489.53542      -678367.40422    4357066.30218    W
 39 ALDA 19383M001        4687280.13727      -190876.52963    4308106.98221    A
 50 ALSA 19419M001        4677250.80744      -176770.35694    4319079.89664    A
 53 AMUR 19388M001        4661499.42683      -244591.22292    4332269.90997    A
100 BIAZ 10074M002        4634456.02211      -124344.93983    4365785.47970    A
101 BIDA 00000M000        4644177.79560      -145778.28871    4354832.50611    A
113 BRZR 19387M001        4662220.96076      -220769.86513    4333309.46057    A
104 CACE 13447M001        4899866.48038      -544566.99950    4033770.22753    W
116 CANT 13438M001        4625924.29115      -307096.19674    4365771.57879    W
154 CHER 00000M000        4645879.99320      -125721.87374    4353624.10770    A
162 CREU 13432M001        4715420.10324      273178.09579    4271946.86465    W
204 EBRE 13410M001        4833519.96769      41537.42786     4147461.74079    W
180 ELGE 19353S001        4657557.36860      -202241.43397    4338991.91056    A
182 EMAZ 17001M001        4645924.18113      -276949.82959    4347759.59955    A
209 GERN 19389M001        4642811.29181      -217222.88855    4353278.90115    A
235 IGEL 19352S001        4645951.40665      -165574.46619    4352550.44468    A
240 ISPS 19484M001        4640596.45207      -206963.74123    4356391.93563    A
245 KAST 19499M001        4646949.05144      -240747.23728    4348015.01389    A
252 LARE 19440M001        4632831.93040      -279026.10767    4360314.45435    A
256 LAZK 19354S001        4666098.30935      -178186.15382    4330463.68885    A
261 LEIT 19428M001        4663520.91190      -155858.68131    4334519.90926    A
334 ORDN 19427M001        4659695.75428      -130864.69914    4338948.90439    A
345 PAS2 19351S001        4644909.03173      -156645.03234    4353623.10150    A
493 PASA 19351S001        4644909.03218      -156645.03235    4353623.10190    W
553 RID1 13448M002        4708446.80127      -199490.24845    4284089.75772    W
558 SALA 13469M001        4803054.46022      -462131.03366    4158379.10061    W
566 SCDA 10088M002        4639940.47204      -136224.90598    4359552.43737    W
418 SOPU 19386M001        4643997.88314      -255913.87164    4350063.16603    A
443 TERU 13487M001        4867391.28728      -95523.30974    4108341.70230    A
493 VITO 19385M001        4679397.67899      -218436.46881    4314898.39194    A
752 YEBE 13420M001        4848724.53592      -261631.89114    4123094.34785    W
755 ZARA 13462M001        4773803.14235      -73505.94800    4215454.11736    W
    
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5.2 ETRF2000 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

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ETRF2000 FINAL COORD. wk 2157                29-MAY-21 23:28
-----
LOCAL GEODETIC DATUM: ETRF2000            EPOCH: 2021-05-12 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  4 ACRD 13434M001        4594489.85742      -678367.97947    4357065.85932    W
 39 ALDA 19383M001        4687280.51639      -190877.11415    4308106.53825    A
 50 ALSA 19419M001        4677251.18913      -176770.94230    4319079.45367    A
 53 AMUR 19388M001        4661499.80105      -244591.80472    4332269.46739    A
100 BIAZ 10074M002        4634456.41376      -124345.51829    4365785.04084    A
101 BIDA 00000M000        4644178.18377      -145778.86831    4354832.06620    A
113 BRZR 19387M001        4662221.33802      -220770.44696    4333309.01824    A
104 CACE 13447M001        4899866.79518      -544567.60814    4033769.76181    W
116 CANT 13438M001        4625924.66006      -307096.77676    4365771.13827    W
154 CHER 00000M000        4645880.38378      -125722.45347    4353623.66791    A
162 CREU 13432M001        4715420.53734      273177.50980    4271946.42430    W
204 EBRE 13410M001        4833520.36384      41536.82799     4147461.28800    W
180 ELGE 19353S001        4657557.74859      -202242.01523    4338991.46885    A
182 EMAZ 17001M001        4645924.55247      -276950.40976    4347759.15781    A
209 GERN 19389M001        4642811.67098      -217223.46821    4353278.46043    A
235 IGEL 19352S001        4645951.79219      -165575.04605    4352550.00437    A
240 ISPS 19484M001        4640596.83275      -206964.32062    4356391.49522    A
245 KAST 19499M001        4646949.42730      -240747.81746    4348014.57253    A
252 LARE 19440M001        4632832.30240      -279026.68638    4360314.01363    A
256 LAZK 19354S001        4666098.69170      -178186.73595    4330463.24676    A
261 LEIT 19428M001        4663521.29733      -155859.26309    4334519.46766    A
334 ORDN 19427M001        4659696.14314      -130865.28042    4338948.46342    A
345 PAS2 19351S001        4644909.41846      -156645.61206    4353622.66139    A
493 PASA 19351S001        4644909.41891      -156645.61207    4353622.66179    W
553 RID1 13448M002        4708447.17755      -199490.83532    4284089.31194    W
558 SALA 13469M001        4803054.79451      -462131.63158    4158378.64380    W
566 SCDA 10088M002        4639940.86175      -136225.48509    4359551.99792    W
418 SOPU 19386M001        4643998.25726      -255914.45153    4350062.72471    A
443 TERU 13487M001        4867391.66350      -95523.91378    4108341.24503    A
493 VITO 19385M001        4679398.05518      -218437.05253    4314897.94826    A
752 YEBE 13420M001        4848724.89257      -261632.49361    4123093.88996    W
755 ZARA 13462M001        4773803.52923      -73506.54170    4215453.66793    W
    
```

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 2157		29-MAY-21 23:28			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2021-05-12 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACDR 13434M001	4594489.81647	-678368.01740	4357065.91035	W
39	ALDA 19383M001	4687280.47313	-190877.15337	4308106.58915	A
50	ALSA 19419M001	4677251.14592	-176770.98161	4319079.50460	A
53	AMUR 19388M001	4661499.75822	-244591.84386	4332269.51834	A
100	BIAZ 10074M002	4634456.37082	-124345.55795	4365785.09193	A
101	BIDA 00000M000	4644178.14080	-145778.90786	4354832.11724	A
113	BRZR 19387M001	4662221.29511	-220770.48617	4333309.06920	A
104	CACE 13447M001	4899866.75066	-544567.64526	4033769.81204	W
116	CANT 13438M001	4625924.61778	-307096.81583	4365771.18929	W
154	CHER 00000M000	4645880.34073	-125722.49308	4353623.71896	A
162	CREU 13432M001	4715420.49215	273177.46914	4271946.47544	W
204	EBRE 13410M001	4833520.31825	41536.78860	4147461.33865	W
180	ELGE 19353S001	4657557.70566	-202242.05453	4338991.51983	A
182	EMAZ 17001M001	4645924.50990	-276950.44886	4347759.20879	A
209	GERN 19389M001	4642811.62825	-217223.50752	4353278.51144	A
235	IGEL 19352S001	4645951.74927	-165575.08553	4352550.05540	A
240	ISPS 19484M001	4640596.79001	-206964.35997	4356391.54625	A
245	KAST 19499M001	4646949.38460	-240747.85668	4348014.62353	A
252	LARE 19440M001	4632832.25996	-279026.72552	4360314.06465	A
256	LAZK 19354S001	4666098.64861	-178186.77530	4330463.29772	A
261	LEIT 19428M001	4663521.25419	-155859.30253	4334519.51865	A
334	ORON 19427M001	4659696.09996	-130865.31995	4338948.51443	A
345	PAS2 19351S001	4644909.37552	-156645.65156	4353622.71243	A
493	PASA 19351S001	4644909.37597	-156645.65157	4353622.71283	W
553	RI01 13448M002	4708447.13409	-199490.87442	4284089.36278	W
558	SALA 13469M001	4803054.75084	-462131.66939	4158378.69429	W
566	SOA 10088M002	4639940.81879	-136225.52468	4359552.04898	W
418	SOPU 19386M001	4643998.21464	-255914.49071	4350062.77571	A
443	TERU 13487M001	4867391.61802	-95523.95257	4108341.29551	A
493	VITO 19385M001	4679398.01209	-218437.09168	4314897.99917	A
752	YEBE 13420M001	4848724.84782	-261632.53191	4123093.94040	W
755	ZARA 13462M001	4773803.48467	-73506.58095	4215453.71866	W

LAZK	19354S001	U	6.75	5.30	-0.82	-1.27	-1.97	-12.72	0.27	8.77
LEIT	19428M001	N	1.28	-2.23	0.35	-1.00	0.79	-0.33	1.37	-1.06
LEIT	19428M001	E	1.76	3.53	-0.10	-0.73	-2.21	-0.73	-0.34	0.28
LEIT	19428M001	U	3.54	1.67	-1.39	-1.35	7.53	-2.86	-1.31	-1.37
ORDN	19427M001	N	5.61	-12.75	1.68	2.47	1.18	2.40	2.80	1.44
ORDN	19427M001	E	1.53	-3.28	0.04	0.33	0.88	-0.22	1.40	0.59
ORDN	19427M001	U	1.18	-1.96	1.74	0.45	0.39	0.47	-0.96	0.09
PAS2	19351S001	N	1.97	3.63	-0.95	-1.97	-0.40	-1.33	-0.82	-1.64
PAS2	19351S001	E	0.83	1.20	0.14	0.17	-0.97	-1.08	0.69	-0.32
PAS2	19351S001	U	1.93	-1.29	-3.36	-1.04	1.01	-1.43	2.23	0.53
PASA	19351S001	N	1.90	3.49	-0.79	-1.82	-0.37	-1.43	-0.81	-1.67
PASA	19351S001	E	0.88	1.50	0.00	0.09	-0.87	-1.17	0.46	-0.29
PASA	19351S001	U	1.44	-0.59	-1.73	-1.92	0.42	-1.51	1.69	0.24
RID1	13448M002	N	1.12	1.43	1.04	0.59	0.23	0.05	-0.01	-2.00
RID1	13448M002	E	0.48	-0.93	-0.47	0.07	0.44	-0.17	0.26	-0.01
RID1	13448M002	U	3.89	7.38	0.26	-1.31	-0.94	-0.71	-0.67	-5.74
SALA	13469M001	N	0.24	0.03	0.07	-0.22	0.13	-0.53	0.04	-0.06
SALA	13469M001	E	0.71	0.50	-0.42	-1.29	-0.63	-0.18	-0.12	0.68
SALA	13469M001	U	2.06	0.46	-1.82	-2.51	-1.20	0.89	2.72	2.47
SCDA	10088M002	N	1.24	-2.87	0.05	-0.46	0.61	-0.53	0.19	-0.21
SCDA	10088M002	E	1.74	3.10	-2.31	-0.34	-0.59	-0.16	1.09	-1.19
SCDA	10088M002	U	2.91	-3.06	4.44	-3.76	0.38	-1.72	1.65	-1.34
SOPU	19386M001	N	0.51	-0.05	0.54	-0.06	-0.77	0.78	0.21	-0.07
SOPU	19386M001	E	1.76	2.41	-2.36	-1.13	-2.23	0.22	0.91	0.02
SOPU	19386M001	U	2.30	2.08	-1.39	-2.68	2.25	3.03	-0.87	1.81
TERU	13487M001	N	1.05	-0.99	0.57	-0.12	0.20	1.74	-0.98	1.13
TERU	13487M001	E	0.93	0.56	0.23	0.17	-0.90	-0.16	-0.09	1.99
TERU	13487M001	U	2.61	0.70	-0.46	1.80	0.96	-0.05	-2.54	-5.45
VITO	19385M001	N	1.13	-1.51	1.23	0.65	-1.31	0.07	1.08	-0.76
VITO	19385M001	E	1.34	-2.68	-1.28	0.13	0.49	1.24	-0.01	0.43
VITO	19385M001	U	3.24	-6.63	-4.08	0.78	1.04	0.14	0.02	-0.83
YEBE	13420M001	N	0.73	-0.89	-0.42	-0.11	0.81	1.07	-0.27	-0.57
YEBE	13420M001	E	1.06	0.20	1.51	-1.07	-0.16	-1.64	-0.66	-0.42
YEBE	13420M001	U	3.17	3.87	1.89	1.62	0.66	-1.01	0.91	-6.05
ZARA	13462M001	N	0.78	-0.29	0.58	0.15	0.25	1.39	-0.90	-0.63
ZARA	13462M001	E	1.04	-1.03	-0.28	-0.13	-0.66	-1.16	0.28	1.88
ZARA	13462M001	U	1.49	-1.13	-1.44	2.93	-0.25	0.32	-0.29	1.07

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	-0.04	1.19	3.75
12	ALAC 13433M001	I W	-0.23	0.49	-2.37
15	ALBA 13452M001	I W	0.33	-1.09	-4.16
21	ALME 13437M001	I W	-0.58	-0.10	1.91
47	BCLN 13412M001	I W	-0.81	-1.25	-2.54
52	BELL 13431M001	I W	-0.49	-0.28	3.11
71	BORR 13480M001	I W	-0.55	-0.45	-2.54
76	BRST 10004M004	I W	-1.36	-0.69	5.58
104	CACE 13447M001	I W	-0.39	0.22	5.38
116	CANT 13438M001	I W	-0.30	0.74	-2.56
117	CARG 19412M001	I W	1.25	-0.34	-1.47
122	CASE 13494M001	I W	-1.37	-0.15	-3.69
128	CEU1 13449M002	I W	1.87	0.11	-3.77
143	COBA 13453M001	I W	0.81	1.06	-3.96
162	CREU 13432M001	I W	-1.16	0.83	0.46
204	EBRE 13410M001	I W	-0.18	-0.12	-3.62
222	ESCO 13435M001	I W	-1.44	0.61	0.82
299	HUEL 13451M001	I W	-0.61	-0.60	-4.50
316	IZAN 31309M002	I W	1.14	0.42	-3.87
385	LLIV 13436M001	I W	-0.12	0.24	-1.68
390	LPAL 81701M001	I W	-1.78	1.59	-4.95
392	LROC 10023M001	I W	0.18	0.81	1.99
421	MAS1 31303M002	I W	2.04	1.81	-5.25
432	MELI 19379M001	I W	2.25	1.02	1.34
493	PASA 19351S001	I W	-2.55	-0.47	-1.09
501	PDEL 31906M004	I W	1.99	1.06	-3.42
553	RID1 13448M002	I W	-0.73	0.56	1.40
558	SALA 13469M001	I W	0.64	0.27	-0.57
566	SCOA 10088M002	I W	-1.61	-0.19	-1.81
574	SFER 13402M004	I W	1.10	0.03	0.38
599	SONS 13446M001	I W	-0.22	3.65	7.59
700	VALA 13463M002	I W	-0.05	0.96	1.85
704	VALE 13439M001	I W	0.65	0.06	-2.87
715	VIGO 13450M001	I W	1.15	-1.91	3.02
752	YEBE 13420M001	I W	-2.24	-1.57	13.82
755	ZARA 13462M001	I W	0.22	0.38	2.17
764	ZIMM 14001M004	I W	-0.31	-0.94	4.28
121	CASC 13909S001	A W	3.49	-7.95	1.84
	RMS / COMPONENT		1.31	1.66	4.03
	MEAN		-0.00	0.00	0.00
	MIN		-2.55	-7.95	-5.25
	MAX		3.49	3.65	13.82

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 114
RMS OF TRANSFORMATION : 2.63 MM

BARYCENTER COORDINATES:

LATITUDE : 39 58 22.93
LONGITUDE : - 4 16 24.55
HEIGHT : -42.183 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.43 MM
TRANSLATION IN E : 0.00 +- 0.43 MM
TRANSLATION IN U : -0.00 +- 0.43 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          19411497
NUMBER OF UNKNOWN              229808
NUMBER OF DEGREES OF FREEDOM    19181689
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.075105087961165

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00292      0.0257  0.0078 -0.0206 -0.0001  0.0010  0.0003 -0.00108
 2  0.00223     -0.0094 -0.0129  0.0164  0.0002 -0.0006 -0.0004 -0.00072
 3  0.00180      0.0030  0.0109 -0.0023 -0.0002  0.0001  0.0003  0.00000
 4  0.00193      0.0139  0.0023 -0.0148  0.0001  0.0007  0.0001 -0.00020
 5  0.00214     -0.0043 -0.0192  0.0083  0.0003 -0.0003 -0.0005 -0.00059
 6  0.00331      0.0110  0.0106 -0.0159 -0.0002  0.0006  0.0003  0.00040
 7  0.00256      0.0165 -0.0043 -0.0177  0.0001  0.0008 -0.0001 -0.00045
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Ch1**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00158      2704952      2.49          2739992      3          972      34071      0
 2  0.00147      2739031      2.17          2773800      3          987      33785      0
 3  0.00135      2759074      1.82          2791396      3          972      31353      0
 4  0.00145      2595320      2.09          2627570      3          924      31329      0
 5  0.00139      2770916      1.94          2804425      3          984      32528      0
 6  0.00142      2812856      2.03          2847344      3          984      33507      0
 7  0.00138      2793744      1.90          2826970      3          990      32239      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 21:129:00000 21:135:86370 LEICA GR50 -----
ALDA  A  1 P 21:129:00000 21:135:86370 LEICA GR10 -----
ALSA  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
AMUR  A  1 P 21:129:00000 21:135:86370 LEICA GR10 -----
BIAZ  A  1 P 21:129:00000 21:135:86370 SPECTRA SP90M -----
BIDA  A  1 P 21:129:00000 21:135:86370 LEICA GR10 -----
BRZR  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
CACE  A  1 P 21:129:00000 21:135:86370 TRIMBLE NETR9 -----
CANT  A  1 P 21:129:00000 21:135:86370 LEICA GR10 -----
CHER  A  1 P 21:130:00000 21:135:86370 LEICA GR30 -----
CREU  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
EBRE  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
ELGE  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
EMAZ  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
GERN  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
IGEL  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
ISPS  A  1 P 21:129:00000 21:135:86370 TRIMBLE NETR9 -----
KAST  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
LARE  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
LAZK  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
LEIT  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
ORON  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
PAS2  A  1 P 21:129:00030 21:135:86370 STONEX SC2200 -----
PASA  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
RIO1  A  1 P 21:129:00000 21:135:86370 LEICA GR25 -----
SALA  A  1 P 21:129:00000 21:135:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 21:129:00000 21:135:86370 LEICA GR25 -----
SOPU  A  1 P 21:129:00000 21:135:86370 LEICA GR30 -----
TERU  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
VITO  A  1 P 21:129:00000 21:135:86370 LEICA GR10 -----
YEBE  A  1 P 21:129:00000 21:135:86370 LEICA GR50 -----
ZARA  A  1 P 21:129:00000 21:135:86370 TRIMBLE NETR9 -----
```

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 21:129:00000 21:135:86370 LEIAS04      LEIS -----
ALDA  A  1 P 21:129:00000 21:135:86370 LEIAS10      NONE -----
ALSA  A  1 P 21:129:00000 21:135:86370 LEIAS10      NONE -----
AMUR  A  1 P 21:129:00000 21:135:86370 LEIAS10      NONE -----
```

```

BIAZ A 1 P 21:129:00000 21:135:86370 LEIAR25 LEIT -----
BIDA A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
BRZR A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
CACE A 1 P 21:129:00000 21:135:86370 TRM29659.00 NONE -----
CANT A 1 P 21:129:00000 21:135:86370 LEIAR25_R4 LEIT 25066
CHER A 1 P 21:130:00000 21:135:86370 LEIAR10 NONE -----
CREU A 1 P 21:129:00000 21:135:86370 LEIAR25_R4 NONE 26357
EBRE A 1 P 21:129:00000 21:135:86370 LEIAR25_R4 NONE 26359
ELGE A 1 P 21:129:00000 21:135:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
GERN A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
IGEL A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
ISPS A 1 P 21:129:00000 21:135:86370 TRM59900.00 SCIS -----
KAST A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
LARE A 1 P 21:129:00000 21:135:86370 LEIAR20 LEIM -----
LAZK A 1 P 21:129:00000 21:135:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 21:129:00000 21:135:86370 LEIAR10 NONE -----
ORDN A 1 P 21:129:00000 21:135:86370 LEIAR10 NONE -----
PAS2 A 1 P 21:129:00030 21:135:86370 LEIAR20 LEIM 73034
PASA A 1 P 21:129:00000 21:135:86370 LEIAR20 LEIM 73034
RIO1 A 1 P 21:129:00000 21:135:86370 LEIAR25_R4 LEIT 25138
SALA A 1 P 21:129:00000 21:135:86370 LEIAR25 NONE -----
SCOA A 1 P 21:129:00000 21:135:86370 TRM55971.00 NONE -----
SOPU A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
TERU A 1 P 21:129:00000 21:135:86370 LEIAR20 LEIM 49044
VITO A 1 P 21:129:00000 21:135:86370 LEIAS10 NONE -----
YEBE A 1 P 21:129:00000 21:135:86370 LEIAR20 LEIM 49016
ZARA A 1 P 21:129:00000 21:135:86370 TRM29659.00 NONE -----

```

7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START_ DATA_END_ AXE ARP->BENCHMARK(M) UP_----- NORTH_-- EAST_----
ACOR A 1 P 21:129:00000 21:135:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 21:129:00000 21:135:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 21:129:00000 21:135:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 21:129:00000 21:135:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 21:130:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 21:129:00000 21:135:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 21:129:00000 21:135:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 21:129:00000 21:135:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 21:129:00000 21:135:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 21:129:00000 21:135:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 21:129:00000 21:135:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 21:129:00030 21:135:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
RIO1 A 1 P 21:129:00000 21:135:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 21:129:00000 21:135:86370 UNE 0.0600 0.0000 0.0000
SCOA A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 21:129:00000 21:135:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 21:129:00000 21:135:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 21:129:00000 21:135:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 21:129:00000 21:135:86370 UNE 3.2590 0.0000 0.0000

```

8 References

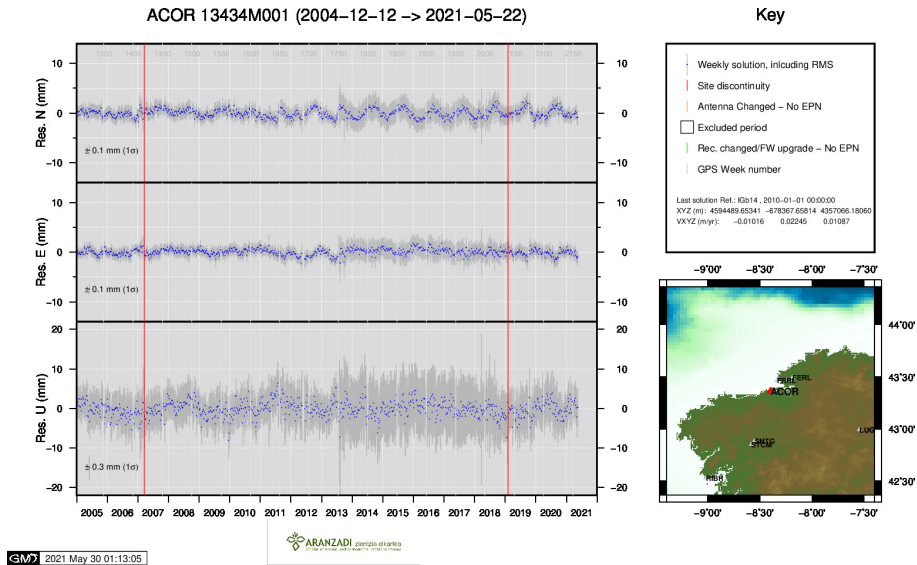
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. etrs89.ensg.ign.fr/memo-V8.pdf

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

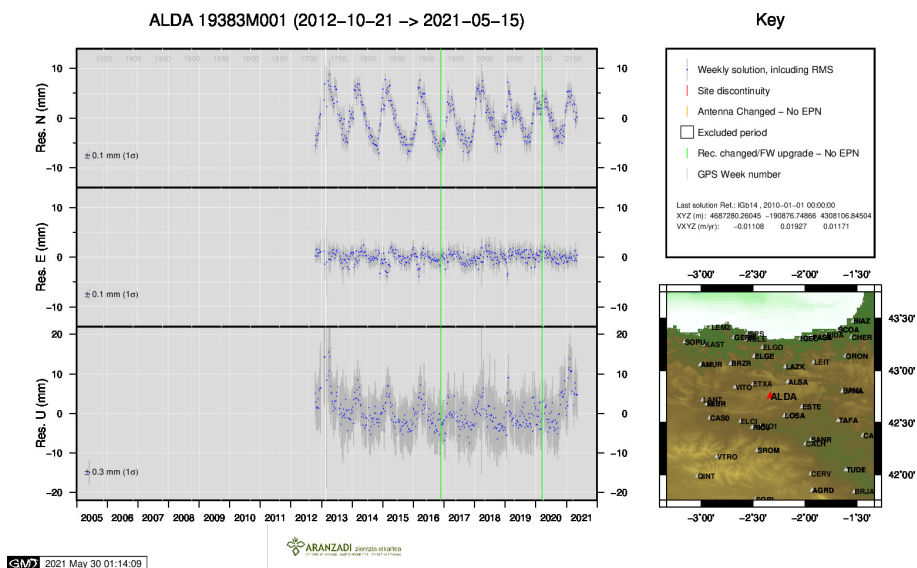
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

9 Cumulative Time Series

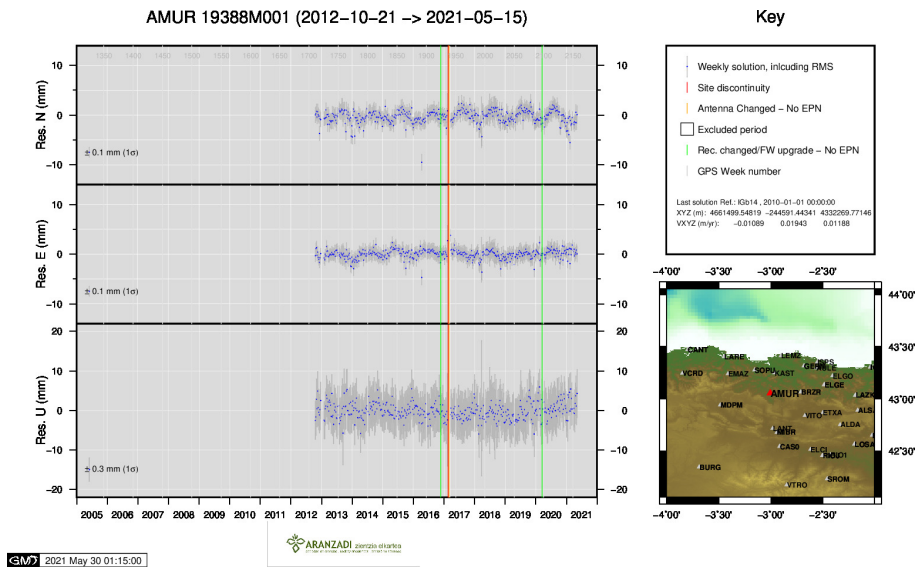
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



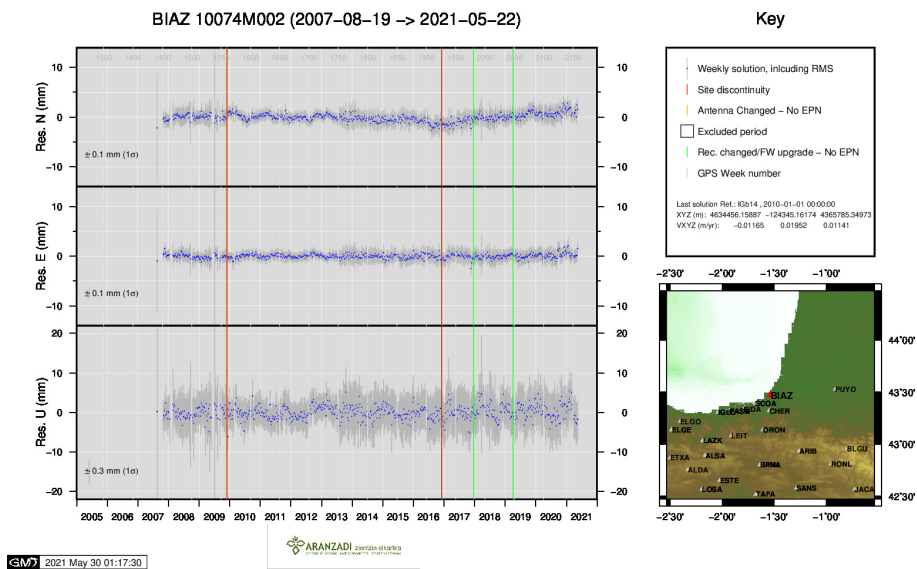
1) ACOR



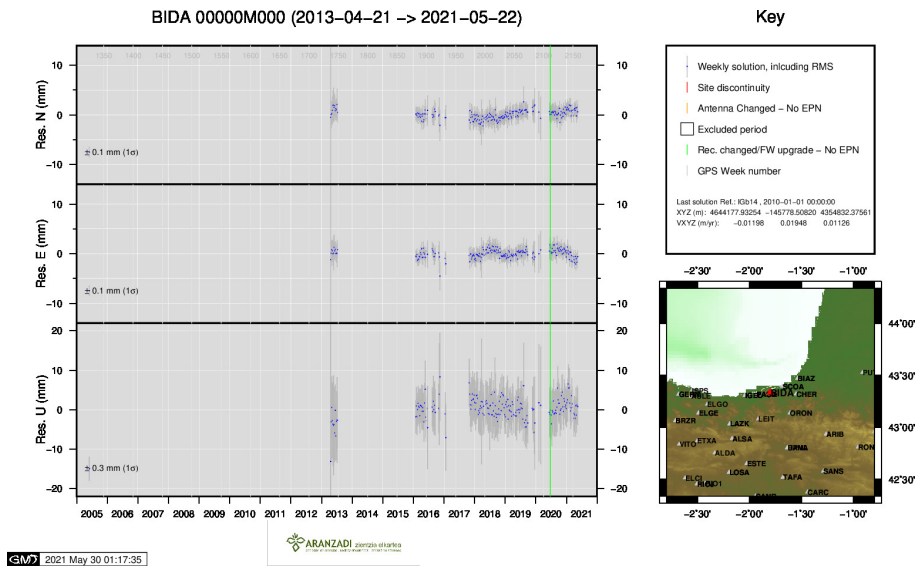
2) ALDA



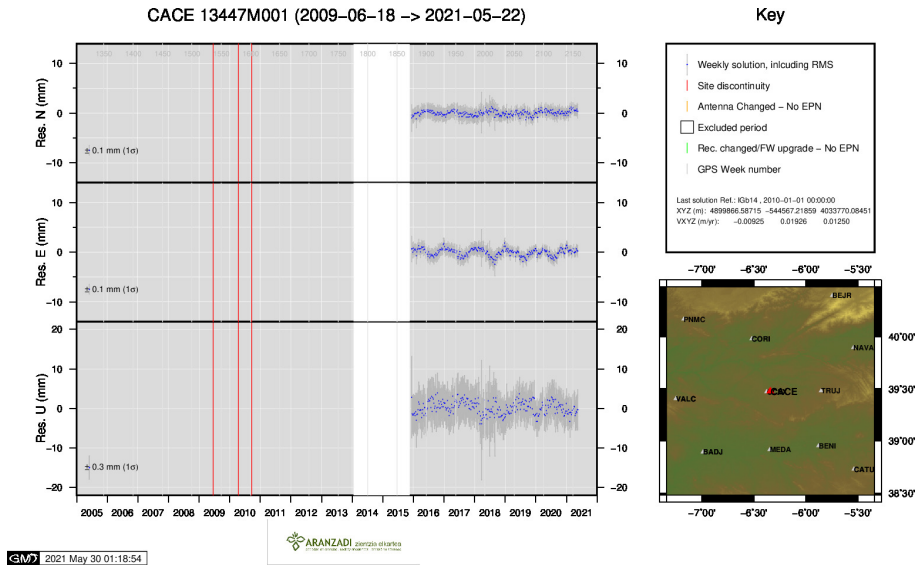
3) AMUR



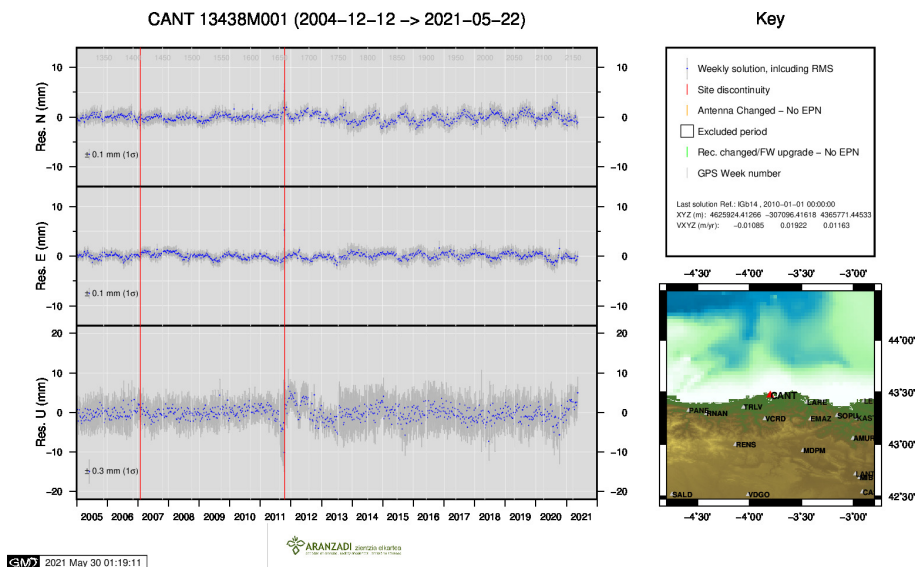
4) BIAZ



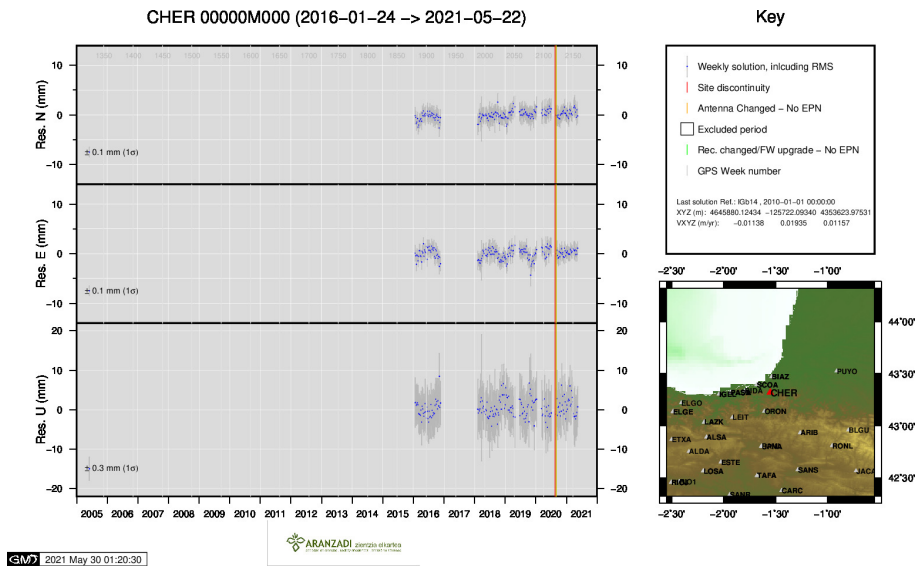
5) BIDA



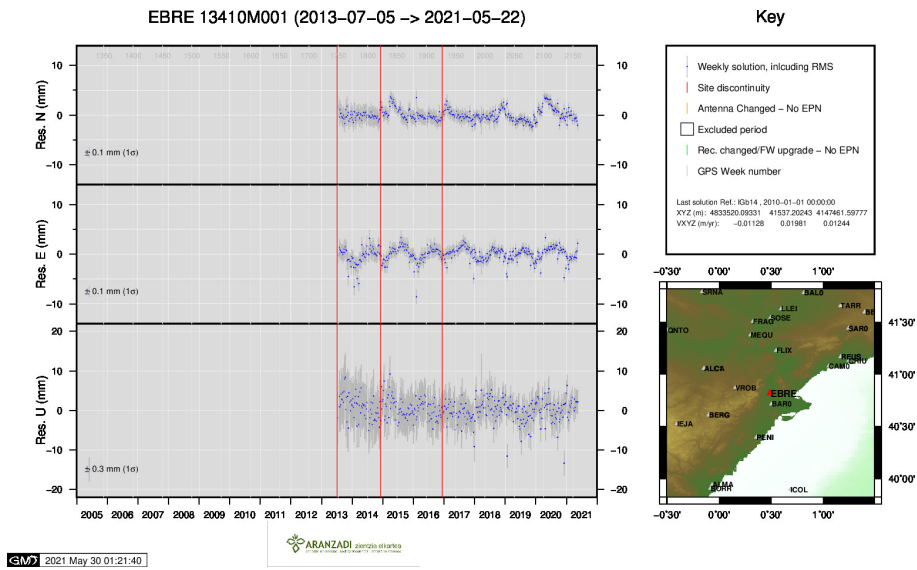
6) CACE



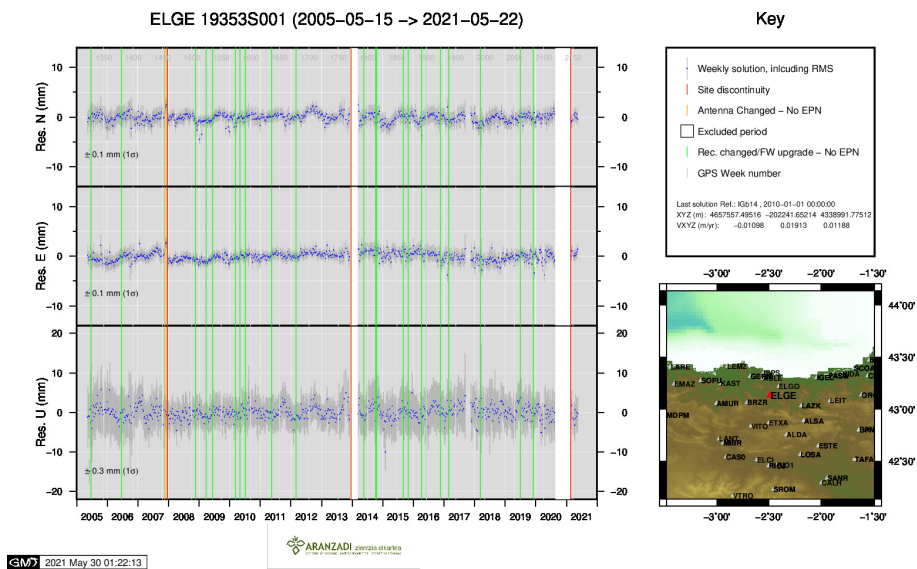
7) CANT



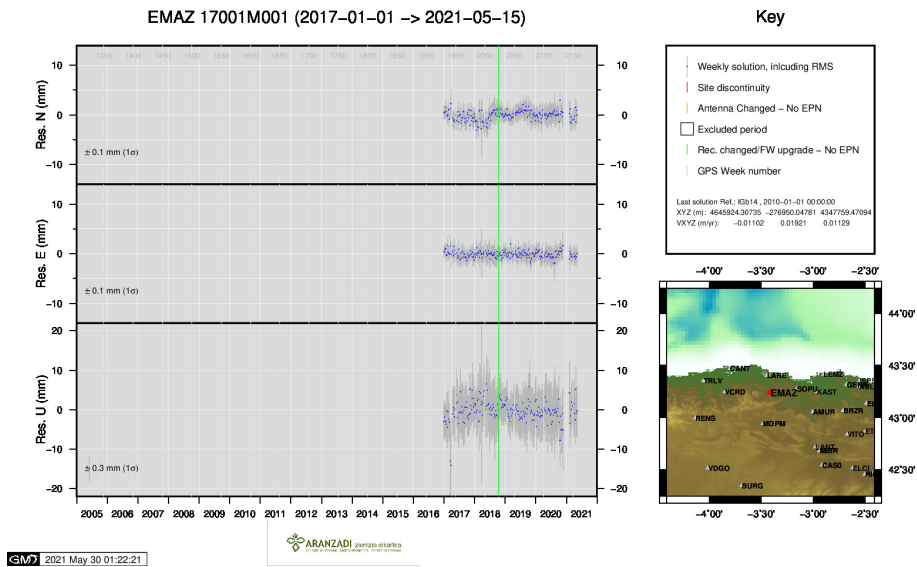
8) CHER



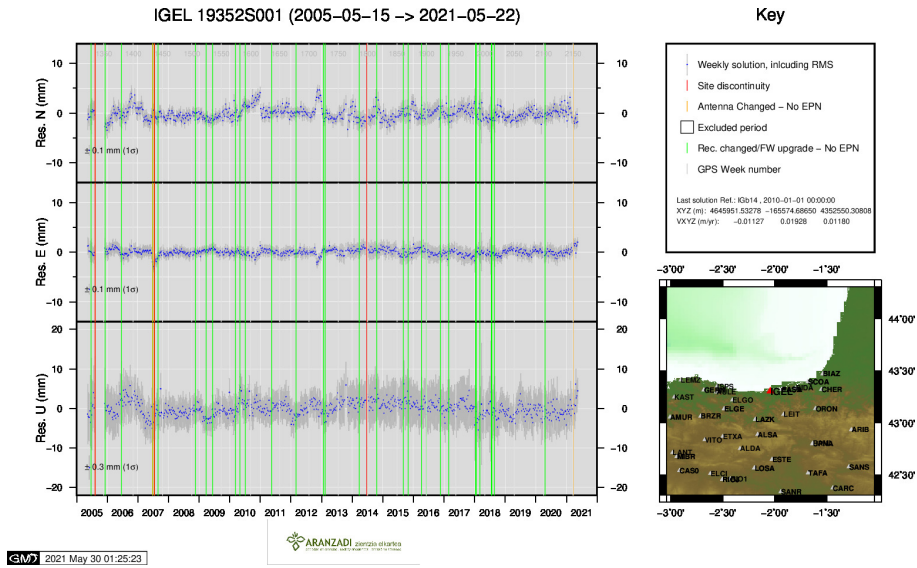
9) EBRE



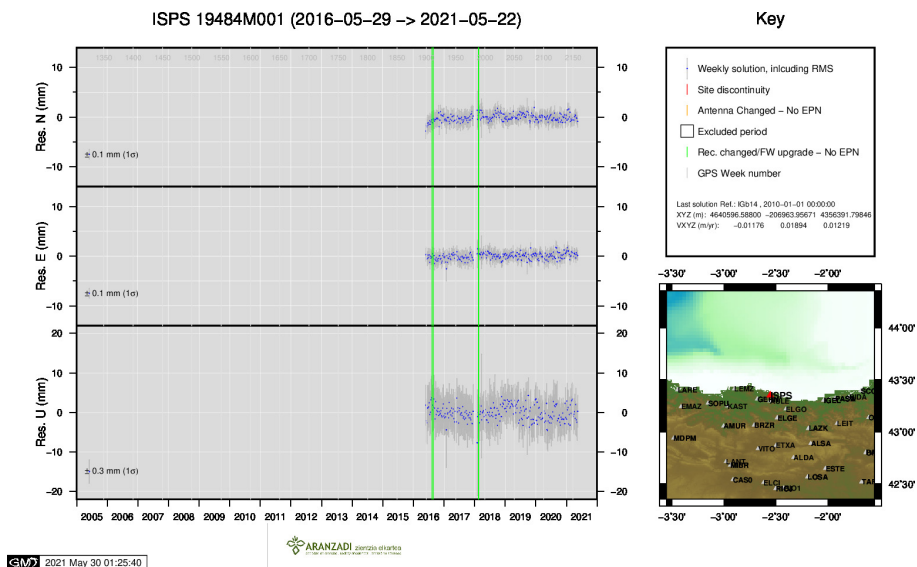
10) ELGE



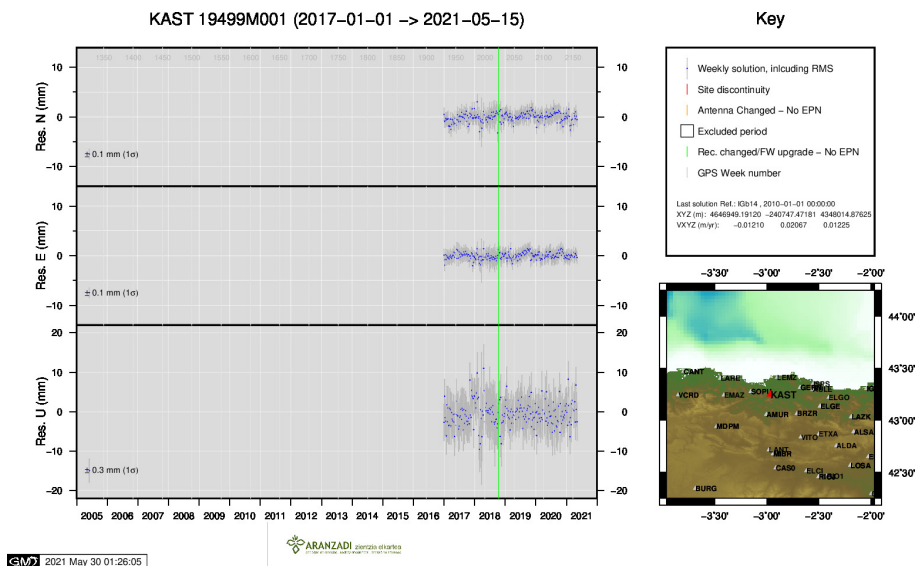
11) EMAZ



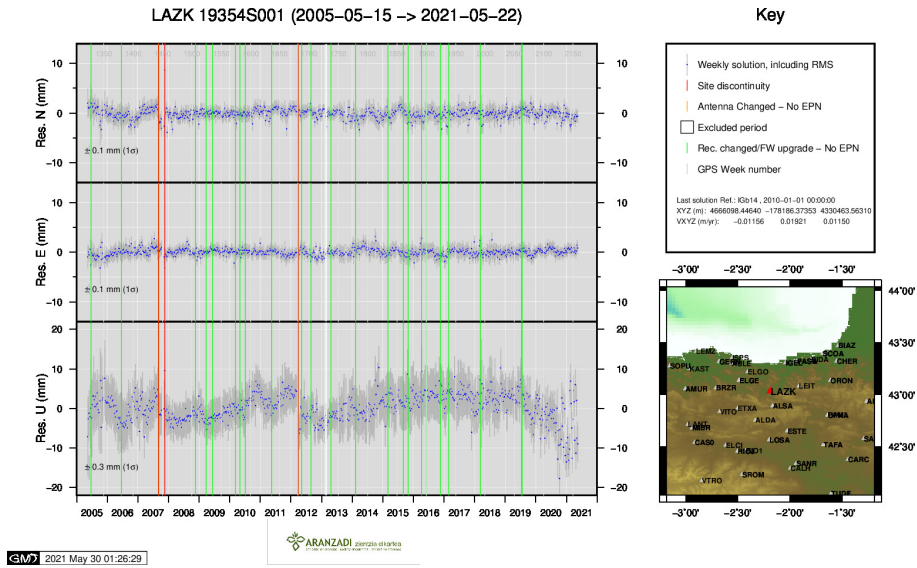
12) IGEL



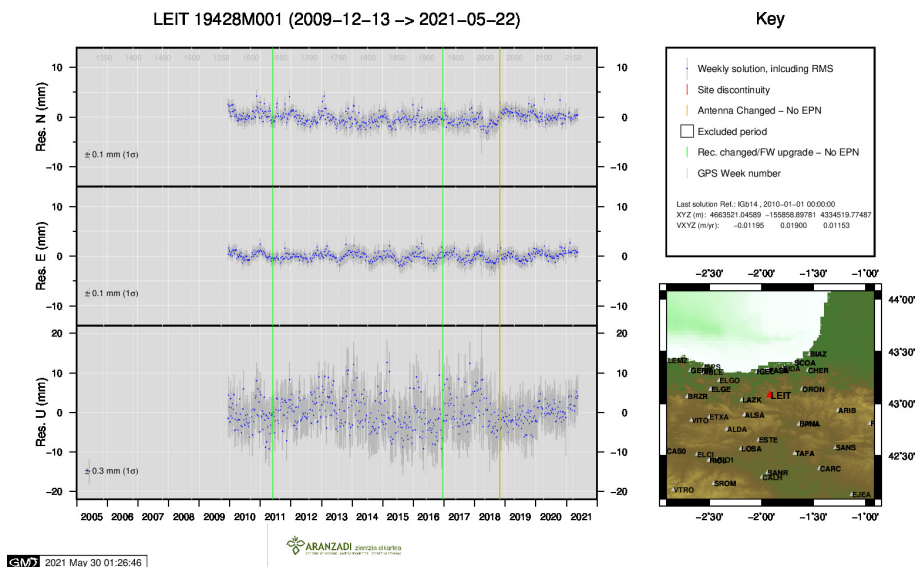
13) ISPS



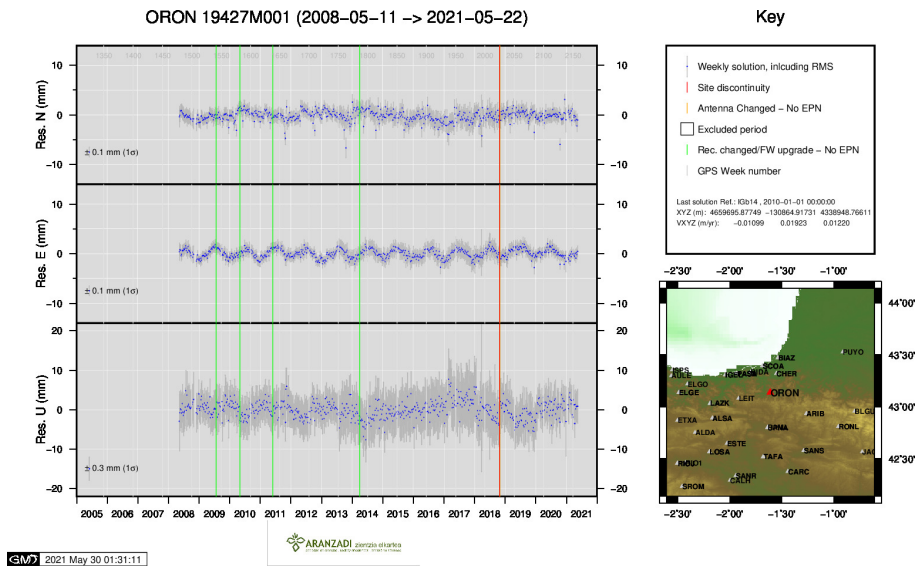
14) KAST



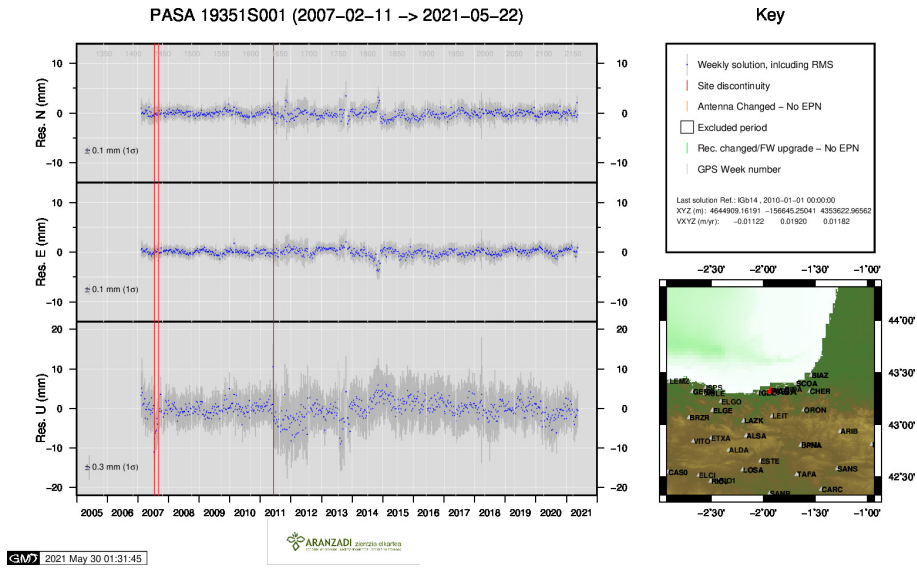
15) LAZK



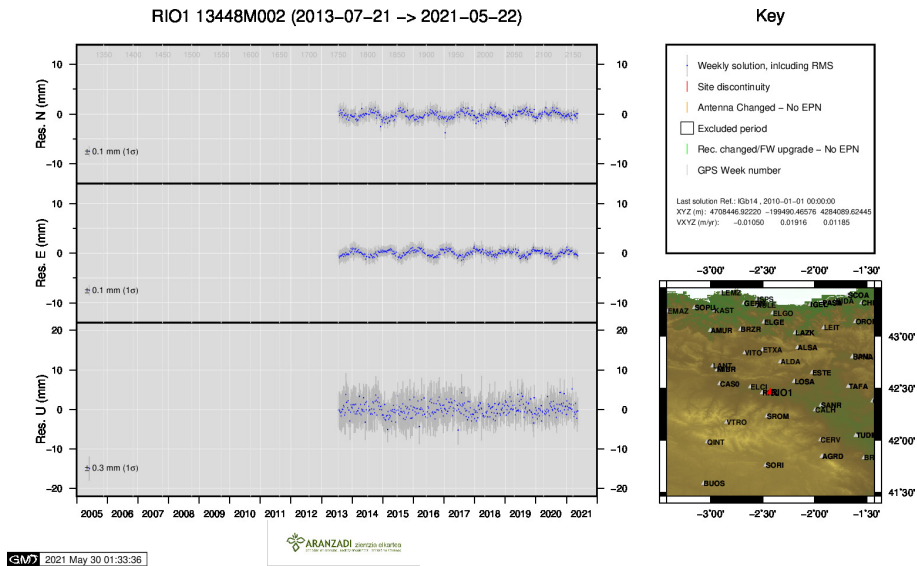
16) LEIT



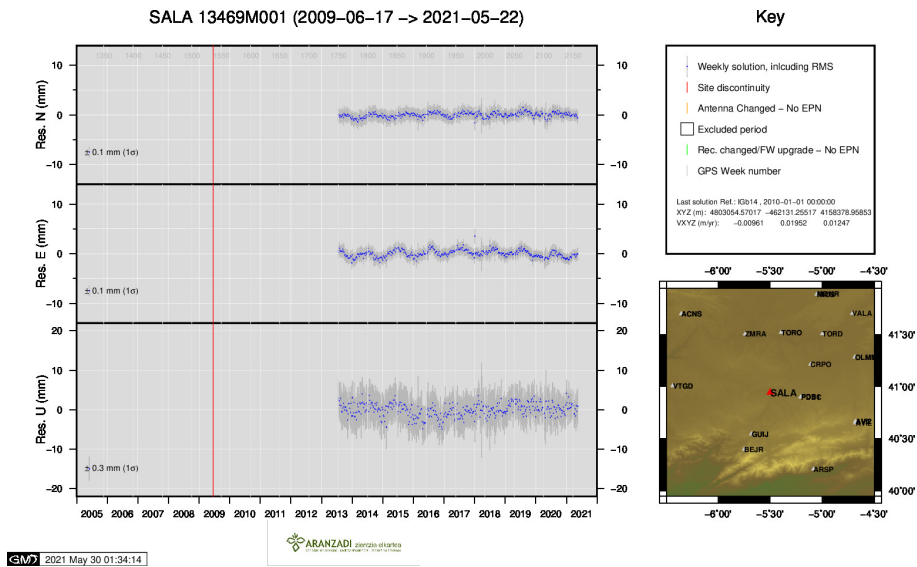
17) ORON



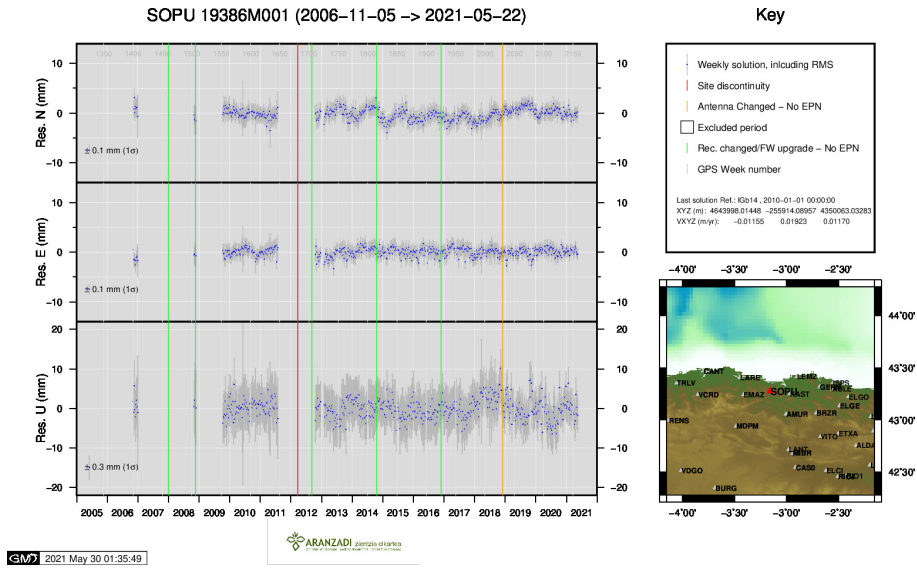
18) PASA



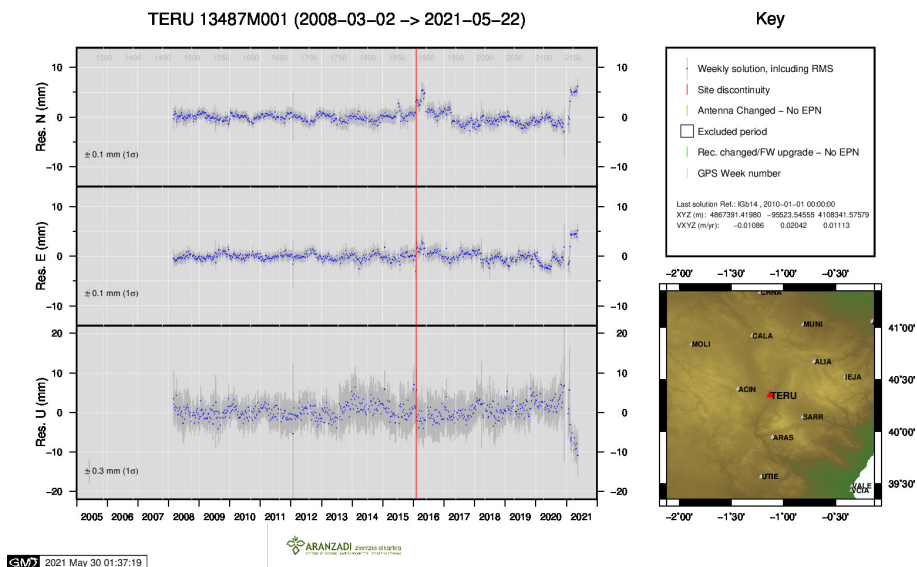
19) RIO1



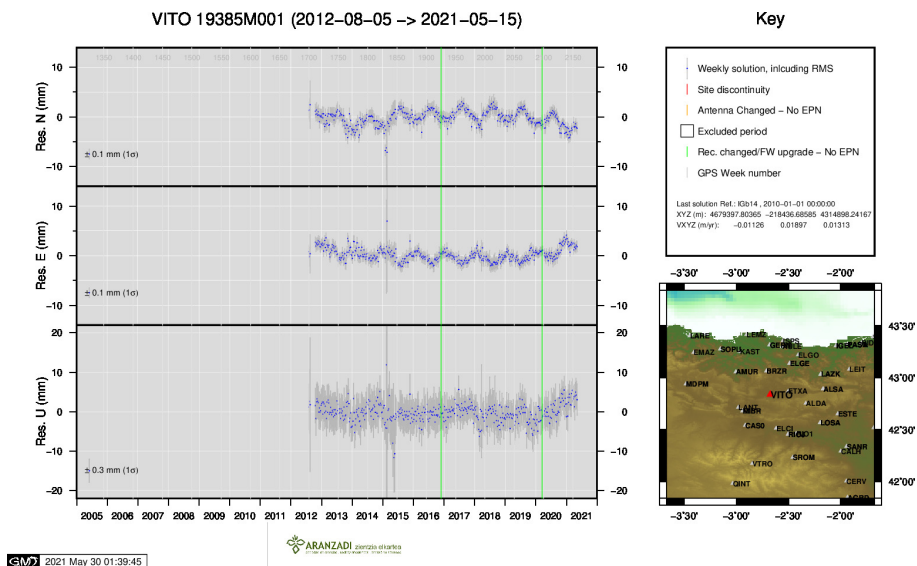
20) SALA



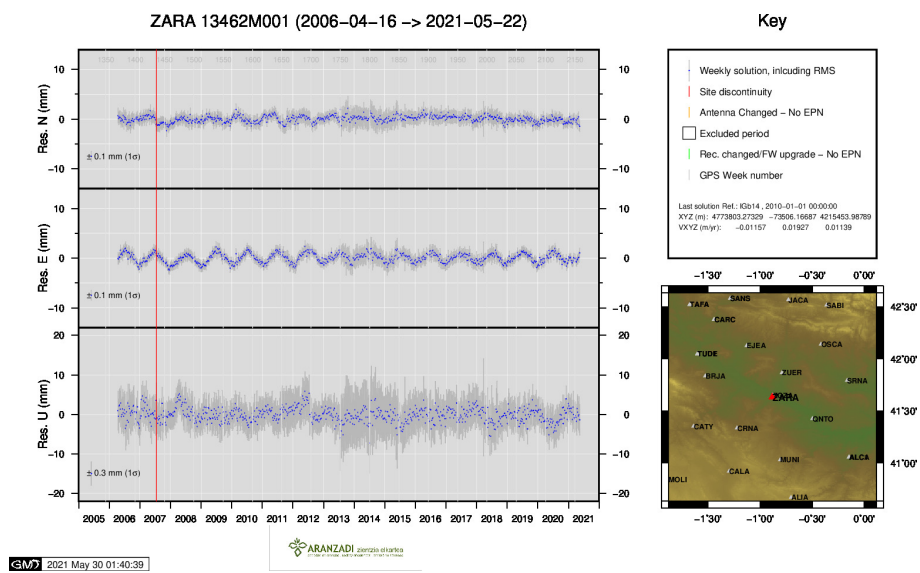
21) SOPU



22) TERU



23) VITO



24) ZARA