

# ARA-DAC Weekly Analysis Result: 2040 (GFA)

## Technical Report

**GPS Week: 2040 (GFA)**

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

**ARA-DAC details:**

Contact person: J. Zurutuza

Contact mail: [geodesia@aranzadi.eus](mailto:geodesia@aranzadi.eus)

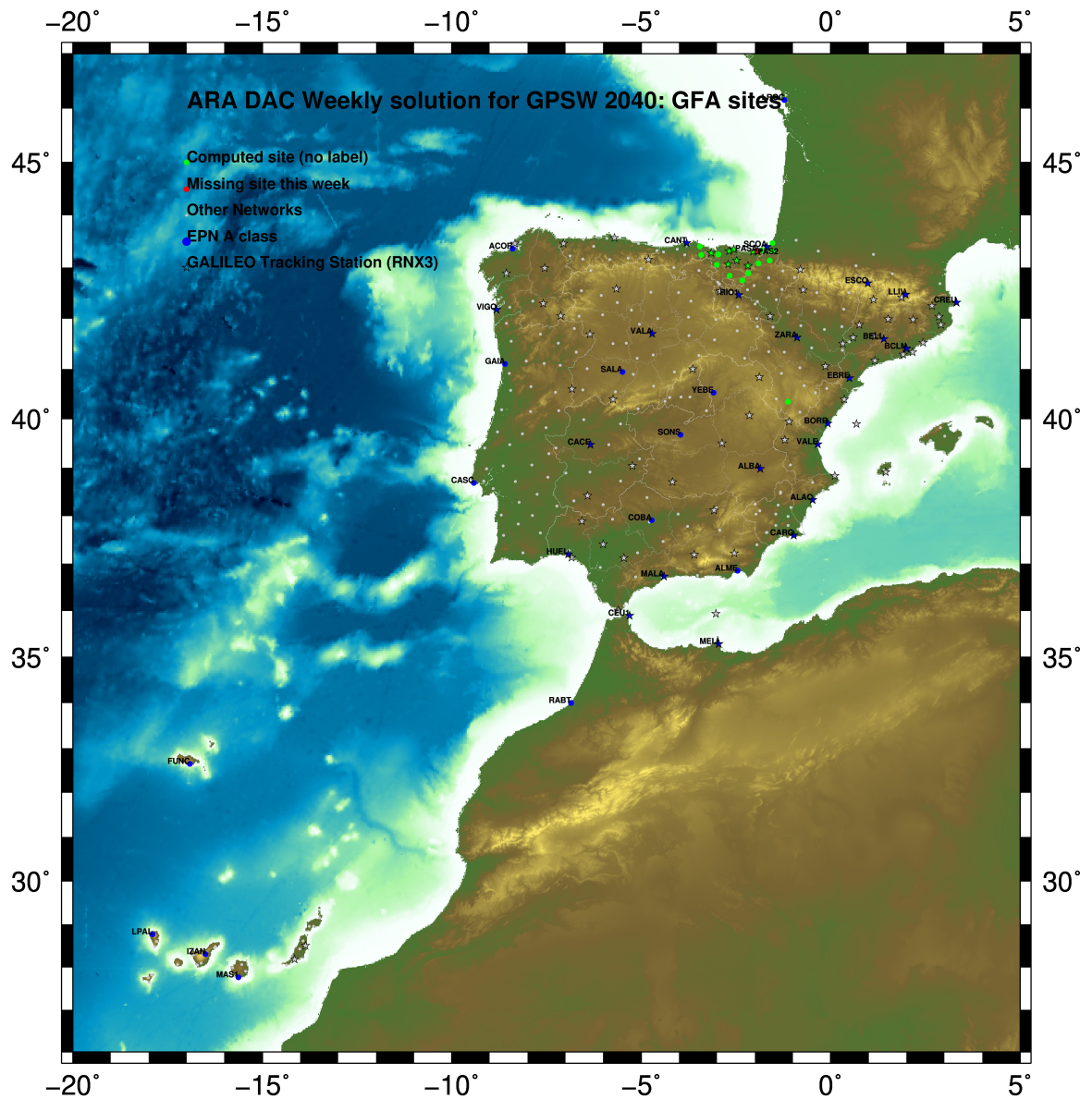
Report generated on 2019/03/03 at 13:17:54



# 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 Mar 03 13:17:46

Fig.1: Computed Sites for GPS Week2040 (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 Wideline (WL) AR for baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane and narrow-lane AR is computed.
  - Phase-Based Wideline ( $L_5$ ) AR for baselines shorter than 200km, the code-based wide-lane AR is replaced by a phase-only wide-lane with a subsequent narrow-lane AR.
  - Quasi-Ionosphere-Free (QIF)AR for the remaining real-valued ambiguities for baselines shorter than 2000km.
  - Direct  $L_1/L_2$  AR for baselines shorter than 20km
- AR Verification: Each baseline is processed by introducing the resolved integer ambiguities and checking the residuals. If there is any problem, the ambiguities are re-initialized.

## 5 Computed Coordinates

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

### 5.1 IGS14

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

ARA LAC 2040 WEEK FINAL COMBINATION: PRECISE ORBITS 03-MAR-19 09:42

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LOCAL GEODETIC DATUM: IGS14 EPOCH: 2019-02-13 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.56277	-678367.45198	4357066.28011	W
33	ALDA 19383M001	4687280.16435	-190876.57319	4308106.96297	A
42	ALSA 19419M001	4677250.83433	-176770.39951	4319079.86696	A
44	AMUR 19388M001	4661499.45178	-244591.26688	4332269.88040	A
78	BLAZ 10074M002	4634456.05538	-124344.98380	4365785.45469	A
79	BIDA 00000M000	4644177.82384	-145778.33148	4354832.47754	A
89	BRZR 19387M001	4662220.99511	-220769.90738	4333309.43774	A
9	CACE 13447M001	4899866.50346	-544567.04164	4033770.19893	W
10	CANT 13438M001	4625924.31696	-307096.24004	4365771.55249	W
114	CHER 00000M000	4645880.32422	-125721.93478	4353624.36927	A
15	CREU 13432M001	4715420.13155	273178.05050	4271946.83766	W
16	EBRE 13410M001	4833519.99121	41537.38179	4147461.71222	W
135	ELGE 19353S001	4657557.40744	-202241.48160	4338991.86630	A
137	EMAZ 17001M001	4645924.20841	-276949.87249	4347759.57448	A
157	GERN 19389M001	4642811.31489	-217222.93884	4353278.87749	A
177	IGEL 19352S001	4645951.43239	-165574.51066	4352550.41569	A
182	ISPS 19484M001	4640596.48482	-206963.78412	4356391.91201	A
187	KAST 19499M001	4646949.08370	-240747.28256	4348014.98892	A
192	LARE 19440M001	4632831.95409	-279026.14426	4360314.42450	A
193	LAZK 19354S001	4666098.34594	-178186.19864	4330463.67014	A
197	LEIT 19428M001	4663520.93445	-155858.72373	4334519.87852	A
253	ORON 19427M001	4659695.77885	-130864.74223	4338948.87767	A
30	PASA 19351S001	4644909.06240	-156645.07543	4353623.07353	W
33	RID1 13448M002	4708446.82923	-199490.29046	4284089.73218	W
34	SALA 13469M001	4803054.48519	-462131.07693	4158379.07414	W
35	SCDA 10088M002	4639940.50185	-136224.94762	4359552.41103	W
313	SOPU 19386M001	4643997.91300	-255913.91461	4350063.14212	A
333	TERU 13487M001	4867391.32205	-95523.36133	4108341.67883	A
366	VITO 19385M001	4679397.70465	-218436.51202	4314898.36257	A
43	YEBE 13420M001	4848724.56776	-261631.93734	4123094.32600	W
44	ZARA 13462M001	4773803.16949	-73505.99221	4215454.09254	W

### 5.2 ETRF2000 (ETRS89) Coordinates

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

ETRF2000 FINAL COORD. wk 2040 03-MAR-19 09:42

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LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2019-02-13 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.86694	-678367.98397	4357065.86715	W
33	ALDA 19383M001	4687280.52171	-190877.11369	4308106.54897	A
42	ALSA 19419M001	4677251.19407	-176770.93893	4319079.45388	A
44	AMUR 19388M001	4661499.80457	-244591.80486	4332269.46769	A
78	BLAZ 10074M002	4634456.42439	-124345.51864	4365785.04545	A
79	BIDA 00000M000	4644178.18962	-145778.86739	4354832.06732	A
89	BRZR 19387M001	4662221.35073	-220770.44538	4333309.02526	A
9	CACE 13447M001	4899866.80101	-544567.60467	4033769.76461	W
10	CANT 13438M001	4625924.66480	-307096.77451	4365771.14170	W
114	CHER 00000M000	4645880.69223	-125722.47081	4353623.95916	A
15	CREU 13432M001	4715420.54009	273177.50875	4271946.42701	W
16	EBRE 13410M001	4833520.36445	41536.82707	4147461.28996	W
135	ELGE 19353S001	4657557.76560	-202242.01906	4338991.45440	A
137	EMAZ 17001M001	4645924.55851	-276950.40896	4347759.16255	A
157	GERN 19389M001	4642811.67229	-217223.47482	4353278.46651	A
177	IGEL 19352S001	4645951.79572	-165575.04682	4352550.00610	A
182	ISPS 19484M001	4640596.84362	-206964.31984	4356391.50132	A
187	KAST 19499M001	4646949.43801	-240747.81903	4348014.57735	A
192	LARE 19440M001	4632832.30481	-279026.67937	4360314.01353	A
193	LAZK 19354S001	4666098.70630	-178186.73691	4330463.25788	A
197	LEIT 19428M001	4663521.29767	-155859.26167	4334519.46672	A
253	ORON 19427M001	4659696.14527	-130865.27970	4338948.46646	A
30	PASA 19351S001	4644909.42683	-156645.61145	4353622.66312	W
33	RID1 13448M002	4708447.18295	-199490.83315	4284089.31648	W
34	SALA 13469M001	4803054.80086	-462131.62996	4158378.64814	W
35	SCDA 10088M002	4639940.86905	-136225.48306	4359552.00124	W
313	SOPU 19386M001	4643998.26570	-255914.45082	4350062.73059	A
333	TERU 13487M001	4867391.67676	-95523.91997	4108341.25239	A
366	VITO 19385M001	4679398.05928	-218437.05178	4314897.94883	A
43	YEBE 13420M001	4848724.90425	-261632.49456	4123093.89898	W
44	ZARA 13462M001	4773803.53409	-73506.54122	4215453.67342	W

### 5.3 ETRF2014 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2014 (Boucher and Altamimi, 2011) and (Altamimi, 2017) (Altamimi, 2017).

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ETRF2014 FINAL COORD. wk 2040                                03-MAR-19 09:42
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LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2019-02-13 12:00:00
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
1  ACDR 13434M001         4594489.82434      -678368.02267    4357065.91543    W
33 ALDA 19383M001         4687280.47694      -190877.15371    4308106.59714    A
42 ALSA 19419M001         4677251.14936      -176770.97904    4319079.50209    A
44 AMUR 19388M001         4661499.76021      -244591.84480    4332269.51591    A
78 BIAZ 10074M002         4634456.37993      -124345.55910    4365785.09379    A
79 BIDA 00000M000         4644178.14513      -145778.90773    4354832.11562    A
89 BRZR 19387M001         4662221.30630      -220770.48539    4333309.07349    A
9  CACE 13447M001         4899866.75501      -544567.64266    4033769.81223    W
10 CANT 13438M001         4625924.62096      -307096.81438    4365771.18998    W
114 CHER 00000M000         4645880.64767      -125722.51121    4353624.00746    A
15 CREU 13432M001         4715420.49352      273177.46727    4271946.47541    W
16 EBRE 13410M001         4833520.31748      41536.78682     4147461.33794    W
135 ELGE 19353S001         4657557.72115      -202242.05916    4338991.50264    A
137 EMAZ 17001M001         4645924.51440      -276950.44885    4347759.21079    A
157 GERN 19389M001         4642811.62802      -217223.51492    4353278.51479    A
177 IGEL 19352S001         4645951.75127      -165575.08708    4352550.05338    A
182 ISPS 19484M001         4640596.79935      -206964.35999    4356391.54960    A
187 KAST 19499M001         4646949.39378      -240747.85904    4348014.62560    A
192 LARE 19440M001         4632832.26082      -279026.71931    4360314.06180    A
193 LAZK 19354S001         4666098.66169      -178186.77706    4330463.30611    A
197 LEIT 19428M001         4663521.25303      -155859.30191    4334519.51497    A
253 ORDN 19427M001         4659696.10058      -130865.32003    4338948.51473    A
30 PASA 19351S001         4644909.38237      -156645.65175    4353622.71142    W
33 RIO1 13448M002         4708447.13799      -199490.87306    4284089.36461    W
34 SALA 13469M001         4803054.75567      -462131.66861    4158378.69597    W
35 SOGA 10088M002         4639940.82458      -136225.52346    4359552.04955    W
313 SOPU 19386M001         4643998.22153      -255914.49078    4350062.77884    A
333 TERU 13487M001         4867391.62987      -95523.95962     4108341.30022    A
366 VITO 19385M001         4679398.01467      -218437.09174    4314897.99701    A
43 YEBE 13420M001         4848724.85805      -261632.53372    4123093.94678    W
44 ZARA 13462M001         4773803.48810      -73506.58131    4215453.72146    W

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## 6 Quality Control

### 6.1 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repeatabilities refer to the IGS14 solution and are given with respect the Local frame (North-East-Up).

ARA LAC 2040 WEEK FINAL COMBINATION: PRECISE ORBITS				03-MAR-19 09:42		
Station	#Days	Weekday 0123456	Repeatability (mm)			
			N	E	U	
ACOR 13434M001	7	XXXXXX	0.58	0.55	2.59	
ALDA 19383M001	7	XXXXXX	1.90	0.95	4.12	
ALSA 19419M001	7	XXXXXX	4.38	2.30	4.94	
AMUR 19388M001	7	XXXXXX	1.52	0.84	3.81	
BIAZ 10074M002	7	XXXXXX	0.66	0.69	1.79	
BIDA 00000M000	6	XXXX X	1.04	0.63	3.04	
BRZR 19387M001	6	X XXXX	2.34	3.25	5.34	
CACE 13447M001	7	XXXXXX	0.65	0.44	2.51	
CANT 13438M001	7	XXXXXX	0.63	0.46	1.58	
CHER 00000M000	5	XX XX	0.51	1.81	3.37	
CREU 13432M001	7	XXXXXX	0.76	0.64	2.54	
EBRE 13410M001	7	XXXXXX	0.39	1.35	2.32	
ELGE 19353S001	7	XXXXXX	1.12	1.41	2.42	
EMAZ 17001M001	7	XXXXXX	1.45	0.89	2.40	
GERN 19389M001	7	XXXXXX	0.85	0.84	1.36	
IGEL 19352S001	7	XXXXXX	0.73	1.11	1.27	
ISPS 19484M001	3	XXX	0.27	0.75	3.09	
KAST 19499M001	7	XXXXXX	1.48	1.73	6.54	
LARE 19440M001	7	XXXXXX	1.58	0.73	2.99	
LAZK 19354S001	7	XXXXXX	1.90	1.57	3.61	
LEIT 19428M001	7	XXXXXX	0.95	1.30	2.97	
ORON 19427M001	7	XXXXXX	1.17	0.90	3.66	
PASA 19351S001	7	XXXXXX	1.01	0.71	2.21	
RI01 13448M002	5	XX XX	0.28	0.82	2.66	
SALA 13469M001	7	XXXXXX	0.30	0.26	1.21	
SCDA 10088M002	7	XXXXXX	1.55	0.83	1.90	
SOPU 19386M001	7	XXXXXX	1.09	2.96	3.62	
TERU 13487M001	7	XXXXXX	0.24	0.47	1.36	
VITO 19385M001	7	XXXXXX	0.80	1.12	3.02	
YEBE 13420M001	7	XXXXXX	0.78	0.73	1.70	
ZARA 13462M001	7	XXXXXX	0.37	0.64	2.32	

Comparison of individual solutions:

ACOR 13434M001	N	0.58	-0.93	-0.36	0.22	0.73	0.21	0.65	-0.02
ACOR 13434M001	E	0.55	-0.08	-0.23	0.91	-0.47	0.75	0.31	0.19
ACOR 13434M001	U	2.59	0.30	0.59	-2.97	0.15	2.76	-3.86	2.91
ALDA 19383M001	N	1.90	1.76	-1.44	0.03	0.01	-2.79	1.40	-2.61
ALDA 19383M001	E	0.95	-0.27	-0.89	-2.00	-0.16	-0.47	-0.39	-0.32
ALDA 19383M001	U	4.12	-3.84	-1.75	-0.93	-1.19	1.40	-7.01	-5.53
ALSA 19419M001	N	4.38	3.24	3.77	3.11	0.19	-8.82	-0.04	-1.66
ALSA 19419M001	E	2.30	-4.30	-0.57	-0.35	1.15	3.23	-0.07	1.07
ALSA 19419M001	U	4.94	-3.61	-1.96	-2.09	-0.84	5.93	-9.41	0.81
AMUR 19388M001	N	1.52	2.07	-0.56	-1.35	0.22	2.23	-0.03	-1.54
AMUR 19388M001	E	0.84	-0.98	0.56	-0.26	0.68	-0.46	-0.38	-1.46
AMUR 19388M001	U	3.81	-2.54	-4.38	-4.02	-4.09	-3.61	-3.10	-2.39
BIAZ 10074M002	N	0.66	0.98	-0.71	1.00	0.32	-0.05	-0.16	-0.02
BIAZ 10074M002	E	0.69	0.97	-0.02	0.62	0.90	0.10	-0.82	-0.05
BIAZ 10074M002	U	1.79	1.43	-2.09	1.24	-1.74	1.00	2.35	1.28
BIDA 00000M000	N	1.04	1.13	1.81	-0.37	-0.82	-0.03		-0.34
BIDA 00000M000	E	0.63	-0.10	-0.39	1.16	0.55	0.38		0.24
BIDA 00000M000	U	3.04	4.29	-1.54	-0.84	2.05	2.37		-3.86
BRZR 19387M001	N	2.34	-4.11		0.75	2.21	0.59	1.94	-0.91
BRZR 19387M001	E	3.25	-6.11		1.71	3.12	0.46	1.48	-0.77
BRZR 19387M001	U	5.34	0.45		8.91	2.68	-1.19	-1.99	-7.08
CACE 13447M001	N	0.65	-1.22	-0.09	-0.62	-0.55	0.30	-0.16	0.47
CACE 13447M001	E	0.44	-0.13	-0.46	-0.86	-0.24	-0.03	-0.16	-0.29
CACE 13447M001	U	2.51	-5.49	2.13	1.24	0.15	1.15	-0.10	-0.23
CANT 13438M001	N	0.63	0.71	-0.67	0.84	0.45	0.49	-0.23	-0.49
CANT 13438M001	E	0.46	-0.55	0.21	0.03	0.24	0.28	-0.02	-0.89
CANT 13438M001	U	1.58	0.07	-1.52	1.56	-0.10	-0.45	-1.07	-2.98
CHER 00000M000	N	0.51	0.49	-0.46	0.26			0.20	0.69
CHER 00000M000	E	1.81	-2.83	-0.41	1.49			0.91	1.39
CHER 00000M000	U	3.37	5.63	-1.57	-1.47			1.79	-2.42
CREU 13432M001	N	0.76	0.80	0.66	-1.07	-0.61	0.84	0.37	-0.15
CREU 13432M001	E	0.64	0.77	0.37	0.74	0.71	-0.24	-0.75	-0.13
CREU 13432M001	U	2.54	-3.27	-1.98	2.99	0.66	2.56	-1.96	-2.11
EBRE 13410M001	N	0.39	0.15	0.50	-0.65	-0.10	-0.39	-0.23	0.00
EBRE 13410M001	E	1.35	2.56	-1.82	-0.04	-0.27	0.72	-0.65	-0.21
EBRE 13410M001	U	2.32	2.36	3.65	-0.70	-0.27	-0.86	-0.09	-3.46
ELGE 19353S001	N	1.12	2.21	-0.72	-0.02	0.05	0.53	-0.18	-1.33
ELGE 19353S001	E	1.41	2.30	1.14	0.57	0.38	-0.84	-1.22	-1.62
ELGE 19353S001	U	2.42	-0.94	-3.06	-1.85	-0.36	2.16	2.26	3.39
EMAZ 17001M001	N	1.45	-1.89	0.99	2.11	-0.79	-1.23	-0.78	0.94
EMAZ 17001M001	E	0.89	2.02	-0.04	0.53	-0.49	0.13	-0.19	-0.34
EMAZ 17001M001	U	2.40	2.29	4.22	-1.80	0.12	1.92	2.11	0.52
GERN 19389M001	N	0.85	0.42	0.40	0.47	-0.89	0.41	-1.11	1.25
GERN 19389M001	E	0.84	-1.65	0.58	0.35	0.47	-0.06	-0.08	0.89
GERN 19389M001	U	1.36	0.62	-0.74	1.49	0.42	-0.04	1.92	-2.03
IGEL 19352S001	N	0.73	0.69	-0.40	-0.78	-0.12	0.58	-0.38	1.22
IGEL 19352S001	E	1.11	1.75	0.29	1.39	1.12	-0.70	-0.73	-0.31
IGEL 19352S001	U	1.27	1.72	0.88	-2.36	0.42	0.11	-0.07	0.38
ISPS 19484M001	N	0.27					-0.22	-0.29	0.14
ISPS 19484M001	E	0.75					0.87	-0.02	-0.61
ISPS 19484M001	U	3.09					3.03	-1.35	-2.85
KAST 19499M001	N	1.48	-1.91	1.41	1.99	1.31	0.70	0.58	-1.00
KAST 19499M001	E	1.73	-3.10	-0.24	2.56	-0.53	0.49	-0.24	-1.05
KAST 19499M001	U	6.54	-6.08	6.88	2.38	-2.64	0.88	-0.91	-12.56
LARE 19440M001	N	1.58	-1.79	-2.00	1.77	1.81	0.99	0.50	-0.44
LARE 19440M001	E	0.73	0.94	0.79	0.77	0.36	-0.74	-0.68	0.05
LARE 19440M001	U	2.99	-3.03	1.29	-0.01	1.45	0.27	3.70	5.19
LAZK 19354S001	N	1.90	2.61	1.93	1.40	-0.13	-1.63	-0.97	-2.34
LAZK 19354S001	E	1.57	2.89	-0.91	0.01	1.08	-0.40	0.28	-2.04
LAZK 19354S001	U	3.61	0.44	-3.85	-3.44	-3.13	3.33	5.29	1.63

LEIT 19428M001	N	0.95	-1.10	1.02	0.53	0.19	1.25	-0.80	-0.80
LEIT 19428M001	E	1.30	-0.93	-0.89	-0.61	1.40	2.03	0.44	1.35
LEIT 19428M001	U	2.97	1.72	5.09	2.52	-0.29	-0.34	-2.32	-3.47
ORDN 19427M001	N	1.17	1.22	0.91	0.59	0.20	-2.30	-0.33	0.39
ORDN 19427M001	E	0.90	-0.30	1.44	0.40	0.82	-1.17	0.61	0.40
ORDN 19427M001	U	3.66	4.50	0.69	-3.05	1.30	0.19	6.44	-2.71
PASA 19351S001	N	1.01	1.53	-0.56	0.80	0.52	-0.20	-0.06	-1.59
PASA 19351S001	E	0.71	0.80	0.72	1.10	0.67	0.07	-0.08	-0.43
PASA 19351S001	U	2.21	4.59	-1.11	-0.65	0.80	-0.33	-1.52	1.86
RIO1 13448M002	N	0.28	0.08	-0.07	-0.38			0.22	0.35
RIO1 13448M002	E	0.82	-1.12	0.14	-1.11			-0.08	-0.43
RIO1 13448M002	U	2.66	0.38	-2.20	-3.45			-2.89	-1.74
SALA 13469M001	N	0.30	0.00	0.36	0.12	-0.24	0.50	-0.29	-0.03
SALA 13469M001	E	0.26	-0.14	-0.19	-0.34	-0.47	0.04	0.07	0.11
SALA 13469M001	U	1.21	0.70	0.47	0.41	-0.64	1.24	-1.08	2.18
SCDA 10088M002	N	1.55	0.20	-1.29	1.52	2.45	-0.32	-1.63	1.30
SCDA 10088M002	E	0.83	-0.61	0.36	0.38	1.10	-0.61	0.53	1.28
SCDA 10088M002	U	1.90	-0.33	-2.21	0.78	2.57	1.96	2.34	-0.45
SOPU 19386M001	N	1.09	0.22	0.64	1.46	1.04	-0.64	-0.31	-1.72
SOPU 19386M001	E	2.96	-6.38	0.26	0.76	1.80	2.77	0.59	0.19
SOPU 19386M001	U	3.62	-2.55	4.59	5.25	-1.14	0.32	0.09	-4.71
TERU 13487M001	N	0.24	-0.32	-0.23	-0.22	0.01	0.07	0.24	0.26
TERU 13487M001	E	0.47	0.98	0.22	0.32	0.02	0.25	0.36	0.13
TERU 13487M001	U	1.36	-2.84	0.46	0.60	0.66	-1.05	-0.32	-0.88
VITO 19385M001	N	0.80	-1.48	-0.24	0.21	0.69	0.85	0.53	0.18
VITO 19385M001	E	1.12	-0.67	1.46	0.85	0.18	-1.16	-1.45	-0.84
VITO 19385M001	U	3.02	-2.65	-1.23	-0.71	-3.48	-3.53	-3.16	-3.32
YEBE 13420M001	N	0.78	0.46	1.65	-0.69	-0.39	-0.33	-0.01	0.07
YEBE 13420M001	E	0.73	1.25	-0.61	-0.49	-0.34	-0.83	0.47	0.00
YEBE 13420M001	U	1.70	0.53	-0.22	2.46	-2.09	0.69	-2.48	-0.06
ZARA 13462M001	N	0.37	-0.73	-0.31	-0.03	0.27	0.07	0.25	0.18
ZARA 13462M001	E	0.64	1.32	-0.02	-0.35	-0.01	-0.57	-0.46	0.28
ZARA 13462M001	U	2.32	0.67	-0.92	-2.17	-0.20	-3.74	-3.49	-0.27



## 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	-0.16	-1.87	-0.50
2	ALAC 13433M001	I W	-0.11	0.01	-0.90
3	ALBA 13452M001	I W	0.14	-0.52	1.26
4	ALME 13437M001	I W	-2.05	-0.52	1.63
5	BCLN 13412M001	I W	0.57	2.26	2.22
6	BELL 13431M001	I W	1.55	2.30	-0.70
7	BORR 13480M001	I W	-0.05	-2.33	-0.73
8	BRST 10004M004	I W	-1.04	-0.03	-3.17
9	CACE 13447M001	I W	0.98	-0.60	3.06
10	CANT 13438M001	I W	1.23	-0.72	-0.97
11	CARG 19412M001	I W	1.04	-1.18	-1.24
12	CASC 13909S001	I W	1.02	-1.71	0.23
13	CEU1 13449M002	I W	0.41	-0.29	-2.61
14	COBA 13453M001	I W	1.09	0.21	-0.98
15	CREU 13432M001	I W	-0.78	2.94	1.00
16	EBRE 13410M001	I W	-0.36	2.33	-0.82
17	ESCO 13435M001	I W	0.95	1.52	1.97
18	FUNC 13911S001	I W	-1.69	-3.83	7.40
19	GAIA 13902M001	I W	-2.48	-2.01	-7.06
21	HUEL 13451M001	I W	-1.19	-0.49	3.41
22	IZAN 31309M002	I W	0.60	-3.59	0.86
23	LLIV 13436M001	I W	-0.71	1.48	2.82
24	LPAL 81701M001	I W	-5.44	-1.18	0.61
25	LROC 10023M001	I W	0.59	-0.69	1.63
26	MALA 13443M001	I W	-0.53	-0.39	-0.32
27	MAS1 31303M002	I W	-2.43	-1.29	3.27
29	MELI 19379M001	I W	-0.05	0.89	-3.48
30	PASA 19351S001	I W	1.58	0.51	-0.39
31	PDEL 31906M004	I W	0.27	1.10	-12.36
32	RABT 35001M002	I W	-0.05	-0.21	-4.36
33	RIO1 13448M002	I W	0.87	-0.08	-1.01
34	SALA 13469M001	I W	1.08	0.59	-1.73
35	SCOA 10088M002	I W	-1.02	-0.51	-2.14
38	SONS 13446M001	I W	1.95	1.63	-1.81
40	VALA 13463M002	I W	-0.24	0.98	1.55
41	VALE 13439M001	I W	-0.02	2.01	2.24
42	VIGO 13450M001	I W	0.89	-0.59	5.54
43	YEBE 13420M001	I W	0.42	0.07	3.87
44	ZARA 13462M001	I W	0.88	1.97	0.13
45	ZIMM 14001M004	I W	2.29	1.85	2.57
RMS / COMPONENT			1.43	1.58	3.36
MEAN			-0.00	-0.00	0.00
MIN			-5.44	-3.83	-12.36
MAX			2.29	2.94	7.40

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 120  
RMS OF TRANSFORMATION : 2.30 MM

BARYCENTER COORDINATES:

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

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.36 MM  
TRANSLATION IN E : -0.00 +- 0.36 MM  
TRANSLATION IN U : 0.00 +- 0.36 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          17361186
NUMBER OF UNKNOWN               214703
NUMBER OF DEGREES OF FREEDOM    17146483
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  1.769836235105805

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00245      0.0096 0.0101 -0.0011 -0.0001 0.0002 0.0003 -0.00098
 2  0.00200      0.0044 -0.0090 -0.0123  0.0002 0.0004 -0.0002  0.00055
 3  0.00149      -0.0112 0.0015  0.0079  0.0000 -0.0004 0.0001  0.00067
 4  0.00144      -0.0143 -0.0029  0.0049  0.0001 -0.0004 -0.0000  0.00124
 5  0.00172      -0.0150 0.0008  0.0194 -0.0001 -0.0008 -0.0000 -0.00012
 6  0.00188      -0.0101 0.0076  0.0158 -0.0002 -0.0006 0.0002 -0.00035
 7  0.00231      0.0085 -0.0113 -0.0062  0.0002 0.0003 -0.0003 -0.00046
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00139      2478240  1.93          2512058      3          1002      32819      0
 2  0.00133      2437543  1.77          2470589      3          993      32056      0
 3  0.00129      2416767  1.68          2446363      3          957      28642      0
 4  0.00129      2421464  1.65          2451841      3          957      29423      0
 5  0.00130      2329783  1.69          2359136      3          948      28408      0
 6  0.00133      2496918  1.78          2528631      3          999      30717      0
 7  0.00135      2559948  1.81          2592568      3          1008      31615      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 19:04:00000 19:04:86370 LEICA GR10 -----
ALDA  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
ALSA  A  1 P 19:04:00000 19:04:86370 LEICA GR50 -----
AMUR  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
BIAZ  A  1 P 19:04:00000 19:04:86370 TRI SP90M -----
BIDA  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
BRZR  A  1 P 19:04:00000 19:04:86370 LEICA GR30 -----
CACE  A  1 P 19:04:00000 19:04:86370 TRIMBLE NETR9 -----
CANT  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
CHER  A  1 P 19:04:00000 19:04:86370 LEICA GRX1200+GNSS -----
CREU  A  1 P 19:04:00000 19:04:86370 LEICA GR50 -----
EBRE  A  1 P 19:04:00000 19:04:86370 LEICA GR50 -----
ELGE  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
EMAZ  A  1 P 19:04:00000 19:04:86370 LEICA GR30 -----
GERN  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
IGEL  A  1 P 19:04:00000 19:04:86370 LEICA GR30 -----
ISPS  A  1 P 19:04:00000 19:04:86370 TRIMBLE NETR9 -----
KAST  A  1 P 19:04:00000 19:04:86370 LEICA GR30 -----
LARE  A  1 P 19:04:00000 19:04:86370 LEICA GRX1200GGPRD -----
LAZK  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
LEIT  A  1 P 19:04:00000 19:04:86370 LEICA GR50 -----
ORON  A  1 P 19:04:00000 19:04:86370 LEICA GR50 -----
PASA  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
RIO1  A  1 P 19:04:00000 19:04:86370 LEICA GR25 -----
SALA  A  1 P 19:04:00000 19:04:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 19:04:00000 19:04:86370 LEICA GR25 -----
SOPU  A  1 P 19:04:00000 19:04:86370 LEICA GR30 -----
TERU  A  1 P 19:04:00000 19:04:86370 LEICA GRX1200GGPRD -----
VITO  A  1 P 19:04:00000 19:04:86370 LEICA GR10 -----
YEBE  A  1 P 19:04:00000 19:04:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 19:04:00000 19:04:86370 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 19:04:00000 19:04:86370 LEIAT504      LEIS -----
ALDA  A  1 P 19:04:00000 19:04:86370 LEIAS10      NONE -----
ALSA  A  1 P 19:04:00000 19:04:86370 LEIAR10      NONE -----
AMUR  A  1 P 19:04:00000 19:04:86370 LEIAS10      NONE -----
BIAZ  A  1 P 19:04:00000 19:04:86370 LEIAR25      LEIT -----
```

```

BIDA A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
BRZR A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
CACE A 1 P 19:041:00000 19:047:86370 TRM29659.00 NONE -----
CANT A 1 P 19:041:00000 19:047:86370 LEIAR25_R4 LEIT 25066
CHER A 1 P 19:041:00000 19:047:86370 LEIAX1203+GNSS NONE -----
CREU A 1 P 19:041:00000 19:047:86370 LEIAR25_R4 NONE 26357
EBRE A 1 P 19:041:00000 19:047:86370 LEIAR25_R4 NONE 26359
ELGE A 1 P 19:041:00000 19:047:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
GERN A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
IGEL A 1 P 19:041:00000 19:047:86370 LEIAR20 LEIM -----
ISPS A 1 P 19:045:00000 19:047:86370 TRM59900.00 SCIS -----
KAST A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
LARE A 1 P 19:041:00000 19:047:86370 LEIAT504 NONE -----
LAZK A 1 P 19:041:00000 19:047:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 19:041:00000 19:047:86370 LEIAR10 NONE -----
ORDN A 1 P 19:041:00000 19:047:86370 LEIAR10 NONE -----
PASA A 1 P 19:041:00000 19:047:86370 LEIAR20 LEIM 73034
RID1 A 1 P 19:041:00000 19:047:86370 LEIAR25_R4 LEIT 25138
SALA A 1 P 19:041:00000 19:047:86370 LEIAR25 NONE -----
SCDA A 1 P 19:041:00000 19:047:86370 TRM55971.00 NONE -----
SOPU A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
TERU A 1 P 19:041:00000 19:047:86370 LEIAT504GG LEIS -----
VITO A 1 P 19:041:00000 19:047:86370 LEIAS10 NONE -----
YEBE A 1 P 19:041:00000 19:047:86370 TRM29659.00 NONE -----
ZARA A 1 P 19:041:00000 19:047:86370 TRM29659.00 NONE -----

```

### 7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START_ DATA_END_ AXE ARP->BENCHMARK(M)
ACOR A 1 P 19:041:00000 19:047:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 19:041:00000 19:047:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 19:041:00000 19:047:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 19:041:00000 19:047:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 19:041:00000 19:047:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 19:041:00000 19:047:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 19:041:00000 19:047:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
IGEL A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 19:045:00000 19:047:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 19:041:00000 19:047:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
RID1 A 1 P 19:041:00000 19:047:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 19:041:00000 19:047:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 19:041:00000 19:047:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 19:041:00000 19:047:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 19:041:00000 19:047:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 19:041:00000 19:047:86370 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:

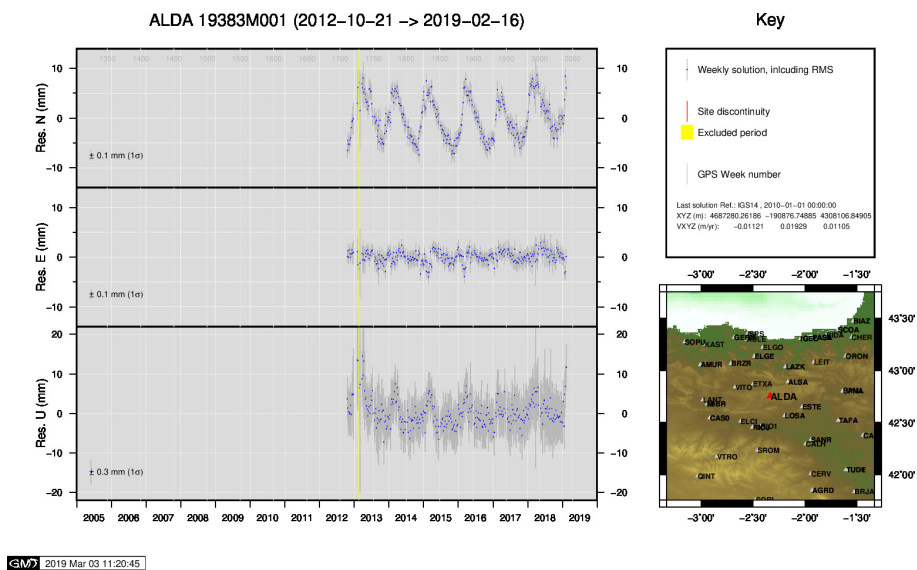
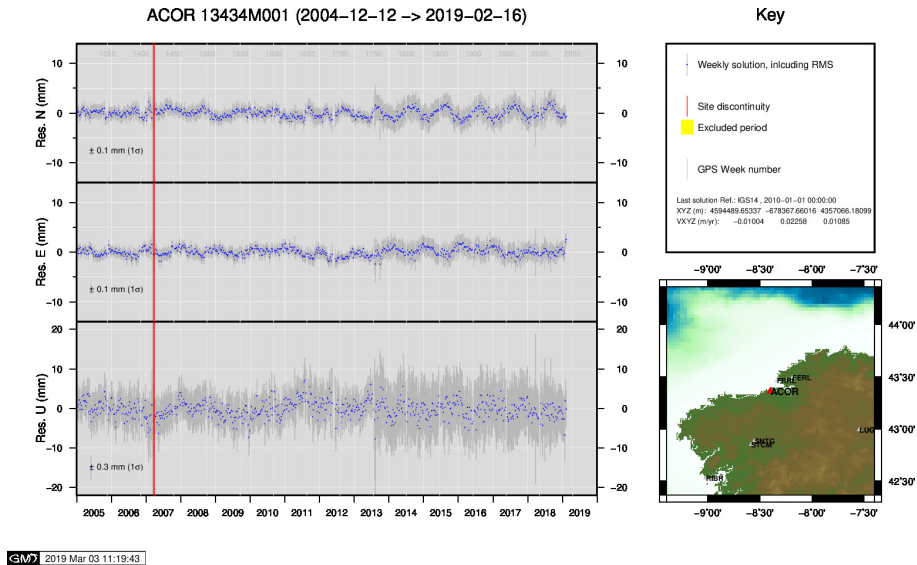
```

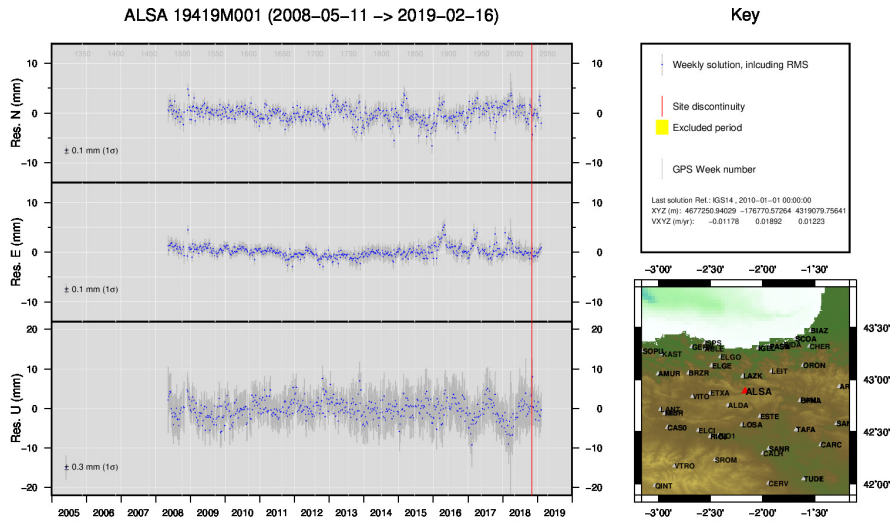
2019-02-24 23:31 UTC | GERNO410.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523
2019-02-25 23:15 UTC | GERNO420.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523
2019-02-26 23:10 UTC | GERNO430.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523
2019-02-27 23:12 UTC | GERNO440.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523
2019-02-28 23:07 UTC | GERNO450.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523
2019-03-01 23:17 UTC | GERNO460.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523
2019-03-02 23:28 UTC | GERNO470.190 | RECEIVER FIRM. VERS. | 4.10 -> 4.10/6.523

```

## 9 Cumulative Time Series

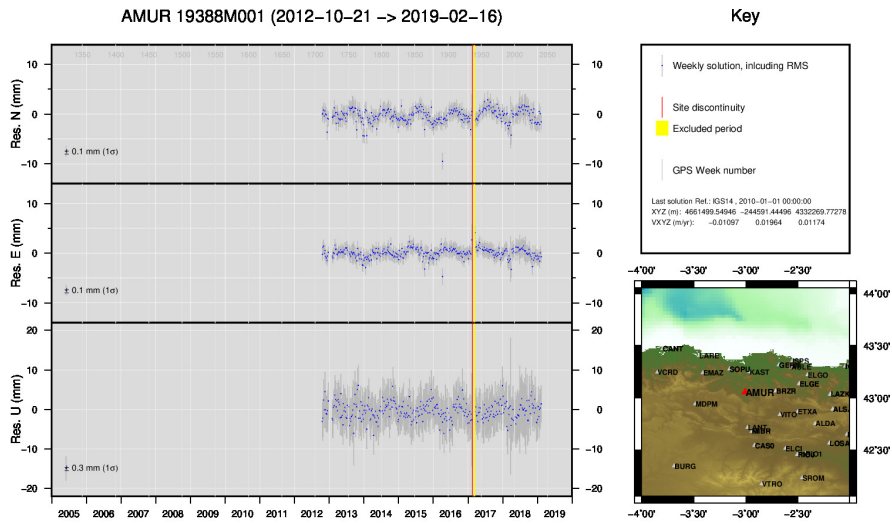
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.





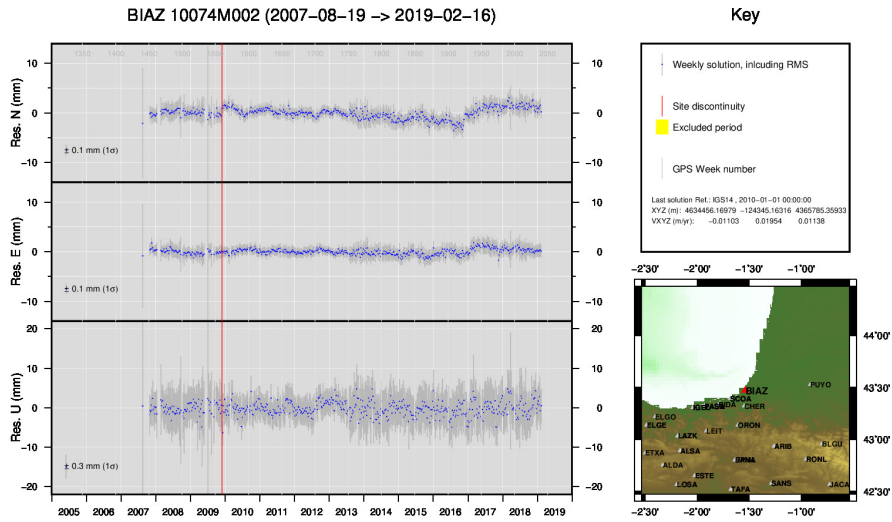
GMW 2019 Mar 03 11:21:29

3 ) ALSA



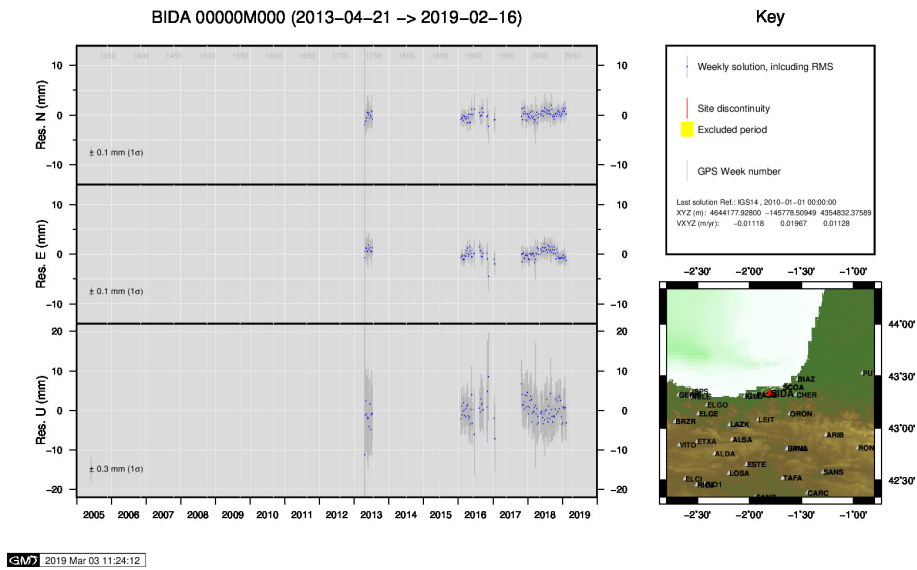
GMW 2019 Mar 03 11:21:38

4 ) AMUR

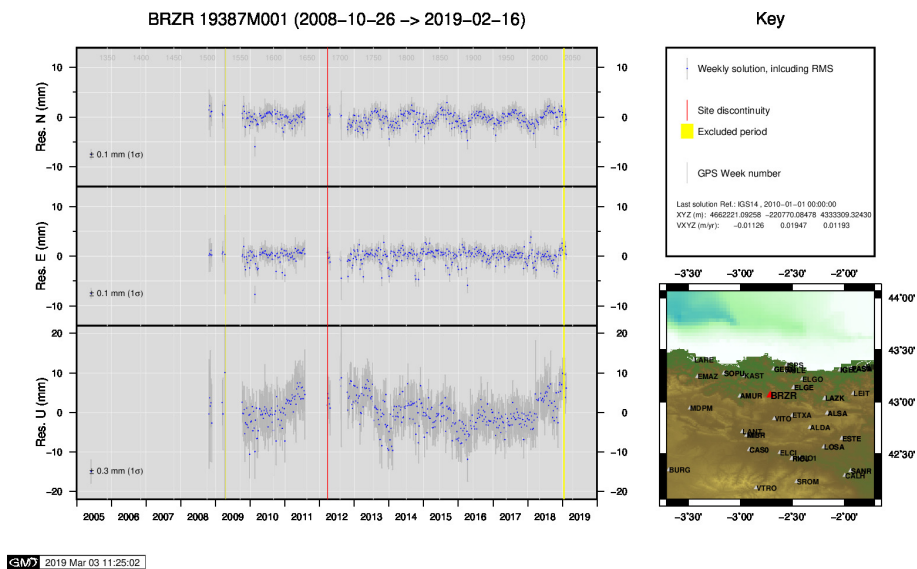


GMW 2019 Mar 03 11:24:07

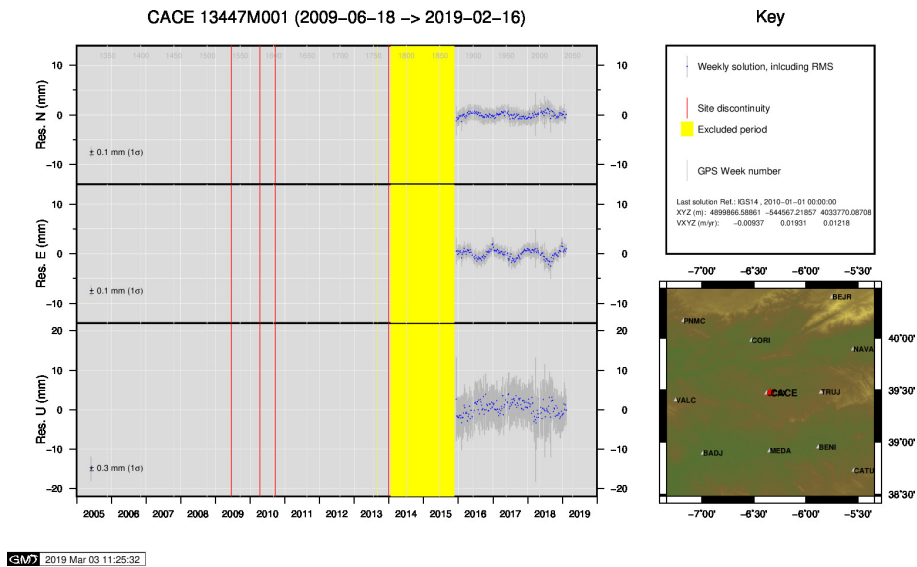
5 ) BIAZ



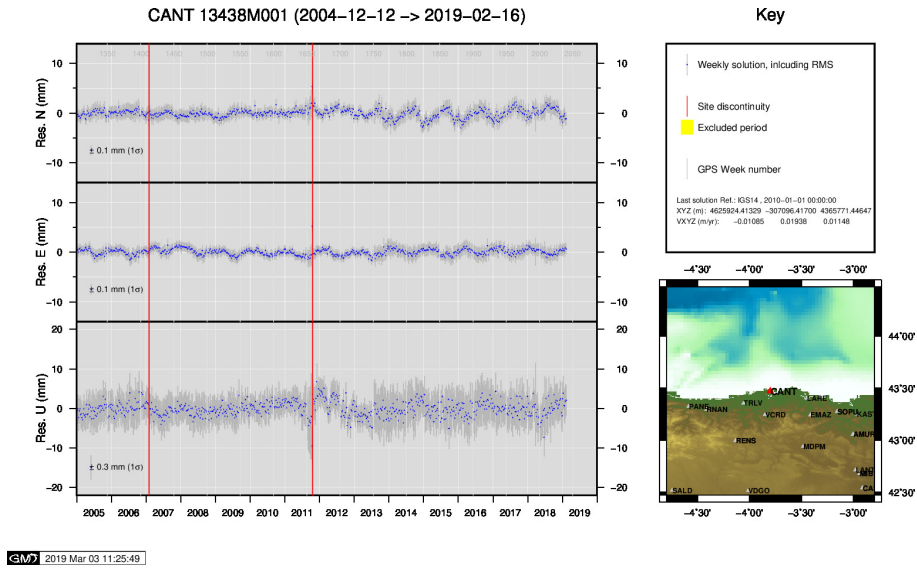
6 ) BIDA



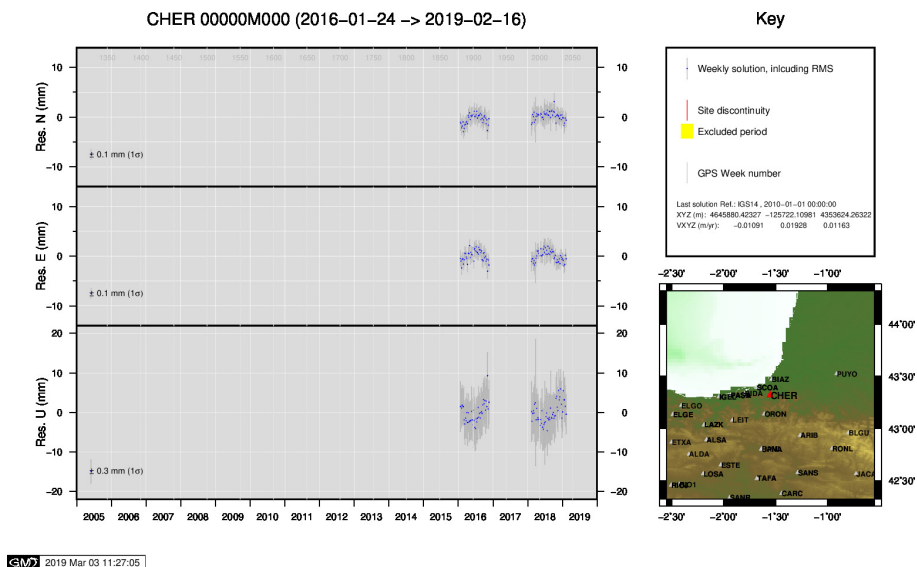
7 ) BRZR



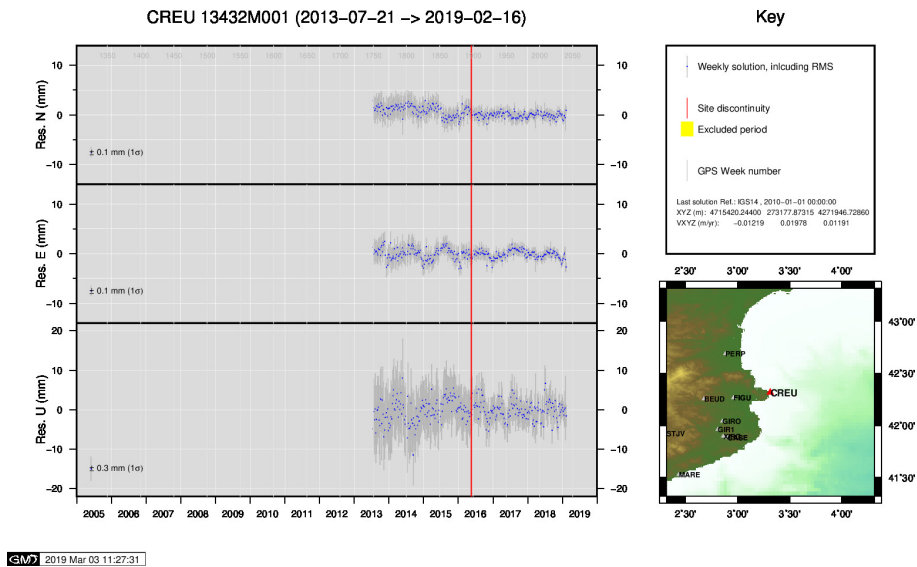
8 ) CACE



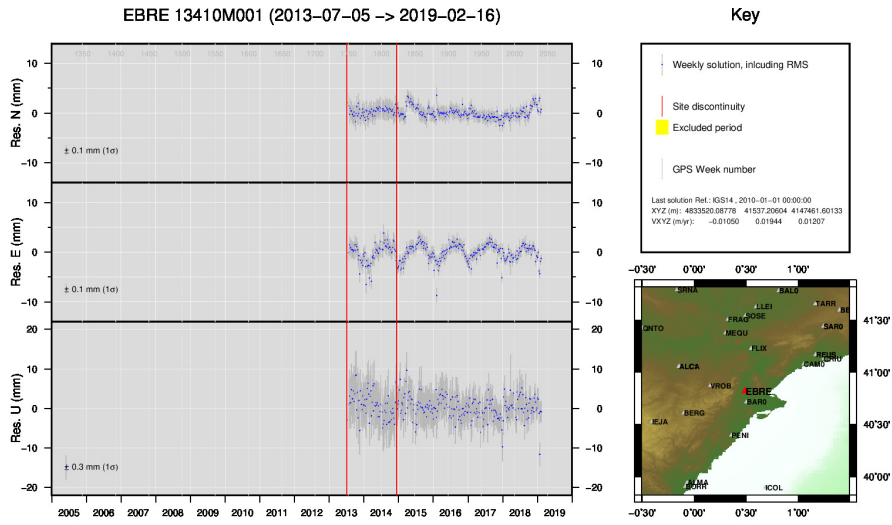
9 ) CANT



10 ) CHER

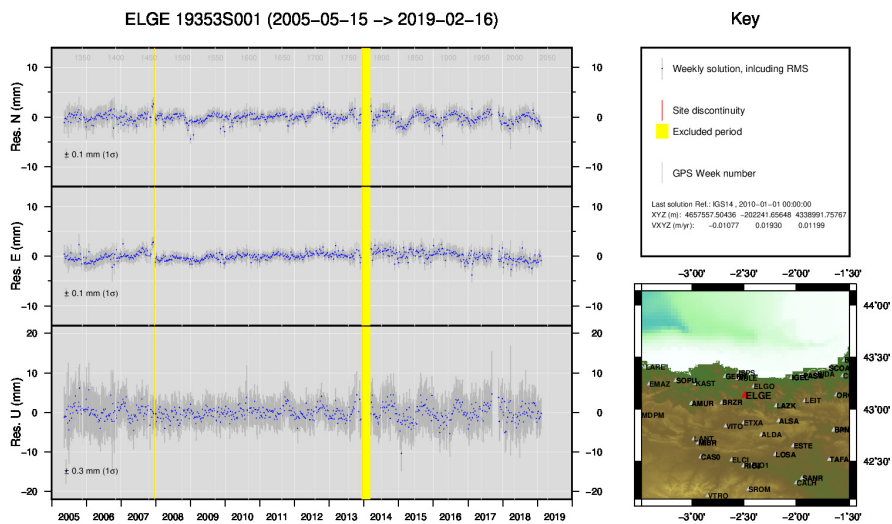


11 ) CREU



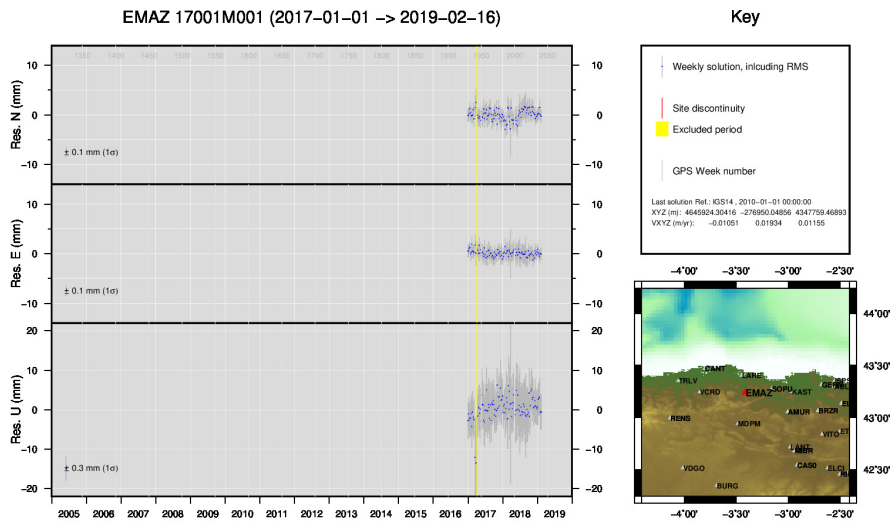
GMW 2019 Mar 03 11:28:16

12 ) EBRE



GMW 2019 Mar 03 11:28:45

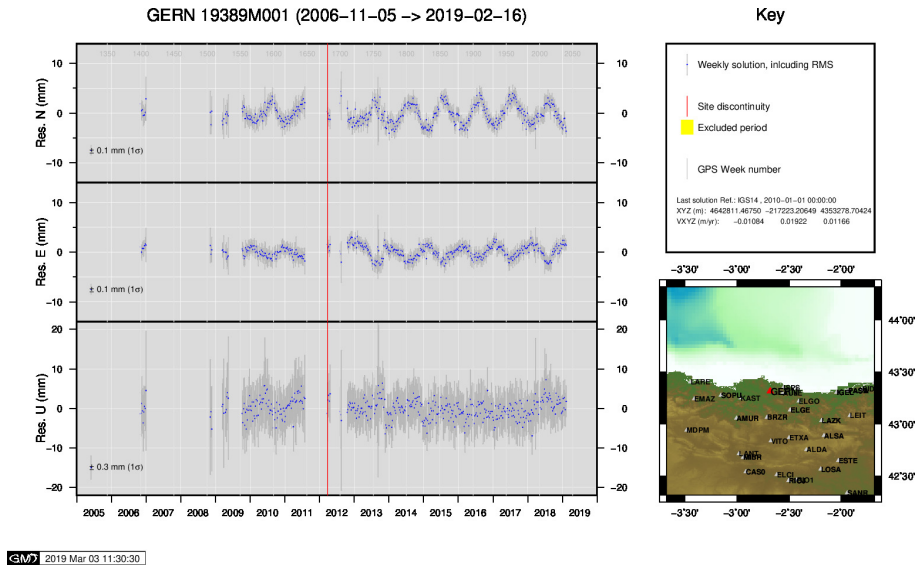
13 ) ELGE



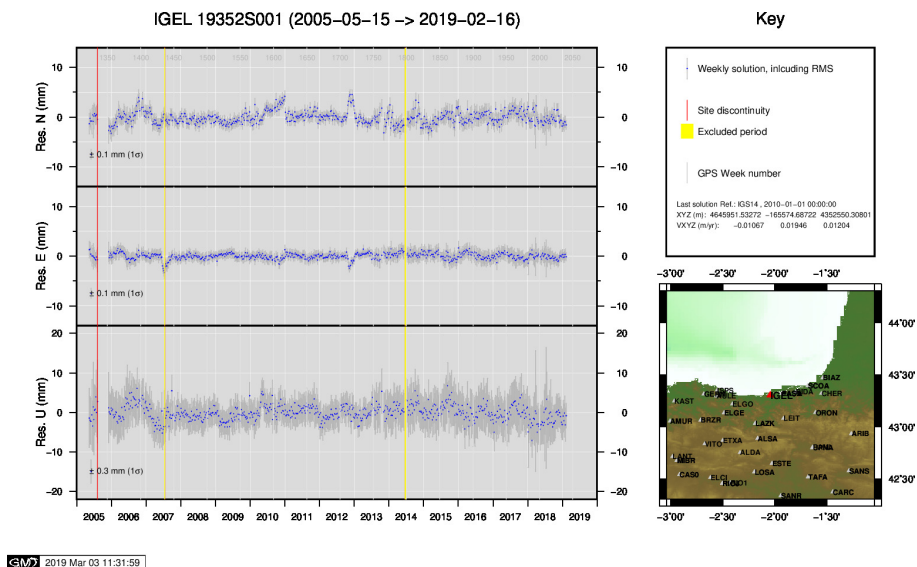
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14 ) EMAZ

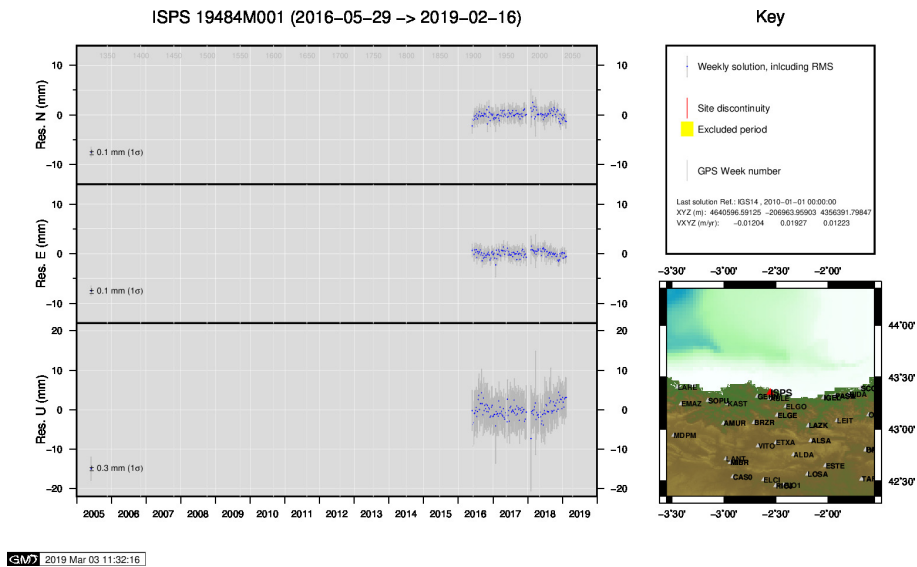




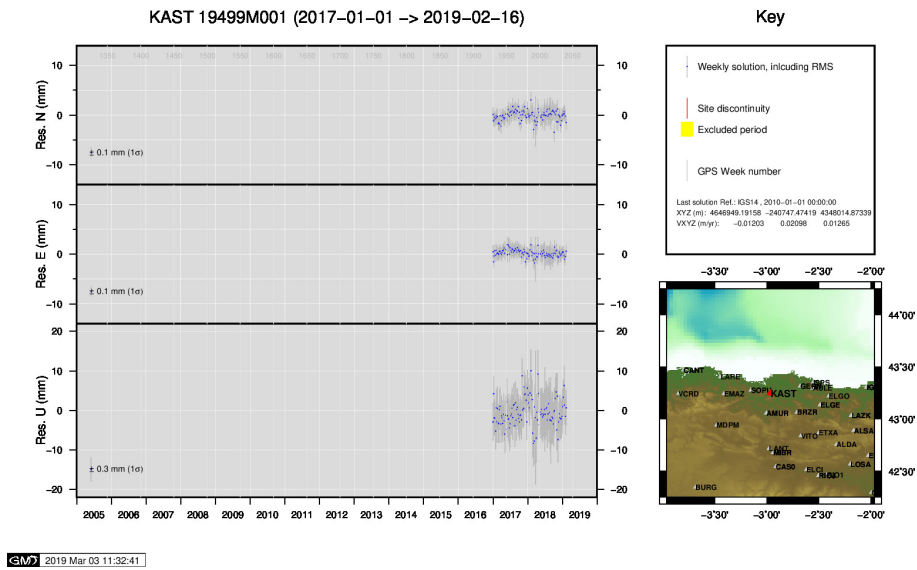
15 ) GERN



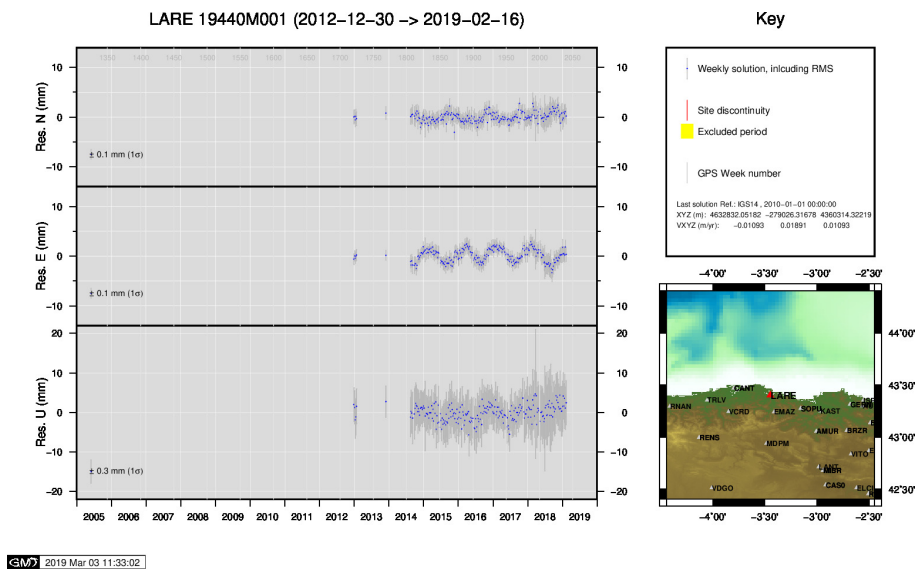
16 ) IGEL



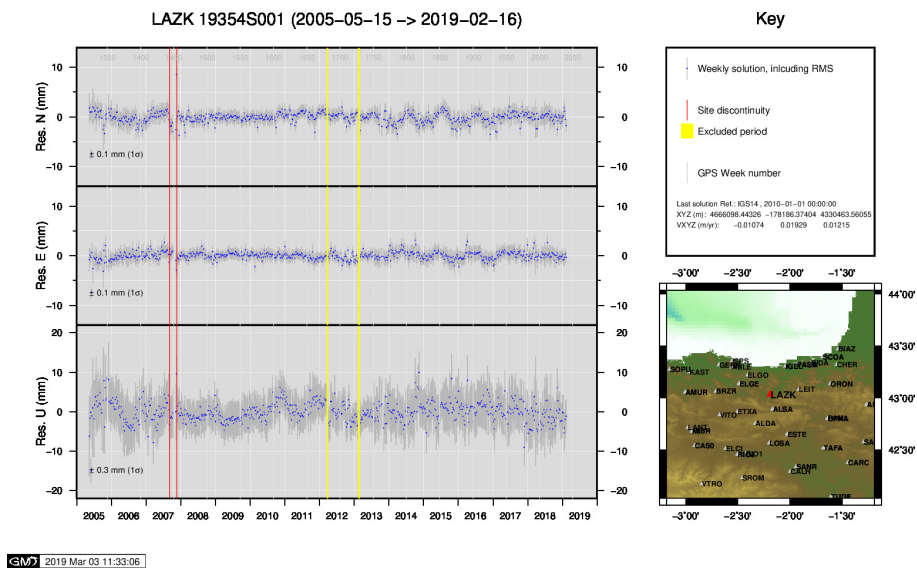
17 ) ISPS



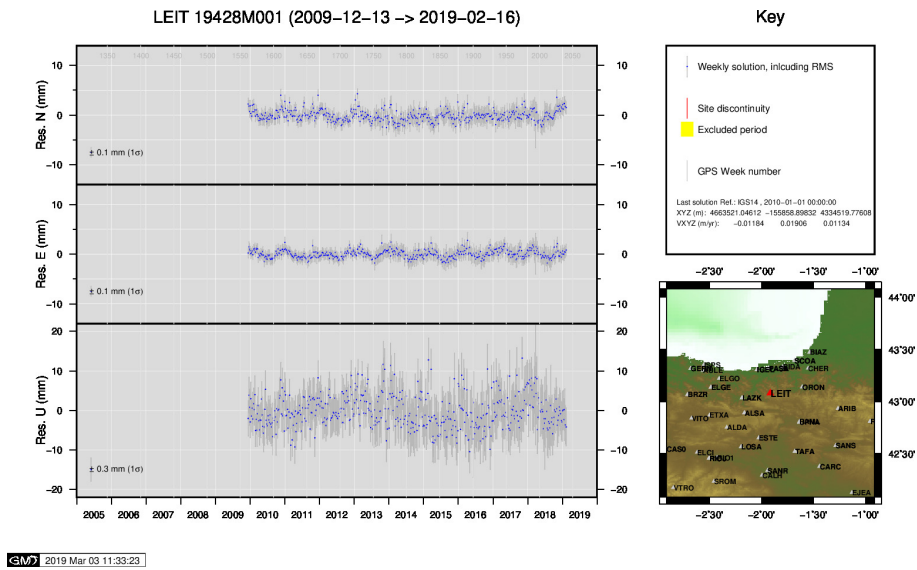
18 ) KAST



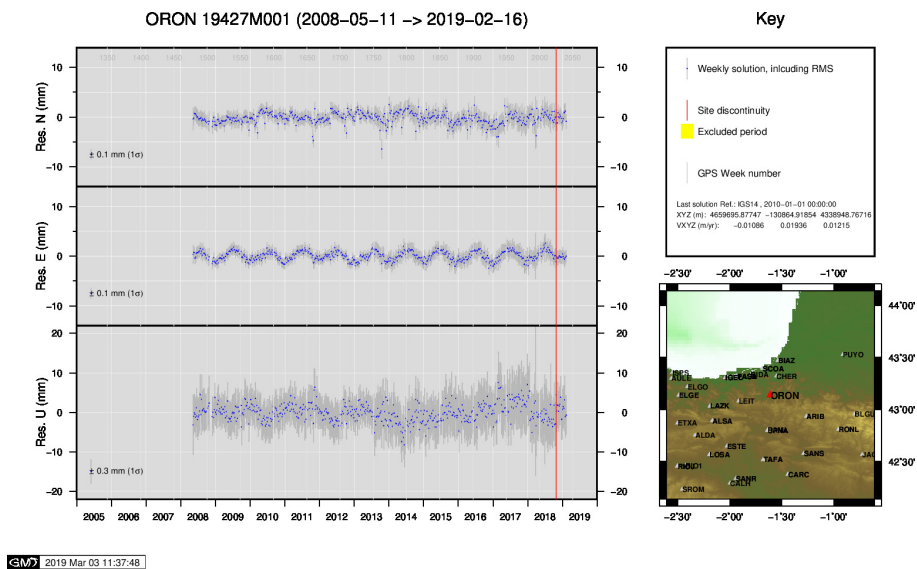
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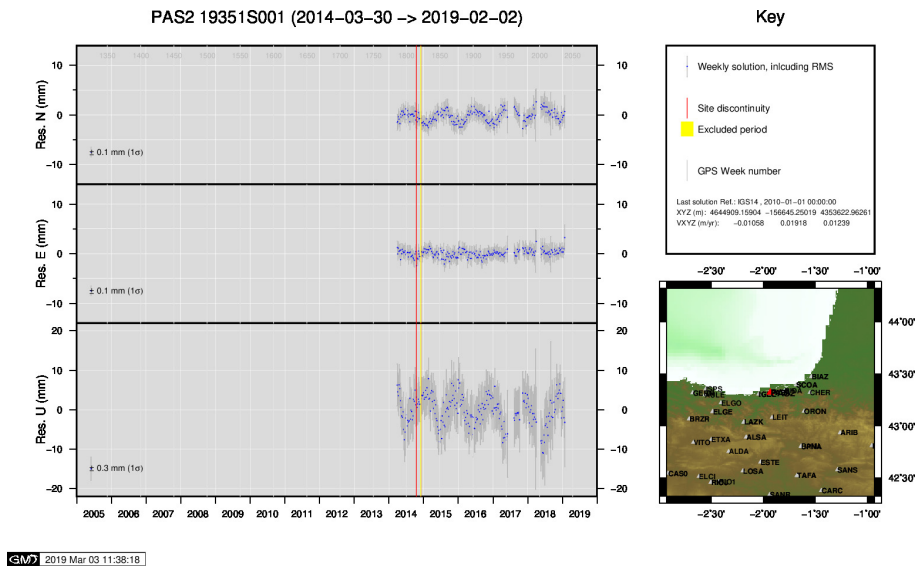
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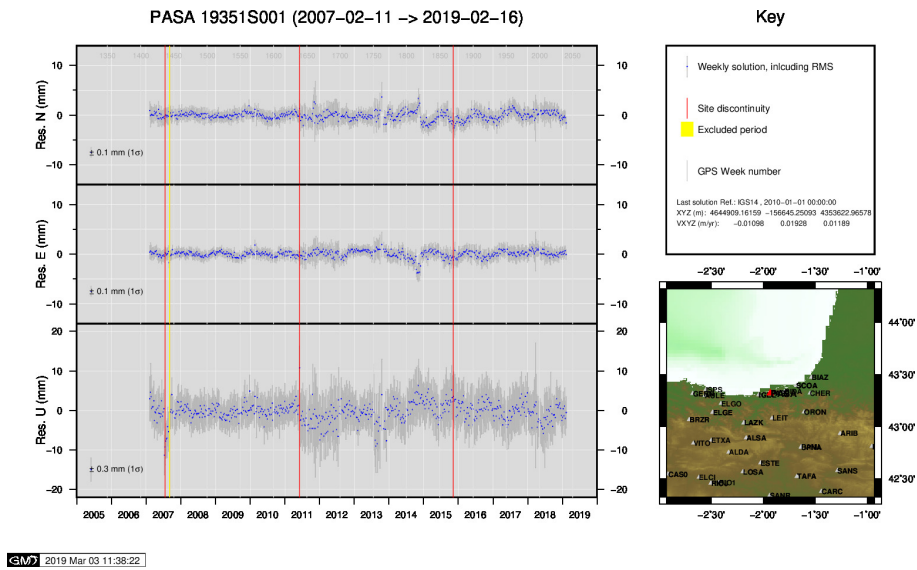
21 ) LEIT



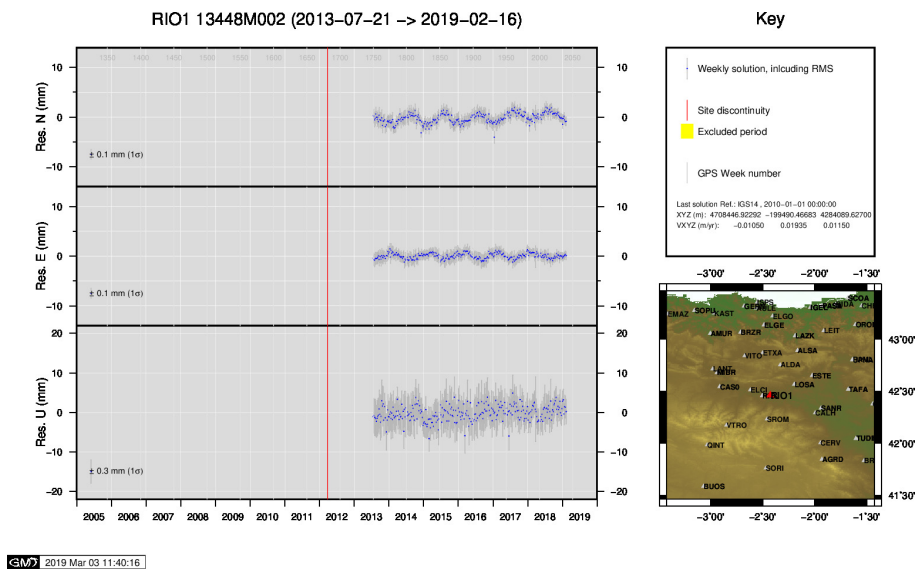
22 ) ORON



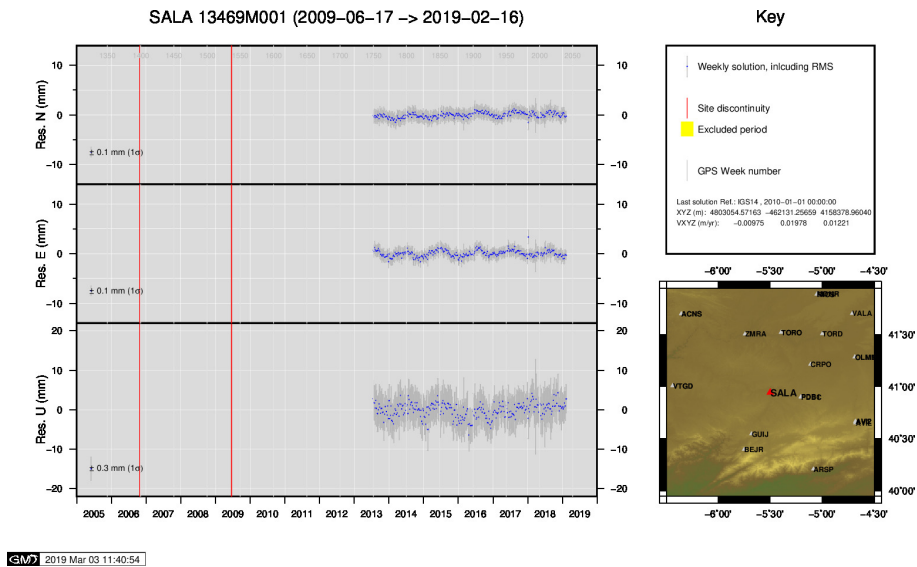
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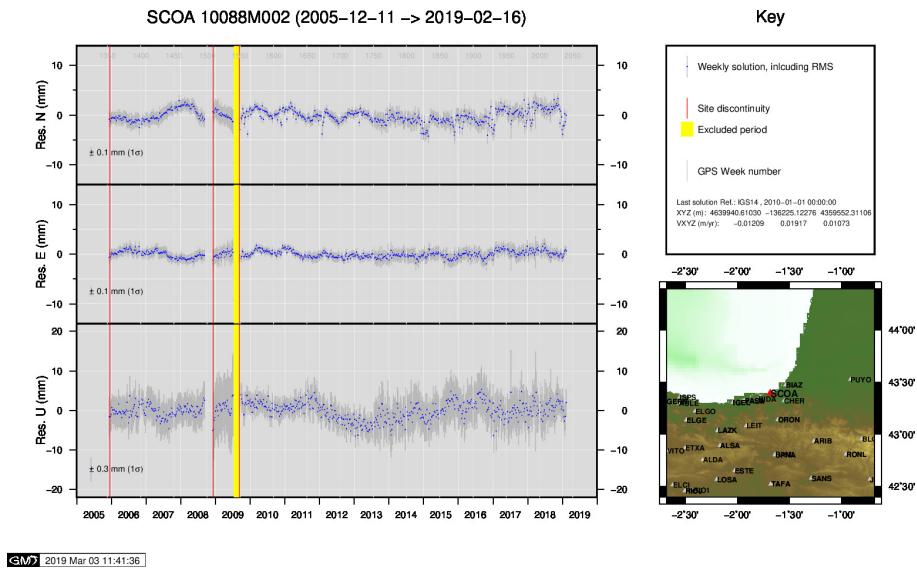
24 ) PASA



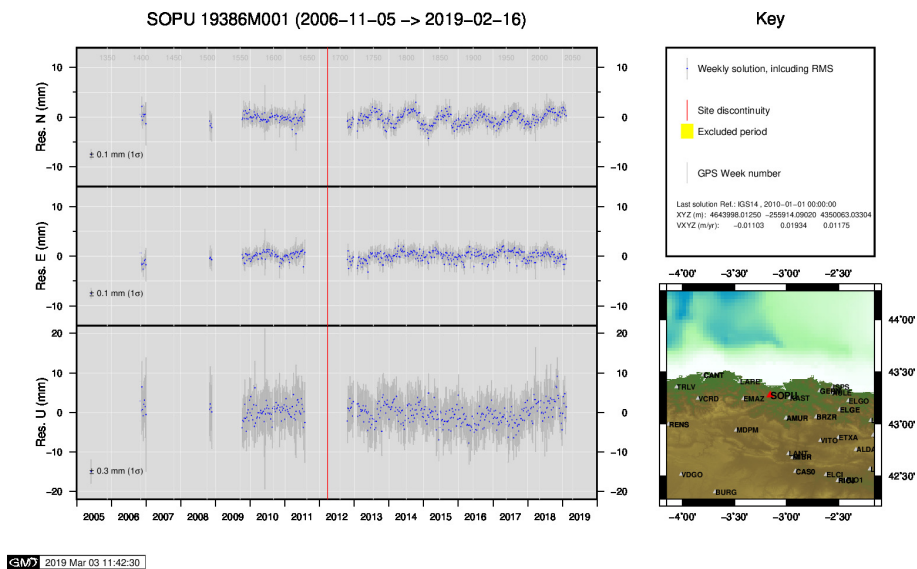
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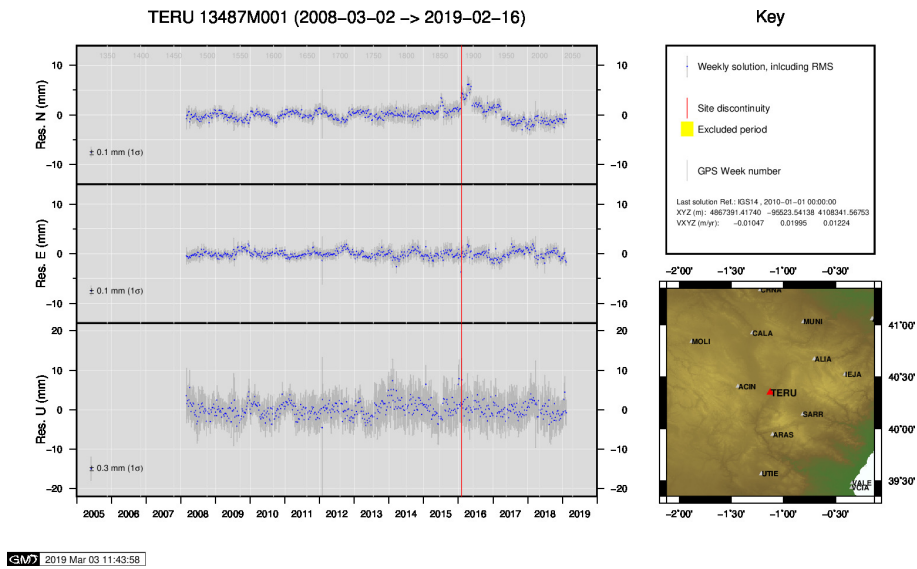
26 ) SALA



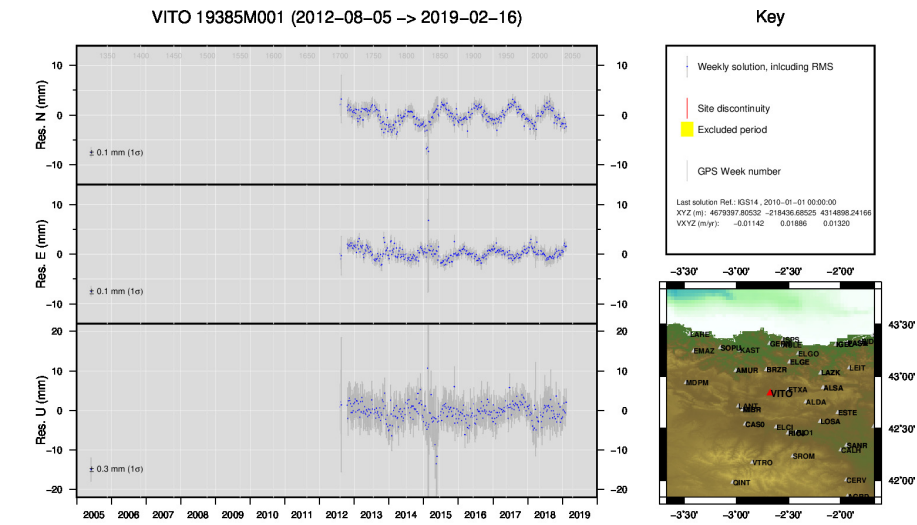
27 ) SCOA



28 ) SOPU

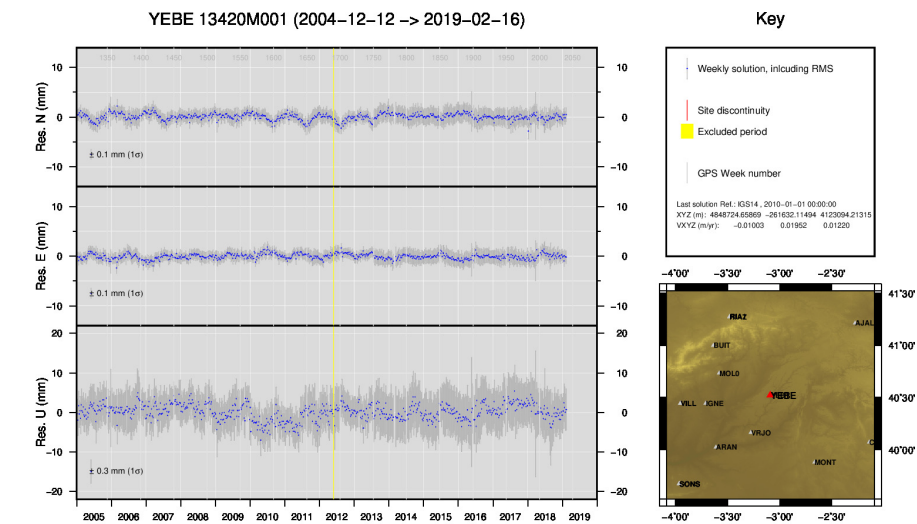


29 ) TERU



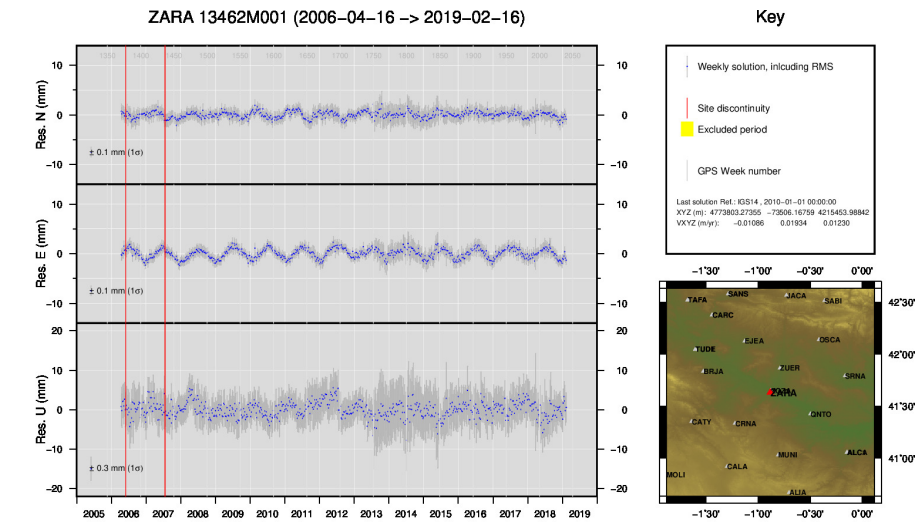
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30 ) VITO



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31 ) YEBE



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32 ) ZARA

