

ARA-DAC Weekly Analysis Result: 2064 (GFA)

Technical Report

GPS Week: 2064 (GFA)

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

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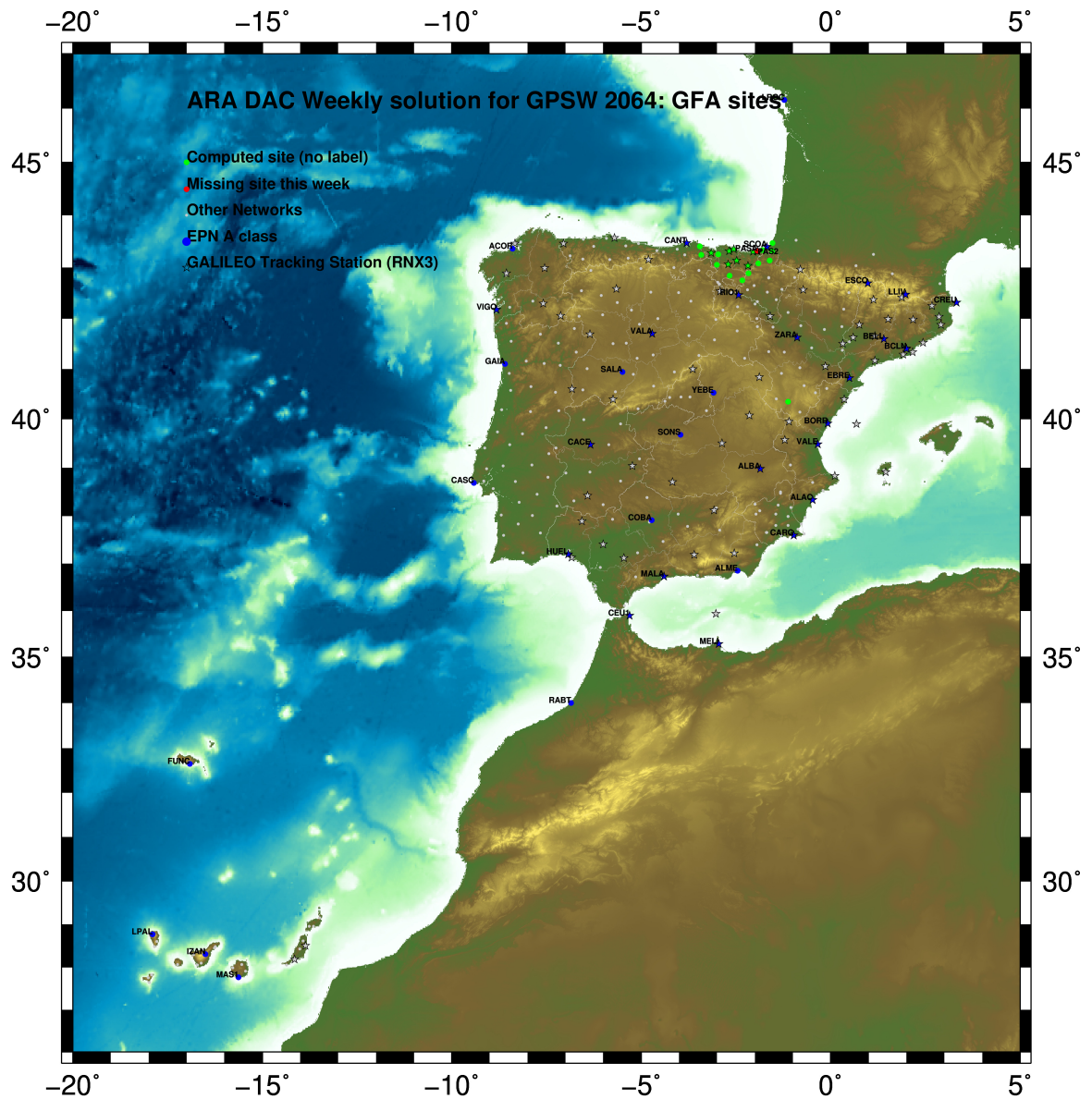
Report generated on 2019/08/18 at 15:51:46



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 2019 Aug 18 15:51:35

Fig.1: Computed Sites for GPS Week2064 (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) IGS14 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 IGS14

The Reference Frame considered in this section is IGS14, release C2010.

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ARA LAC 2064 WEEK FINAL COMBINATION: PRECISE ORBITS                17-AUG-19 23:32
-----
LOCAL GEODETIC DATUM: IGS14                EPOCH: 2019-07-31 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  1 ACRD 13434M001        4594489.55605        -678367.44409        4357066.28742        W
 33 ALDA 19383M001        4687280.15660        -190876.56424        4308106.95868        A
 42 ALSA 19419M001        4677250.82898        -176770.39144        4319079.87776        A
 44 AMUR 19388M001        4661499.44417        -244591.25761        4332269.88792        A
 78 BIAZ 10074M002        4634456.04853        -124344.97500        4365785.46246        A
 79 BIDA 00000M000        4644177.81877        -145778.32124        4354832.48697        A
 89 BRZR 19387M001        4662220.98887        -220769.89668        4333309.44691        A
  9 CACE 13447M001        4899866.50075        -544567.03536        4033770.20675        W
 10 CANT 13438M001        4625924.30946        -307096.23239        4365771.56035        W
114 CHER 00000M000        4645880.31651        -125721.92501        4353624.37676        A
 15 CREU 13432M001        4715420.13093        273178.06247        4271946.84625        W
 16 EBRE 13410M001        4833519.98810        41537.39366        4147461.71880        W
135 ELGE 19353S001        4657557.40169        -202241.47162        4338991.87487        A
137 EMAZ 17001M001        4645924.20083        -276949.86395        4347759.58040        A
157 GERN 19389M001        4642811.31556        -217222.92369        4353278.88629        A
177 IGEL 19352S001        4645951.42732        -165574.50193        4352550.42389        A
182 ISPS 19484M001        4640596.47493        -206963.77501        4356391.91688        A
187 KAST 19499M001        4646949.07652        -240747.27306        4348014.98624        A
192 LARE 19440M001        4632831.94743        -279026.13797        4360314.42936        A
193 LAZK 19354S001        4666098.33900        -178186.18936        4330463.67858        A
197 LEIT 19428M001        4663520.93271        -155858.71714        4334519.88830        A
253 ORDN 19427M001        4659695.77253        -130864.73248        4338948.88547        A
 30 PASA 19351S001        4644909.05699        -156645.06635        4353623.08239        W
 33 RID1 13448M002        4708446.82536        -199490.28270        4284089.74263        W
 34 SALA 13469M001        4803054.47805        -462131.06777        4158379.07929        W
 35 SCDA 10088M002        4639940.49285        -136224.93921        4359552.41949        W
313 SOPU 19386M001        4643997.90377        -255913.90430        4350063.14837        A
333 TERU 13487M001        4867391.31993        -95523.34964        4108341.68392        A
366 VITO 19385M001        4679397.69830        -218436.50510        4314898.37297        A
 43 YEBE 13420M001        4848724.56319        -261631.92878        4123094.33081        W
 44 ZARA 13462M001        4773803.16587        -73505.98098        4215454.10051        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 2064                17-AUG-19 23:32
-----
LOCAL GEODETIC DATUM: ETRF2000                EPOCH: 2019-07-31 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  1 ACRD 13434M001        4594489.86408        -678367.98498        4357065.86868        W
 33 ALDA 19383M001        4687280.51864        -190877.11376        4308106.53889        A
 42 ALSA 19419M001        4677251.19344        -176770.93986        4319079.45890        A
 44 AMUR 19388M001        4661499.80157        -244591.80457        4332269.46944        A
 78 BIAZ 10074M002        4634456.42239        -124345.51878        4365785.04750        A
 79 BIDA 00000M000        4644178.18935        -145778.86610        4354832.07101        A
 89 BRZR 19387M001        4662221.34914        -220770.44366        4333309.02867        A
  9 CACE 13447M001        4899866.80206        -544567.60776        4033769.76632        W
 10 CANT 13438M001        4625924.66183        -307096.77579        4365771.14382        W
114 CHER 00000M000        4645880.68936        -125722.46999        4353623.96091        A
 15 CREU 13432M001        4715420.54493        273177.51168        4271946.42986        W
 16 EBRE 13410M001        4833520.36626        41536.82970        4147461.29062        W
135 ELGE 19353S001        4657557.76453        -202242.01806        4338991.45721        A
137 EMAZ 17001M001        4645924.55550        -276950.40938        4347759.16271        A
157 GERN 19389M001        4642811.67763        -217223.46862        4353278.46957        A
177 IGEL 19352S001        4645951.79541        -165575.04704        4352550.00756        A
182 ISPS 19484M001        4640596.83843        -206964.31968        4356391.50045        A
187 KAST 19499M001        4646949.43546        -240747.81849        4348014.57892        A
192 LARE 19440M001        4632832.30272        -279026.68202        4360314.01264        A
193 LAZK 19354S001        4666098.70408        -178186.73661        4330463.26056        A
197 LEIT 19428M001        4663521.30070        -155859.26406        4334519.47074        A
253 ORDN 19427M001        4659696.14376        -130865.27892        4338948.46851        A
 30 PASA 19351S001        4644909.42621        -156645.61132        4353622.66624        W
 33 RID1 13448M002        4708447.18471        -199490.83444        4284089.32111        W
 34 SALA 13469M001        4803054.79776        -462131.63002        4158378.64731        W
 35 SCDA 10088M002        4639940.86488        -136225.48360        4359552.00397        W
313 SOPU 19386M001        4643998.26107        -255914.44946        4350062.73108        A
333 TERU 13487M001        4867391.67927        -95523.91758        4108341.25150        A
366 VITO 19385M001        4679398.05757        -218437.05387        4314897.95344        A
 43 YEBE 13420M001        4848724.90403        -261632.49527        4123093.89780        W
 44 ZARA 13462M001        4773803.53526        -73506.53914        4215453.67552        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 2064		17-AUG-19 23:32			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2019-07-31 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.82162	-678368.02350	4357065.91717	W
33	ALDA 19383M001	4687280.47397	-190877.15362	4308106.58727	A
42	ALSA 19419M001	4677251.14882	-176770.97982	4319079.50732	A
44	AMUR 19388M001	4661499.75731	-244591.84436	4332269.51786	A
78	BLAZ 10074M002	4634456.37803	-124345.55908	4365785.09605	A
79	BIDA 00000M000	4644178.14496	-145778.90629	4354832.11952	A
89	BRZR 19387M001	4662221.30481	-220770.48352	4333309.07709	A
9	CACE 13447M001	4899866.75614	-544567.64556	4033769.81415	W
10	CANT 13438M001	4625924.61810	-307096.81550	4365771.19230	W
114	CHER 00000M000	4645880.64490	-125722.51024	4353624.00943	A
15	CREU 13432M001	4715420.49842	273177.47033	4271946.47847	W
16	EBRE 13410M001	4833520.31935	41536.78961	4147461.33880	W
135	ELGE 19353S001	4657557.72019	-202242.05800	4338991.50565	A
137	EMAZ 17001M001	4645924.51149	-276950.44911	4347759.21116	A
157	GERN 19389M001	4642811.63347	-217223.50857	4353278.51805	A
177	IGEL 19352S001	4645951.75107	-165575.08716	4352550.05605	A
182	ISPS 19484M001	4640596.79426	-206964.35967	4356391.54894	A
187	KAST 19499M001	4646949.39133	-240747.85834	4348014.62737	A
192	LARE 19440M001	4632832.25884	-279026.72180	4360314.06112	A
193	LAZK 19354S001	4666098.65957	-178186.77661	4330463.30900	A
197	LEIT 19428M001	4663521.25615	-155859.30414	4334519.51920	A
253	ORON 19427M001	4659696.09917	-130865.31910	4338948.51699	A
30	PASA 19351S001	4644909.38185	-156645.65147	4353622.71475	W
33	RI01 13448M002	4708447.13985	-199490.87420	4284089.36944	W
34	SALA 13469M001	4803054.75266	-462131.66848	4158378.69535	W
35	SOA 10088M002	4639940.82050	-136225.52384	4359552.05249	W
313	SOPU 19386M001	4643998.21701	-255914.48927	4350062.77955	A
333	TERU 13487M001	4867391.63245	-95523.95707	4108341.29953	A
366	VITO 19385M001	4679398.01305	-218437.09367	4314898.00183	A
43	YEBE 13420M001	4848724.85791	-261632.53426	4123093.94580	W
44	ZARA 13462M001	4773803.48934	-73506.57907	4215453.72377	W

LEIT 19428M001	N	0.94	0.09	0.58	0.57	-0.87	0.18	-1.53	-1.21
LEIT 19428M001	E	0.75	0.77	-0.68	0.10	0.35	-0.97	1.10	-0.06
LEIT 19428M001	U	2.13	0.58	-0.21	-1.24	-4.84	-0.33	-1.33	0.02
ORDN 19427M001	N	0.82	0.93	-0.28	0.16	-0.83	-0.09	-1.11	-1.08
ORDN 19427M001	E	0.65	-0.52	0.58	-0.89	0.93	-0.00	0.50	0.08
ORDN 19427M001	U	2.75	1.80	-0.28	1.54	-5.13	0.15	-1.32	-3.38
PASA 19351S001	N	0.90	0.57	0.64	-0.42	-0.25	1.89	-0.52	0.18
PASA 19351S001	E	0.60	-0.41	0.29	-0.78	-0.87	-0.66	0.31	0.04
PASA 19351S001	U	4.57	1.45	1.17	3.01	-3.17	7.22	-2.09	-6.81
RIO1 13448M002	N	0.93	-0.20	0.37	-1.01	0.66	-1.66	-0.08	0.85
RIO1 13448M002	E	1.09	1.87	0.29	-0.80	-1.26	-0.16	1.13	-0.02
RIO1 13448M002	U	3.42	-2.83	-0.29	5.65	-4.57	0.94	-0.04	-2.92
SALA 13469M001	N	1.01	-0.53	-0.69	-0.89	0.31	0.64	-0.01	2.00
SALA 13469M001	E	0.75	-0.30	0.39	0.14	-0.10	0.62	0.46	-1.58
SALA 13469M001	U	4.13	-1.80	1.23	-2.37	-4.65	2.35	0.93	8.00
SCDA 10088M002	N	0.78	0.06	-0.07	-0.10	0.71	-1.17		1.07
SCDA 10088M002	E	1.18	0.77	0.48	-1.41	-1.57	0.21		1.26
SCDA 10088M002	U	3.31	-2.33	-2.25	1.02	-0.01	5.10		-4.16
SOPU 19386M001	N	1.08	-0.44	1.35	1.71	-0.43	0.68	-1.10	0.46
SOPU 19386M001	E	1.34	1.46	-1.01	-2.34	-1.40	-0.43	0.31	-0.08
SOPU 19386M001	U	3.84	6.61	0.05	-2.19	-2.09	2.11	-3.47	-4.36
TERU 13487M001	N	1.20	1.11	-0.82	1.17	0.91	-0.02	0.56	-2.05
TERU 13487M001	E	0.94	-0.17	-0.40	-1.60	-0.29	-0.03	0.49	1.49
TERU 13487M001	U	3.01	-1.52	-2.59	4.51	0.56	-1.90	4.58	-0.27
VITO 19385M001	N	0.67	-0.64	1.14	0.48	0.36	0.45	-0.61	-0.15
VITO 19385M001	E	0.76	0.39	0.69	-0.74	-0.32	-0.50	0.59	1.28
VITO 19385M001	U	2.69	-0.83	-1.64	-0.44	-4.36	0.29	-2.83	-3.58
YEBE 13420M001	N	1.11	-1.72	-1.12	0.06	1.31	-0.74	-0.90	0.22
YEBE 13420M001	E	0.81	-0.27	0.45	1.03	-1.19	0.51	-0.38	-0.90
YEBE 13420M001	U	1.14	-1.34	1.15	-0.69	0.63	-1.90	0.38	-0.14
ZARA 13462M001	N	1.09	-0.83	-0.42	-0.38	-0.71	0.04	-0.94	2.19
ZARA 13462M001	E	0.56	-0.13	0.55	0.60	0.31	-0.41	0.86	-0.45
ZARA 13462M001	U	2.80	-1.75	-2.61	-4.96	-2.90	1.83	-0.71	0.60

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: IGS14
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-3.24	0.80	-0.53
2	ALAC 13433M001	I W	1.04	0.08	1.39
3	ALBA 13452M001	I W	-0.42	-0.44	-1.76
4	ALME 13437M001	I W	-1.05	0.58	4.84
5	BCLN 13412M001	I W	0.51	-0.27	-0.86
6	BELL 13431M001	I W	-0.79	0.34	1.49
7	BORR 13480M001	I W	0.37	-1.40	0.33
8	BRST 10004M004	I W	-3.02	1.68	-2.37
9	CACE 13447M001	I W	0.62	1.95	0.61
10	CANT 13438M001	I W	-2.23	0.68	-0.46
11	CARG 19412M001	I W	1.44	1.53	2.55
12	CASC 13909S001	I W	1.10	-0.73	1.93
13	CEU1 13449M002	I W	0.53	0.59	1.99
14	COBA 13453M001	I W	1.97	0.50	-1.28
15	CREU 13432M001	I W	-0.24	-0.43	-4.62
16	EBRE 13410M001	I W	-0.12	-0.59	-2.77
17	ESCO 13435M001	I W	0.55	1.68	-6.17
18	FUNC 13911S001	I W	4.83	-0.30	-2.03
19	GAIA 13902M001	I W	-0.68	0.14	2.87
21	HUEL 13451M001	I W	1.94	-2.31	-4.84
22	IZAN 31309M002	I W	1.35	-0.54	1.87
23	LLIV 13436M001	I W	-1.75	0.38	1.79
24	LPAL 81701M001	I W	-1.25	-0.30	3.08
25	LROC 10023M001	I W	0.75	0.03	-0.32
26	MALA 13443M001	I W	0.16	-1.96	6.38
27	MAS1 31303M002	I W	1.78	1.12	3.81
29	MELI 19379M001	I W	2.87	-1.55	-4.11
30	PASA 19351S001	I W	-1.15	0.31	-2.48
31	PDEL 31906M004	I W	2.70	-1.30	8.17
32	RABT 35001M002	I W	2.28	-0.03	-5.75
33	RIO1 13448M002	I W	-1.75	0.83	-5.65
34	SALA 13469M001	I W	-0.15	0.71	0.61
35	SCOA 10088M002	I W	-5.99	0.17	-1.62
38	SONS 13446M001	I W	-1.97	-1.23	-3.15
40	VALA 13463M002	I W	-0.56	-1.23	3.61
41	VALE 13439M001	I W	-0.16	-0.16	-1.64
42	VIGO 13450M001	I W	-0.28	1.56	4.12
43	YEBE 13420M001	I W	1.10	0.44	4.59
44	ZARA 13462M001	I W	-0.29	-0.45	-2.45
45	ZIMM 14001M004	I W	-0.78	-0.86	-1.19
	RMS / COMPONENT		1.90	1.02	3.42
	MEAN		0.00	-0.00	-0.00
	MIN		-5.99	-2.31	-6.17
	MAX		4.83	1.95	8.17

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 120
RMS OF TRANSFORMATION : 2.34 MM

BARYCENTER COORDINATES:

LATITUDE : 39 38 24.91
LONGITUDE : - 4 55 15.75
HEIGHT : -43.871 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.37 MM
TRANSLATION IN E : 0.00 +- 0.37 MM
TRANSLATION IN U : 0.00 +- 0.37 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 the daily solutions are shown.

```
* STATISTICAL PARAMETER----- VALUE(S)-----
NUMBER OF OBSERVATIONS          16338940
NUMBER OF UNKNOWN               198653
NUMBER OF DEGREES OF FREEDOM    16140287
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.275967456827066

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00210      0.0096 -0.0315 -0.0102  0.0007  0.0005 -0.0008  -0.00056
 2  0.00242     -0.0169 -0.0004  0.0221 -0.0000 -0.0009 -0.0000  -0.00024
 3  0.00251      0.0062 -0.0052 -0.0081  0.0002  0.0003 -0.0001  0.00025
 4  0.00241     -0.0135  0.0102  0.0161 -0.0002 -0.0007  0.0003  0.00018
 5  0.00232     -0.0005  0.0100  0.0029 -0.0002 -0.0001  0.0003  -0.00009
 6  0.00207     -0.0180  0.0111  0.0237 -0.0003 -0.0010  0.0002  0.00012
 7  0.00233     -0.0071 -0.0109  0.0018  0.0001 -0.0002 -0.0004  0.00035
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00153      2438377  2.33          2469240      3          951  29915  0
 2  0.00154      2427660  2.37          2458101      3          954  29490  0
 3  0.00148      2464905  2.19          2495063      3          960  29201  0
 4  0.00147      2433454  2.18          2463121      3          948  28722  0
 5  0.00153      2116081  2.35          2143971      3          858  27035  0
 6  0.00145      2110475  2.10          2137887      3          861  26554  0
 7  0.00154      2143917  2.36          2171557      3          879  26764  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 19:209:00000 19:215:86370 LEICA GR10 -----
ALDA  A  1 P 19:209:00000 19:215:86370 LEICA GR10 -----
ALSA  A  1 P 19:209:00000 19:215:86370 LEICA GR50 -----
AMUR  A  1 P 19:209:00000 19:215:86370 LEICA GR10 -----
BIAZ  A  1 P 19:209:00000 19:215:86370 TRI SP90M -----
BIDA  A  1 P 19:209:00000 19:215:86370 LEICA GR10 -----
BRZR  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
CACE  A  1 P 19:209:00000 19:215:86370 TRIMBLE NETR9 -----
CANT  A  1 P 19:209:00000 19:215:86370 LEICA GR10 -----
CHER  A  1 P 19:209:00000 19:215:86370 LEICA GRX1200+GNSS -----
CREU  A  1 P 19:209:00000 19:214:86370 LEICA GR50 -----
EBRE  A  1 P 19:209:00000 19:215:86370 LEICA GR50 -----
ELGE  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
EMAZ  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
GERN  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
IGEL  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
ISPS  A  1 P 19:209:00000 19:215:86370 TRIMBLE NETR9 -----
KAST  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
LARE  A  1 P 19:209:00000 19:215:86370 LEICA GRX1200GGPRO -----
LAZK  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
LEIT  A  1 P 19:209:00000 19:215:86370 LEICA GR50 -----
ORON  A  1 P 19:209:00000 19:215:86370 LEICA GR50 -----
PASA  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
RIO1  A  1 P 19:209:00000 19:215:86370 LEICA GR25 -----
SALA  A  1 P 19:209:00000 19:215:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 19:209:00000 19:215:86370 LEICA GR25 -----
SOPU  A  1 P 19:209:00000 19:215:86370 LEICA GR30 -----
TERU  A  1 P 19:209:00000 19:215:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 19:209:00000 19:215:86370 LEICA GR10 -----
YEBE  A  1 P 19:209:00000 19:215:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 19:209:00000 19:215:86370 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 19:209:00000 19:215:86370 LEIAT504  LEIS -----
ALDA  A  1 P 19:209:00000 19:215:86370 LEIAS10  NONE -----
ALSA  A  1 P 19:209:00000 19:215:86370 LEIAR10  NONE -----
AMUR  A  1 P 19:209:00000 19:215:86370 LEIAS10  NONE -----
BIAZ  A  1 P 19:209:00000 19:215:86370 LEIAR25  LEIT -----
```

```

BIDA A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
BRZR A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
CACE A 1 P 19:209:00000 19:215:86370 TRM29659.00 NONE -----
CANT A 1 P 19:209:00000 19:215:86370 LEIAR25.R4 LEIT 25066
CHER A 1 P 19:209:00000 19:215:86370 LEIAX1203+GNSS NONE -----
CREU A 1 P 19:209:00000 19:214:86370 LEIAR25.R4 NONE 26357
EBRE A 1 P 19:209:00000 19:215:86370 LEIAR25.R4 NONE 26359
ELGE A 1 P 19:209:00000 19:215:86370 LEIAR25.R4 LEIT -----
EMAZ A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
GERN A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
IGEL A 1 P 19:209:00000 19:215:86370 LEIAR20 LEIM -----
ISPS A 1 P 19:209:00000 19:215:86370 TRM59900.00 SCIS -----
KAST A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
LARE A 1 P 19:209:00000 19:215:86370 LEIAT504 NONE -----
LAZK A 1 P 19:209:00000 19:215:86370 LEIAR25.R4 LEIT -----
LEIT A 1 P 19:209:00000 19:215:86370 LEIAR10 NONE -----
ORDN A 1 P 19:209:00000 19:215:86370 LEIAR10 NONE -----
PASA A 1 P 19:209:00000 19:215:86370 LEIAR20 LEIM 73034
RID1 A 1 P 19:209:00000 19:215:86370 LEIAR25.R4 LEIT 25138
SALA A 1 P 19:209:00000 19:215:86370 LEIAR25 NONE -----
SCDA A 1 P 19:209:00000 19:215:86370 TRM55971.00 NONE -----
SOPU A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
TERU A 1 P 19:209:00000 19:215:86370 LEIAT504GG LEIS -----
VITO A 1 P 19:209:00000 19:215:86370 LEIAS10 NONE -----
YEBE A 1 P 19:209:00000 19:215:86370 TRM29659.00 NONE -----
ZARA A 1 P 19:209:00000 19:215:86370 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 19:209:00000 19:215:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 19:209:00000 19:215:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 19:209:00000 19:215:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 19:209:00000 19:215:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 19:209:00000 19:214:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 19:209:00000 19:215:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 19:209:00000 19:215:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 19:209:00000 19:215:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 19:209:00000 19:215:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 19:209:00000 19:215:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
RID1 A 1 P 19:209:00000 19:215:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 19:209:00000 19:215:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 19:209:00000 19:215:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 19:209:00000 19:215:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 19:209:00000 19:215:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 19:209:00000 19:215:86370 UNE 3.2590 0.0000 0.0000

```

8 References

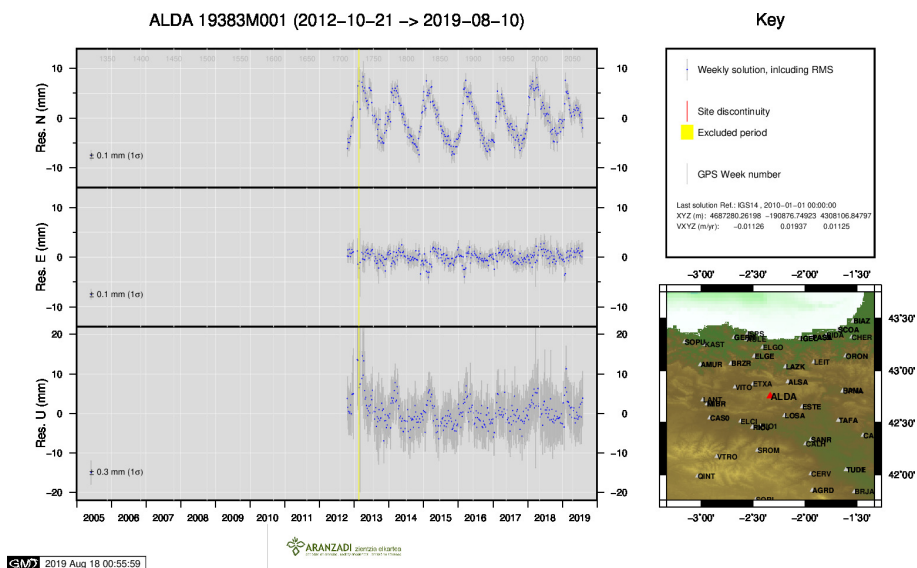
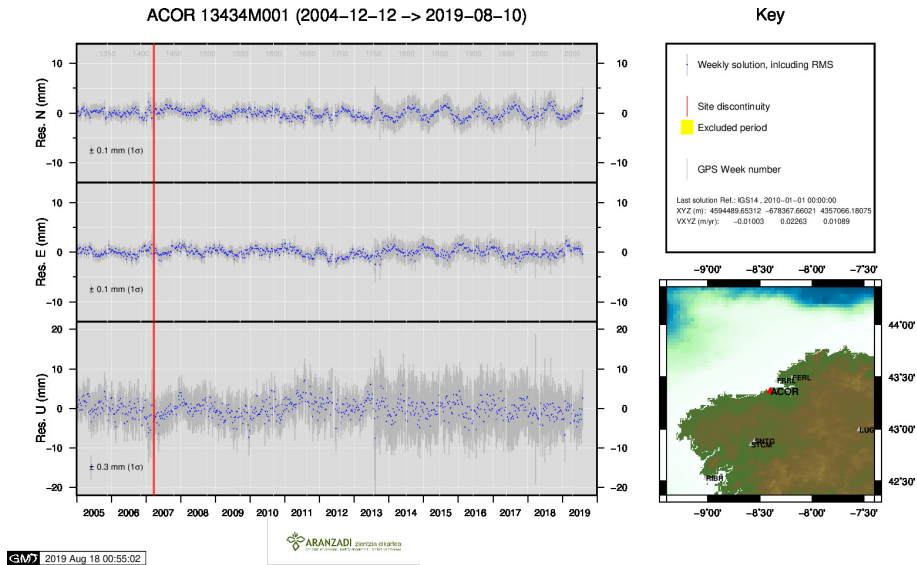
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. etrs89.ensg.ign.fr/memo-V8.pdf

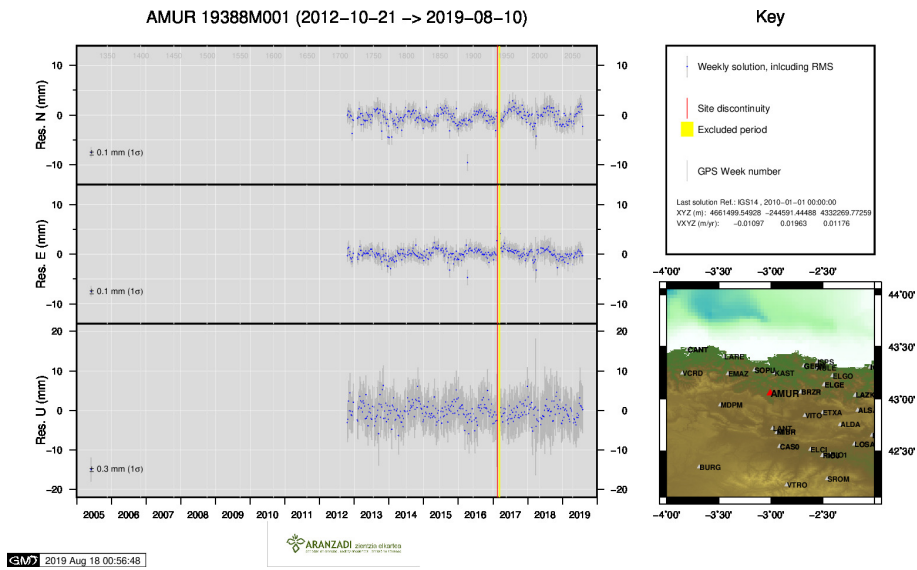
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

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

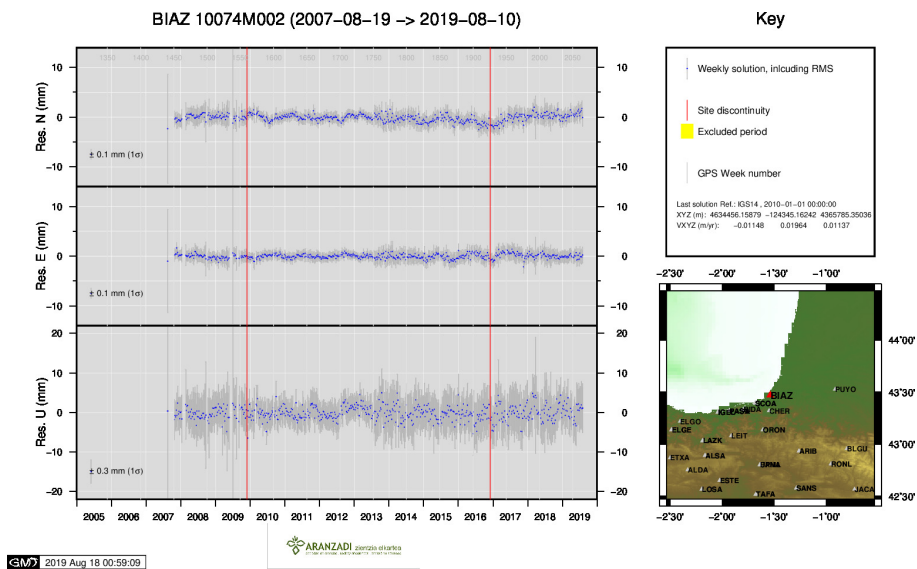
9 Cumulative Time Series

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

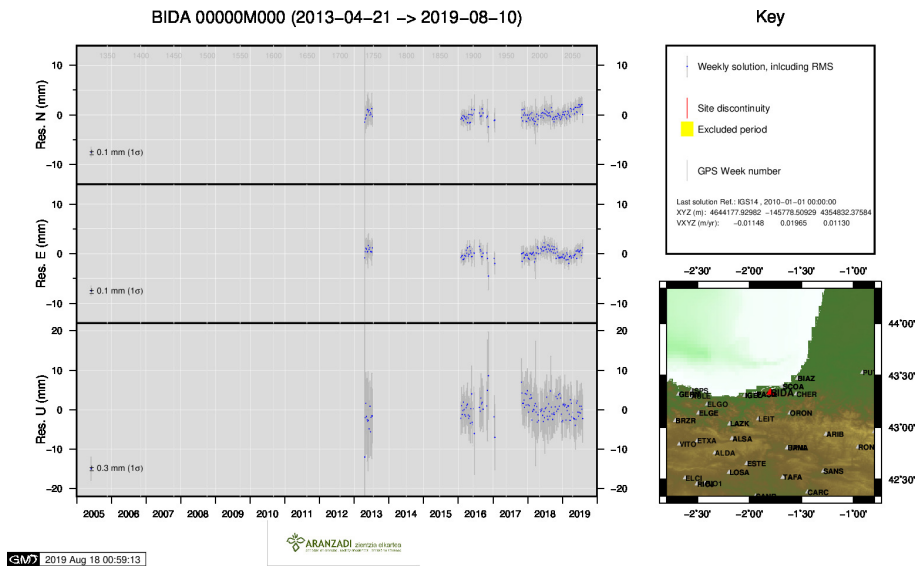




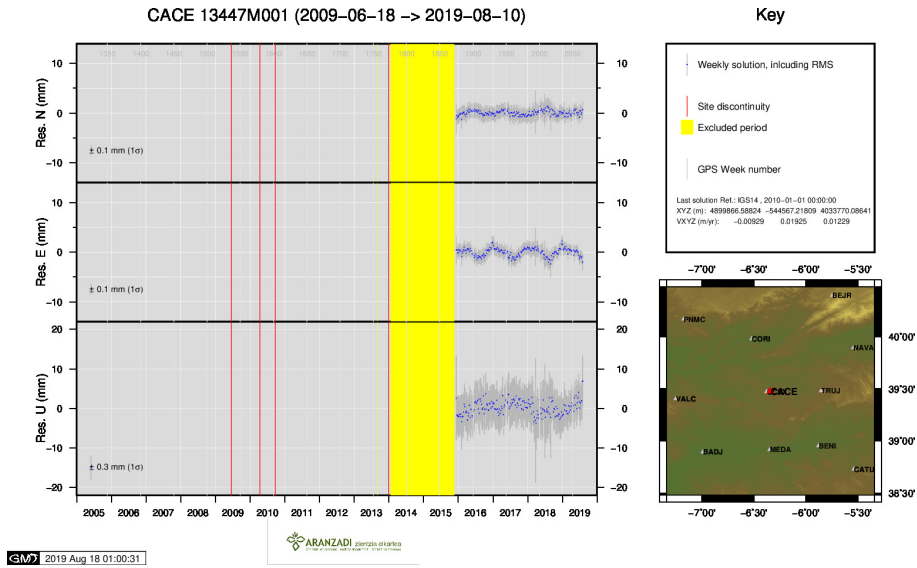
3) AMUR



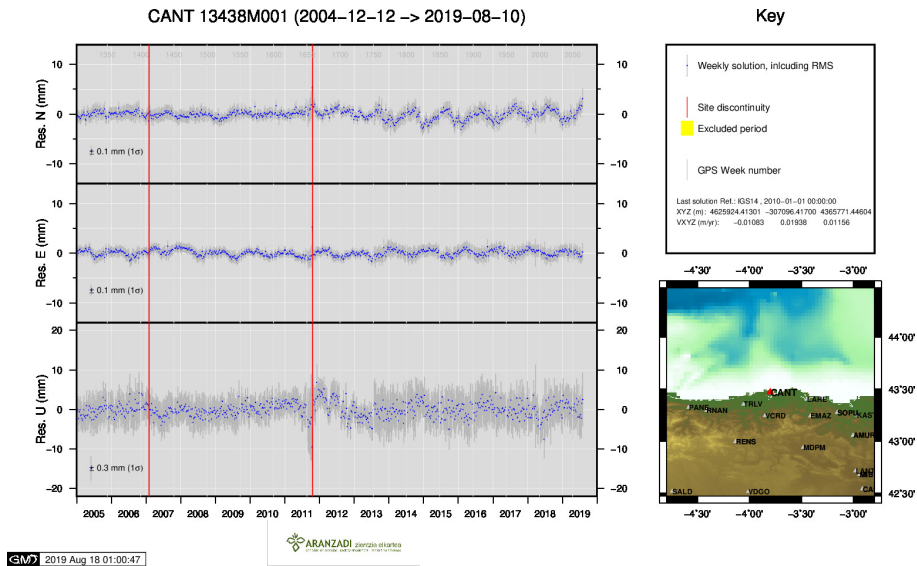
4) BLAZ



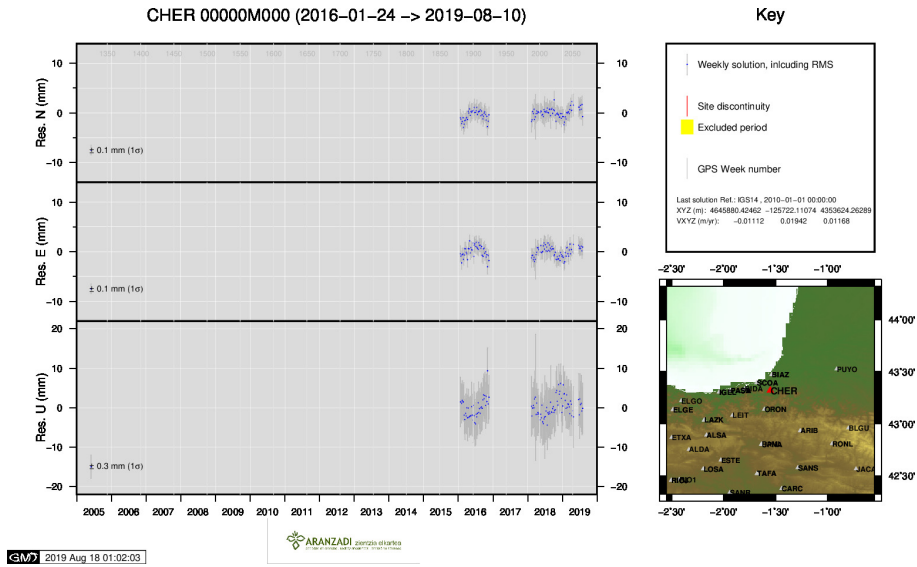
5) BIDA



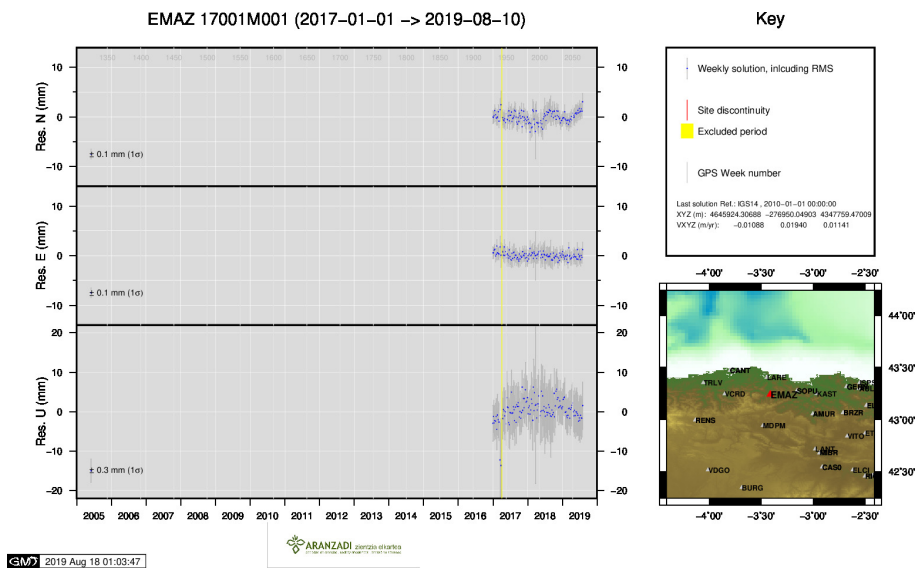
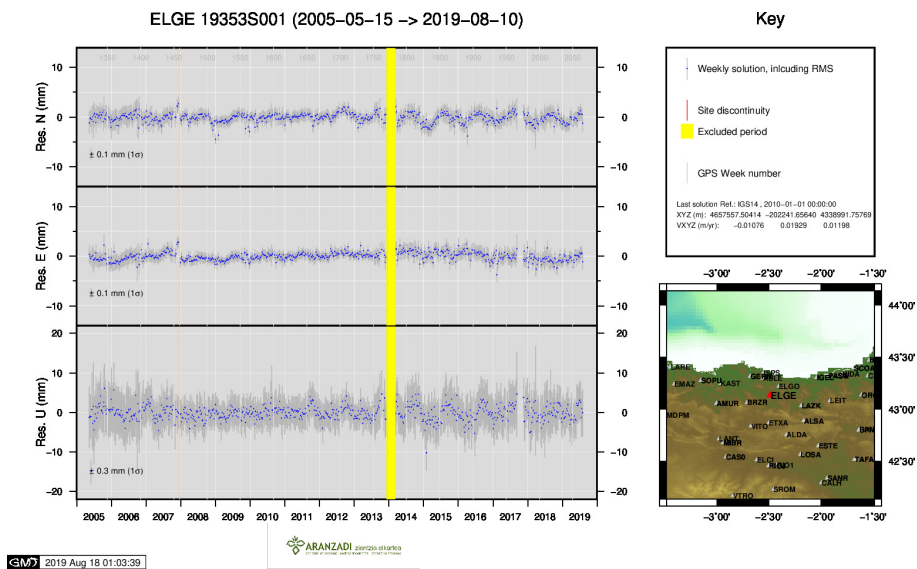
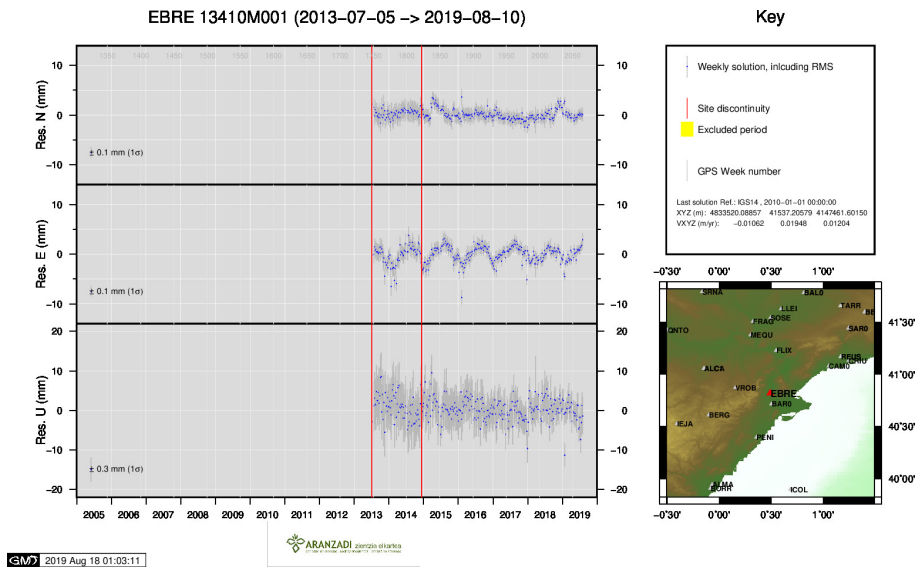
6) CACE

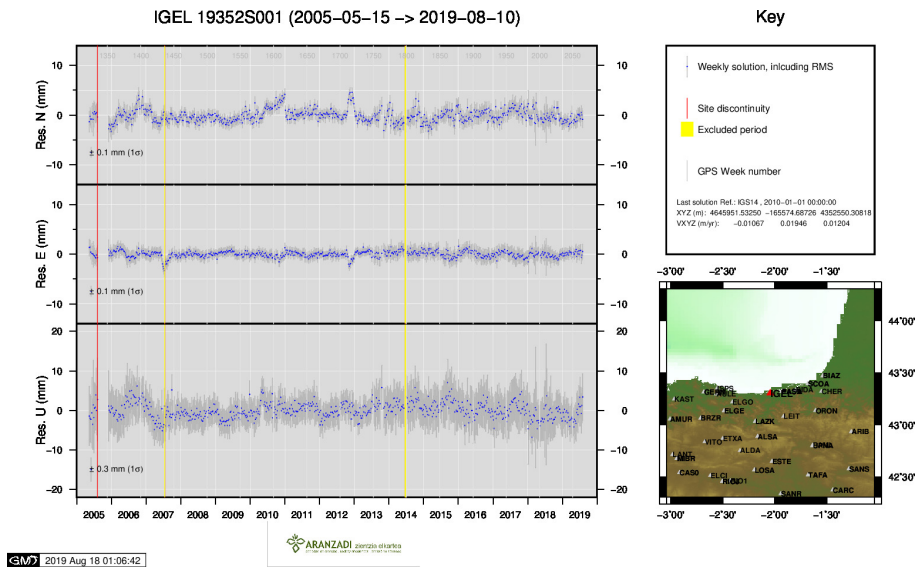


7) CANT

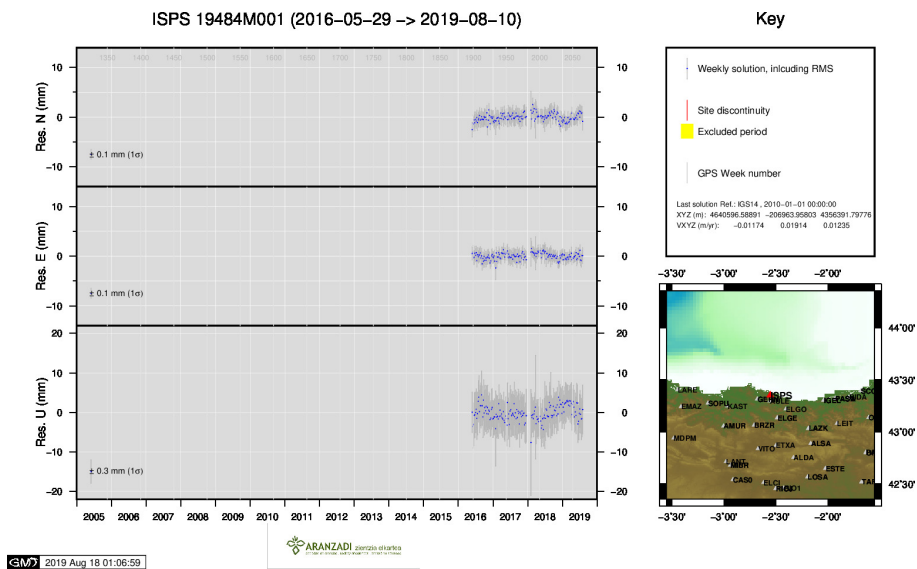


8) CHER

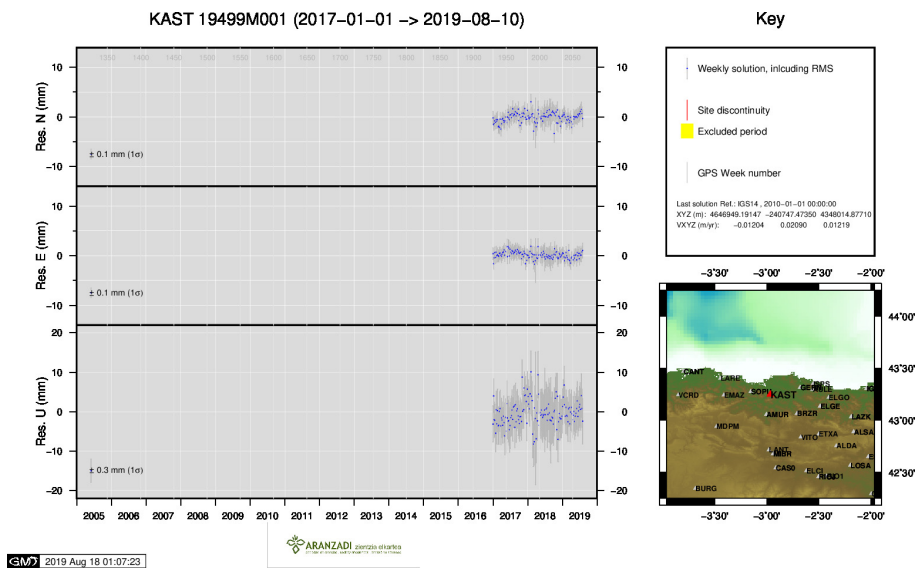




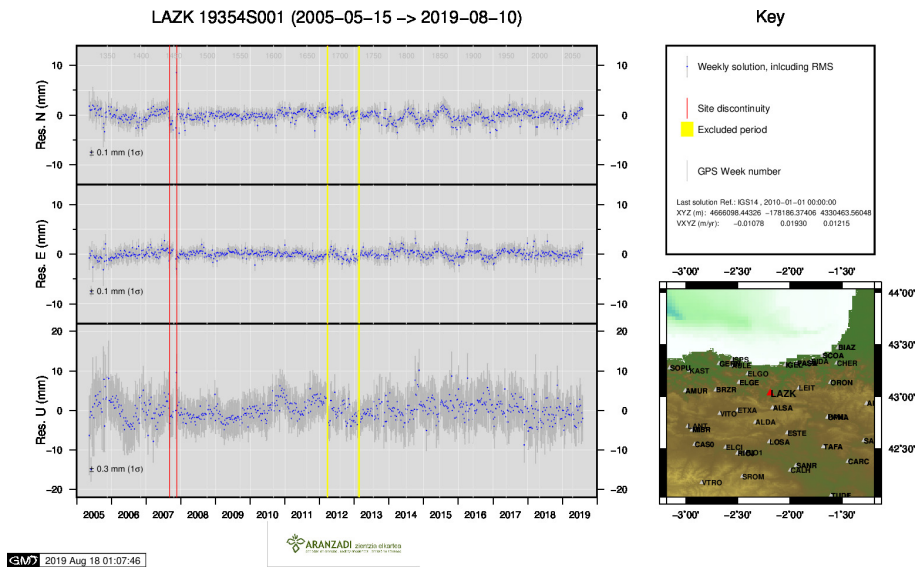
12) IGEL



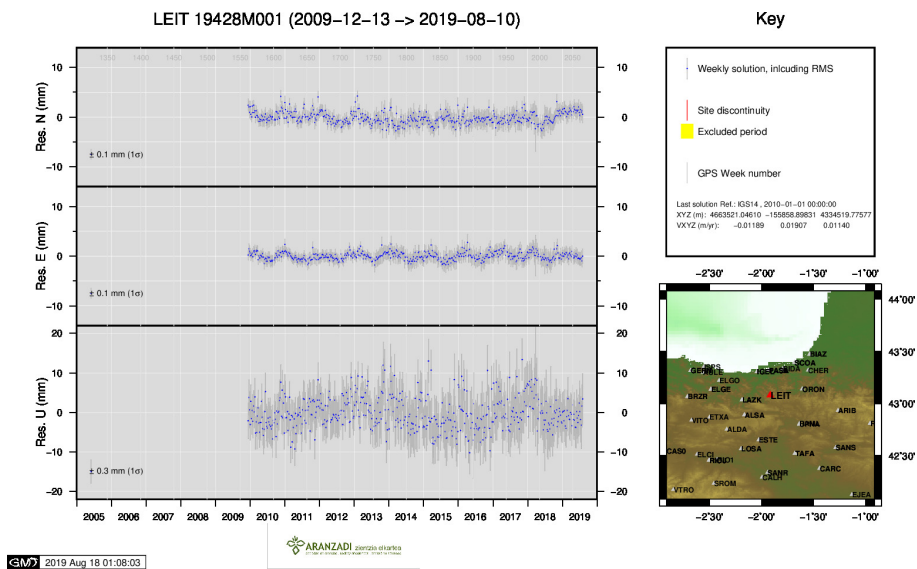
13) ISPS



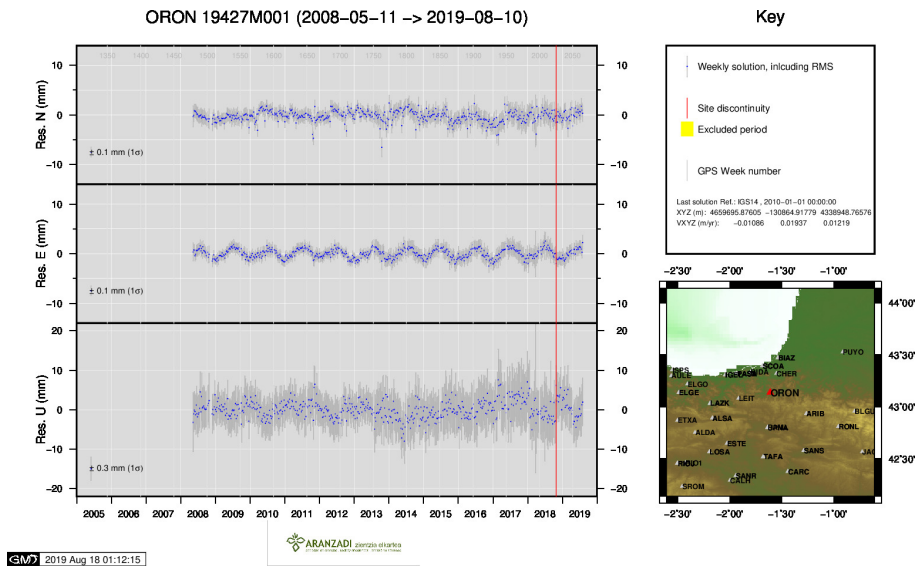
14) KAST



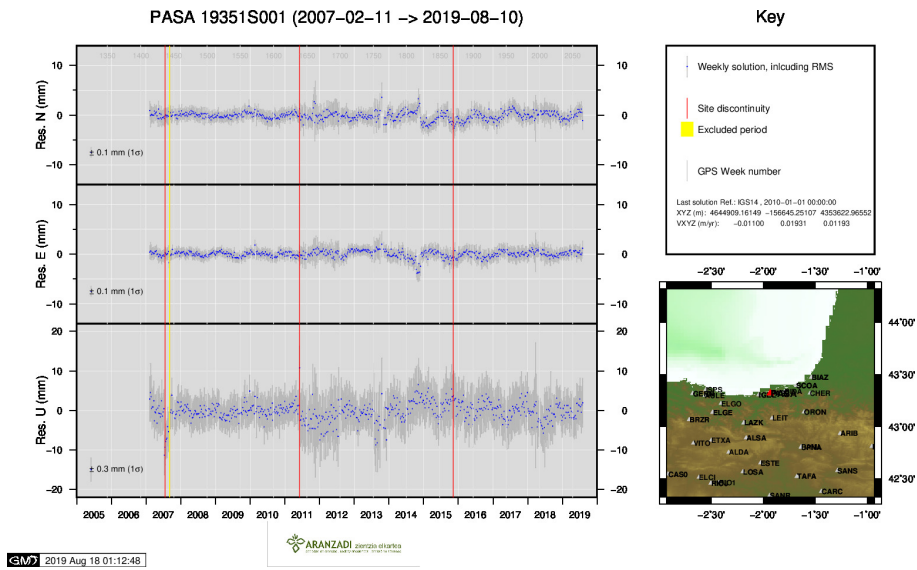
15) LAZK



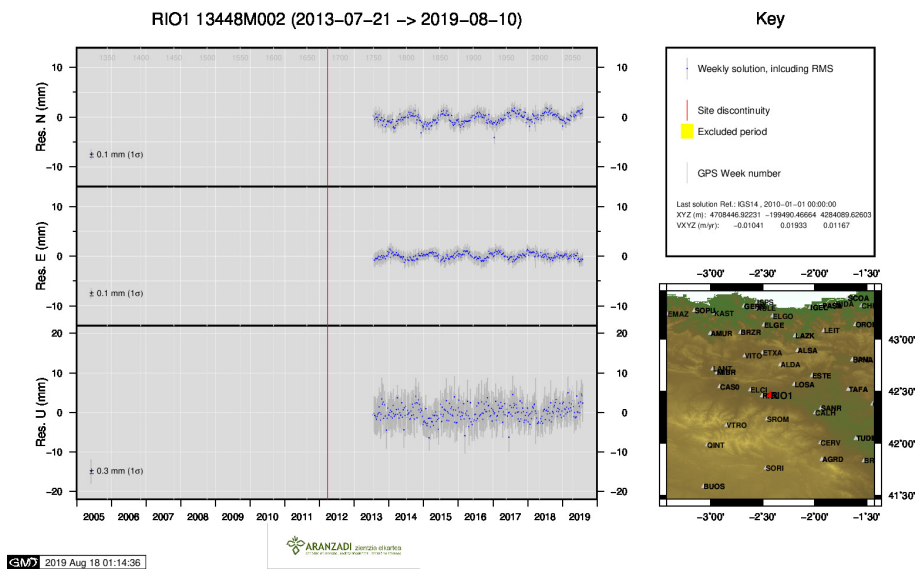
16) LEIT



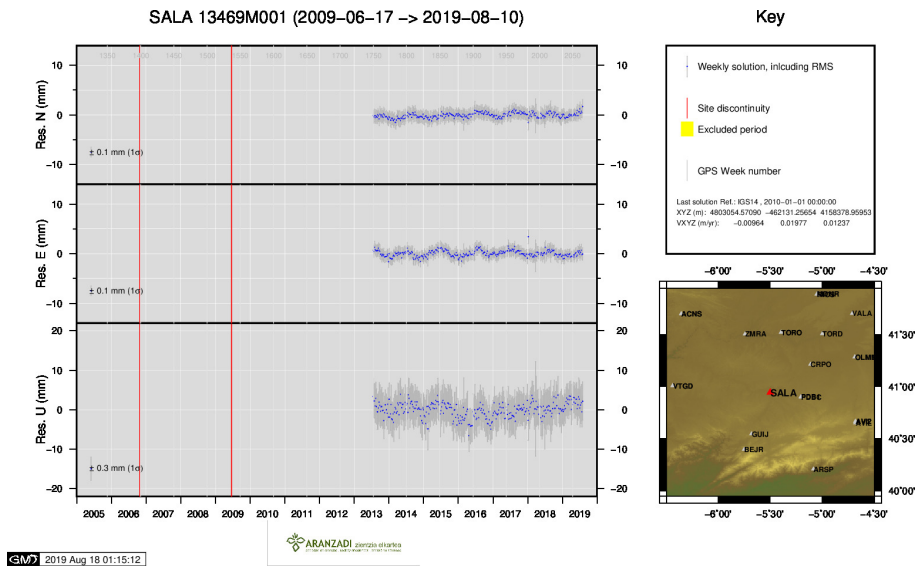
17) ORON



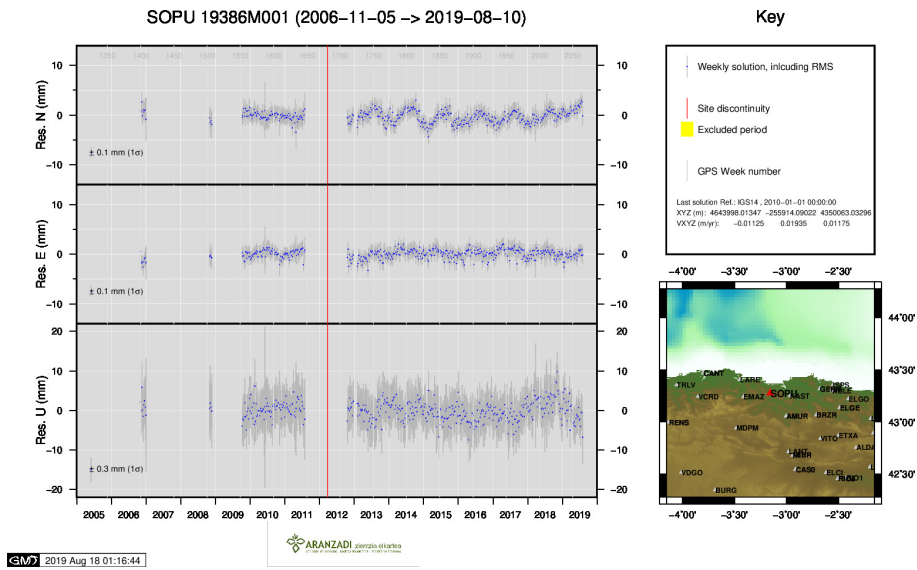
18) PASA



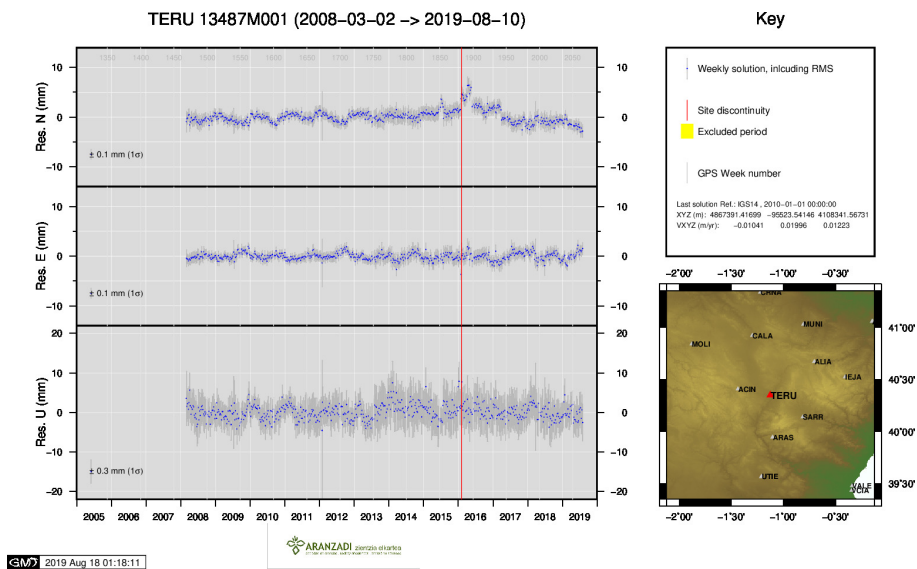
19) RIO1



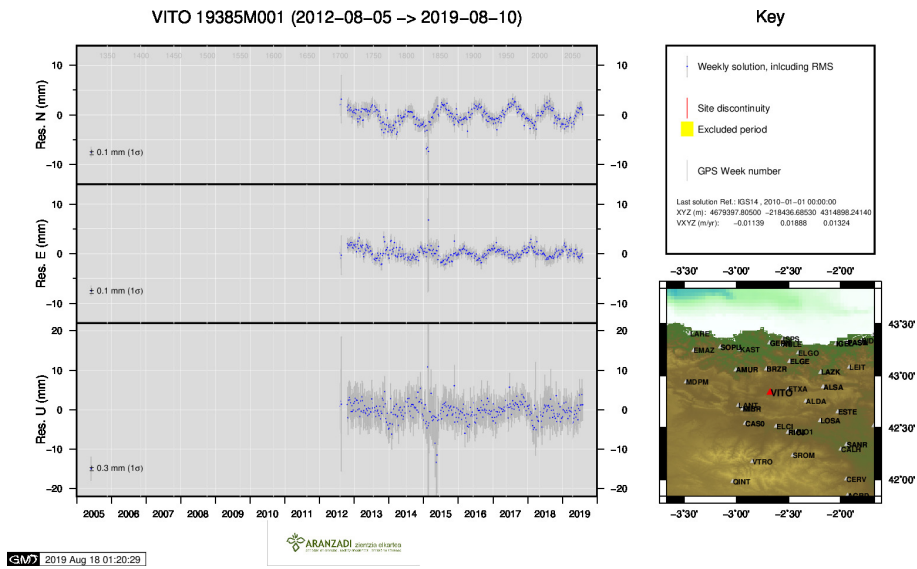
20) SALA



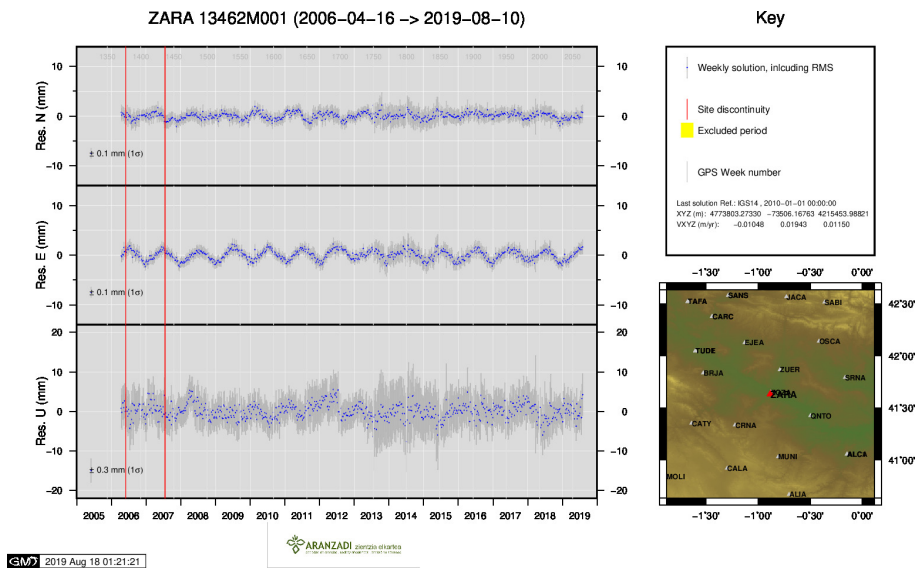
21) SOPU



22) TERU



23) VITO



24) ZARA