

ARA-DAC Weekly Analysis Result: 2050 (GFA)

Technical Report

GPS Week: 2050 (GFA)

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

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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 2050 WEEK FINAL COMBINATION: PRECISE ORBITS 11-MAY-19 23:20

LOCAL GEODETIC DATUM: IGS14 EPOCH: 2019-04-24 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.55895	-678367.44876	4357066.28226	W
33	ALDA 19383M001	4687280.15848	-190876.56836	4308106.95635	A
42	ALSA 19419M001	4677250.83025	-176770.39640	4319079.87163	A
44	AMUR 19388M001	4661499.44854	-244591.26464	4332269.88131	A
78	BIAZ 10074M002	4634456.05279	-124344.98025	4365785.45873	A
79	BIDA 00000M000	4644177.82321	-145778.32712	4354832.48244	A
89	BRZR 19387M001	4662220.99164	-220769.90411	4333309.43978	A
9	CACE 13447M001	4899866.50273	-544567.03902	4033770.20275	W
10	CANT 13438M001	4625924.31254	-307096.23730	4365771.55362	W
114	CHER 00000M000	4645880.32102	-125721.93041	4353624.37332	A
15	CREU 13432M001	4715420.13317	273178.05534	4271946.84398	W
16	EBRE 13410M001	4833519.99218	41537.38640	4147461.71615	W
135	ELGE 19353S001	4657557.40470	-202241.47945	4338991.86850	A
137	EMAZ 17001M001	4645924.20750	-276949.86895	4347759.58015	A
157	GERN 19389M001	4642811.32236	-217222.92803	4353278.88085	A
177	IGEL 19352S001	4645951.42926	-165574.50743	4352550.41804	A
182	ISPS 19484M001	4640596.48199	-206963.78055	4356391.91573	A
187	KAST 19499M001	4646949.07974	-240747.28013	4348014.98991	A
192	LARE 19440M001	4632831.95074	-279026.14203	4360314.42741	A
193	LAZK 19354S001	4666098.34456	-178186.19512	4330463.67380	A
197	LEIT 19428M001	4663520.93646	-155858.72087	4334519.88626	A
253	ORON 19427M001	4659695.77724	-130864.73785	4338948.87931	A
30	PASA 19351S001	4644909.06016	-156645.07136	4353623.07734	W
33	RID1 13448M002	4708446.82790	-199490.28698	4284089.73912	W
34	SALA 13469M001	4803054.48322	-462131.07356	4158379.07703	W
35	SCDA 10088M002	4639940.49823	-136224.94431	4359552.41509	W
313	SOPU 19386M001	4643997.90847	-255913.91078	4350063.14413	A
333	TERU 13487M001	4867391.32404	-95523.35607	4108341.68239	A
366	VITO 19385M001	4679397.69847	-218436.51008	4314898.36294	A
43	YEBE 13420M001	4848724.56592	-261631.93316	4123094.32813	W
44	ZARA 13462M001	4773803.16917	-73505.98718	4215454.09746	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 2050 11-MAY-19 23:20

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2019-04-24 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.86473	-678367.98446	4357065.86689	W
33	ALDA 19383M001	4687280.51779	-190877.11261	4308106.53994	A
42	ALSA 19419M001	4677251.19196	-176770.93957	4319079.45614	A
44	AMUR 19388M001	4661499.80325	-244591.80636	4332269.46620	A
78	BIAZ 10074M002	4634456.42382	-124345.51882	4365785.04711	A
79	BIDA 00000M000	4644178.19099	-145778.86676	4354832.06983	A
89	BRZR 19387M001	4662221.34920	-220770.44585	4333309.02490	A
9	CACE 13447M001	4899866.80184	-544567.60596	4033769.76588	W
10	CANT 13438M001	4625924.66227	-307096.77550	4365771.14044	W
114	CHER 00000M000	4645880.69105	-125722.47017	4353623.96082	A
15	CREU 13432M001	4715420.54398	273177.50982	4271946.43094	W
16	EBRE 13410M001	4833520.36747	41536.82783	4147461.29142	W
135	ELGE 19353S001	4657557.76481	-202242.02065	4338991.45420	A
137	EMAZ 17001M001	4645924.55951	-276950.40916	4347759.16582	A
157	GERN 19389M001	4642811.68170	-217223.46774	4353278.46748	A
177	IGEL 19352S001	4645951.79457	-165575.04732	4352550.00505	A
182	ISPS 19484M001	4640596.84275	-206964.32010	4356391.50265	A
187	KAST 19499M001	4646949.43598	-240747.82034	4348014.57594	A
192	LARE 19440M001	4632832.30336	-279026.68087	4360314.01405	A
193	LAZK 19354S001	4666098.70688	-178186.73713	4330463.25914	A
197	LEIT 19428M001	4663521.30167	-155859.26255	4334519.47206	A
253	ORON 19427M001	4659696.14566	-130865.27906	4338948.46570	A
30	PASA 19351S001	4644909.42659	-156645.61111	4353622.66454	W
33	RID1 13448M002	4708447.18455	-199490.83344	4284089.32100	W
34	SALA 13469M001	4803054.80057	-462131.63043	4158378.64854	W
35	SCDA 10088M002	4639940.86744	-136225.48348	4359552.00291	W
313	SOPU 19386M001	4643998.26308	-255914.45072	4350062.73020	A
333	TERU 13487M001	4867391.68068	-95523.91858	4108341.25346	A
366	VITO 19385M001	4679398.05503	-218437.05359	4314897.94679	A
43	YEBE 13420M001	4848724.90422	-261632.49424	4123093.89862	W
44	ZARA 13462M001	4773803.53576	-73506.54000	4215453.67590	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 2050		11-MAY-19 23:20			
LOCAL GEODETIC DATUM: ETRF2014		EPOCH: 2019-04-24 12:00:00			
NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACDR 13434M001	4594489.82219	-678368.02308	4357065.91526	W
33	ALDA 19383M001	4687280.47306	-190877.15257	4308106.58820	A
42	ALSA 19419M001	4677251.14728	-176770.97962	4319079.50444	A
44	AMUR 19388M001	4661499.75893	-244591.84624	4332269.51450	A
78	BLAZ 10074M002	4634456.37940	-124345.55921	4365785.09553	A
79	BIDA 00000M000	4644178.14654	-145778.90704	4354832.11821	A
89	BRZR 19387M001	4662221.30481	-220770.48580	4333309.07321	A
9	CACE 13447M001	4899866.75588	-544567.64386	4033769.81359	W
10	CANT 13438M001	4625924.61847	-307096.81529	4365771.18880	W
114	CHER 00000M000	4645880.64653	-125722.51051	4353624.00921	A
15	CREU 13432M001	4715420.49744	273177.46839	4271946.47943	W
16	EBRE 13410M001	4833520.32052	41536.78765	4147461.33949	W
135	ELGE 19353S001	4657557.72041	-202242.06069	4338991.50252	A
137	EMAZ 17001M001	4645924.51544	-276950.44898	4347759.21415	A
157	GERN 19389M001	4642811.63748	-217223.50778	4353278.51584	A
177	IGEL 19352S001	4645951.75017	-165575.08752	4352550.05343	A
182	ISPS 19484M001	4640596.79852	-206964.36018	4356391.55102	A
187	KAST 19499M001	4646949.39179	-240747.86028	4348014.62428	A
192	LARE 19440M001	4632832.25942	-279026.72073	4360314.06240	A
193	LAZK 19354S001	4666098.66232	-178186.77722	4330463.30746	A
197	LEIT 19428M001	4663521.25706	-155859.30272	4334519.52040	A
253	ORON 19427M001	4659696.10102	-130865.31933	4338948.51406	A
30	PASA 19351S001	4644909.38217	-156645.65135	4353622.71292	W
33	RI01 13448M002	4708447.13963	-199490.87329	4284089.36921	W
34	SALA 13469M001	4803054.75542	-462131.66900	4158378.69645	W
35	SOA 10088M002	4639940.82301	-136225.52381	4359552.05131	W
313	SOPU 19386M001	4643998.21897	-255914.49062	4350062.77854	A
333	TERU 13487M001	4867391.63382	-95523.95817	4108341.30137	A
366	VITO 19385M001	4679398.01046	-218437.09349	4314897.99506	A
43	YEBE 13420M001	4848724.85806	-261632.53333	4123093.94649	W
44	ZARA 13462M001	4773803.48980	-73506.58003	4215453.72402	W

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 2050 WEEK FINAL COMBINATION: PRECISE ORBITS 11-MAY-19 23:20

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	1.22	0.92	1.95
ALDA 19383M001	7	XXXXXX	1.28	0.78	4.00
ALSA 19419M001	7	XXXXXX	1.66	1.04	4.13
AMUR 19388M001	7	XXXXXX	3.62	3.21	6.09
BLAZ 10074M002	7	XXXXXX	1.29	0.83	3.89
BIDA 00000M000	7	XXXXXX	1.76	1.26	2.56
BRZR 19387M001	7	XXXXXX	1.61	2.76	5.41
CACE 13447M001	7	XXXXXX	0.65	0.76	2.64
CANT 13438M001	7	XXXXXX	1.00	0.96	3.17
CHER 00000M000	7	XXXXXX	1.73	1.49	2.32
CREU 13432M001	2	XX	0.92	1.00	3.08
EBRE 13410M001	7	XXXXXX	0.76	0.72	3.25
ELGE 19353S001	7	XXXXXX	1.50	1.75	3.72
EMAZ 17001M001	7	XXXXXX	1.58	0.53	3.98
GERN 19389M001	7	XXXXXX	1.31	1.20	5.77
IGEL 19352S001	7	XXXXXX	2.03	1.14	2.91
ISPS 19484M001	7	XXXXXX	1.88	1.86	4.76
KAST 19499M001	7	XXXXXX	1.37	0.98	3.02
LARE 19440M001	7	XXXXXX	1.01	0.58	3.16
LAZK 19354S001	7	XXXXXX	1.76	0.73	3.30
LEIT 19428M001	7	XXXXXX	1.97	0.78	6.20
ORON 19427M001	7	XXXXXX	4.18	1.82	3.27
PASA 19351S001	7	XXXXXX	1.13	1.27	2.92
RI01 13448M002	7	XXXXXX	0.74	0.78	4.47
SALA 13469M001	7	XXXXXX	0.43	0.21	2.90
SCOA 10088M002	7	XXXXXX	1.19	0.68	2.36
SOPU 19386M001	7	XXXXXX	1.40	0.85	2.86
TERU 13487M001	7	XXXXXX	0.78	1.06	1.97
VITO 19385M001	7	XXXXXX	1.96	0.98	5.61
YEBE 13420M001	7	XXXXXX	0.61	0.66	2.84
ZARA 13462M001	7	XXXXXX	0.46	0.70	2.56

Comparison of individual solutions:

ACOR 13434M001	N	1.22	1.01	1.69	-0.72	-0.40	-2.02	0.15	-0.59
ACOR 13434M001	E	0.92	0.31	-1.75	-0.85	-0.56	0.71	-0.16	0.64
ACOR 13434M001	U	1.95	-0.07	-2.85	2.06	-0.22	2.62	1.12	1.56
ALDA 19383M001	N	1.28	0.44	-1.46	-2.03	0.41	0.53	-0.08	1.72
ALDA 19383M001	E	0.78	0.03	-0.20	0.29	1.60	0.11	0.21	-0.97
ALDA 19383M001	U	4.00	-5.06	-3.87	-1.52	-0.87	5.27	-0.21	-4.93
ALSA 19419M001	N	1.66	0.32	-0.75	-3.02	0.44	1.87	-1.12	1.37
ALSA 19419M001	E	1.04	0.47	0.00	0.31	1.27	-2.13	0.13	0.01
ALSA 19419M001	U	4.13	-2.58	-3.34	1.73	-0.01	-8.94	-1.32	-0.38
AMUR 19388M001	N	3.62	1.28	1.60	1.19	-3.26	-7.23	2.69	1.72
AMUR 19388M001	E	3.21	2.23	0.39	2.38	-3.52	-5.60	1.53	2.21
AMUR 19388M001	U	6.09	-2.98	1.18	2.70	-8.28	-11.54	1.76	0.10
BLAZ 10074M002	N	1.29	0.96	0.56	0.73	1.98	1.79	-0.26	-1.02
BLAZ 10074M002	E	0.83	0.38	-1.30	0.27	-0.76	-0.37	0.59	1.08
BLAZ 10074M002	U	3.89	-5.16	-2.48	-0.05	7.40	0.88	1.44	0.62
BIDA 00000M000	N	1.76	0.80	-0.06	-0.42	2.48	3.27	-0.79	0.40
BIDA 00000M000	E	1.26	0.01	-0.89	-0.63	-0.63	2.77	-0.54	0.09
BIDA 00000M000	U	2.56	-1.42	0.34	-1.58	-3.14	-0.36	3.42	3.59
BRZR 19387M001	N	1.61	2.32	2.30	-0.03	-0.48	-1.59	0.75	1.23
BRZR 19387M001	E	2.76	1.41	0.46	0.04	-2.07	-5.17	1.84	3.03
BRZR 19387M001	U	5.41	2.17	4.37	0.64	-3.00	-9.91	6.55	1.04
CACE 13447M001	N	0.65	-0.88	-0.25	-0.79	1.00	-0.23	-0.18	-0.01
CACE 13447M001	E	0.76	-0.64	-0.85	-1.12	-0.12	-0.28	0.37	-0.90
CACE 13447M001	U	2.64	-0.96	5.50	-0.75	-0.83	-2.60	-1.60	-0.07
CANT 13438M001	N	1.00	1.26	1.36	0.78	0.94	0.83	-0.03	-0.58
CANT 13438M001	E	0.96	0.78	-1.02	-0.46	-1.56	0.90	0.36	0.61
CANT 13438M001	U	3.17	0.74	-4.24	-3.28	-1.23	2.45	3.08	3.76
CHER 00000M000	N	1.73	-0.02	1.49	1.98	-0.85	3.32	-0.06	-0.31
CHER 00000M000	E	1.49	1.85	-0.37	1.13	-1.78	-1.84	-1.25	0.65
CHER 00000M000	U	2.32	0.84	0.35	2.26	-1.34	-3.86	-0.77	3.00
CREU 13432M001	N	0.92						-0.82	0.42
CREU 13432M001	E	1.00						0.88	-0.47
CREU 13432M001	U	3.08						1.54	2.66
EBRE 13410M001	N	0.76	-0.29	-0.99	-0.26	0.59	-0.12	1.41	-0.08
EBRE 13410M001	E	0.72	-0.11	1.04	0.19	0.63	0.37	-1.08	-0.55
EBRE 13410M001	U	3.25	-0.93	2.95	-0.89	-1.62	-2.33	-2.89	6.07
ELGE 19353S001	N	1.50	1.67	2.41	0.94	-0.42	-1.62	1.04	0.27
ELGE 19353S001	E	1.75	0.77	-1.02	0.81	-3.36	-0.48	1.84	1.02
ELGE 19353S001	U	3.72	-2.20	0.83	2.40	1.56	-7.11	3.06	3.03
EMAZ 17001M001	N	1.58	-1.22	0.37	-0.13	1.62	-0.45	-0.70	-3.17
EMAZ 17001M001	E	0.53	0.11	-0.53	-0.12	-0.08	0.54	-0.04	1.03
EMAZ 17001M001	U	3.98	-3.89	-3.84	2.74	-1.00	-3.89	5.65	3.09
GERN 19389M001	N	1.31	1.82	1.86	0.46	-0.74	1.63	-0.20	-0.36
GERN 19389M001	E	1.20	0.93	-1.50	-0.46	0.58	1.89	-0.94	-0.68
GERN 19389M001	U	5.77	-5.42	-3.11	2.48	7.58	-7.46	6.03	2.23
IGEL 19352S001	N	2.03	0.12	1.26	3.31	0.04	2.55	-0.51	-2.31
IGEL 19352S001	E	1.14	0.72	-1.23	-0.30	-1.64	-0.22	1.25	1.15
IGEL 19352S001	U	2.91	-2.51	-3.91	-2.18	1.86	2.78	2.73	2.44
ISPS 19484M001	N	1.88	-0.38	0.79	-0.88	2.68	2.88	-0.25	-2.02
ISPS 19484M001	E	1.86	-0.01	-2.45	-1.71	0.97	3.14	-0.19	0.99
ISPS 19484M001	U	4.76	0.51	3.22	1.55	-3.53	-3.54	-4.45	8.85
KAST 19499M001	N	1.37	1.28	0.42	-1.15	0.40	2.69	0.67	0.48
KAST 19499M001	E	0.98	0.43	0.18	-0.49	0.69	2.09	-0.66	-0.04
KAST 19499M001	U	3.02	-2.84	-0.89	-1.11	-0.87	-3.87	3.18	4.32
LARE 19440M001	N	1.01	-0.39	0.89	-0.69	-0.82	-0.02	-0.91	-1.78
LARE 19440M001	E	0.58	-0.45	0.37	0.62	-0.01	-0.80	0.60	0.57
LARE 19440M001	U	3.16	-2.71	-1.54	1.85	-2.20	-3.76	2.58	4.61
LAZK 19354S001	N	1.76	2.07	2.22	-0.39	-2.20	-0.06	1.98	0.69
LAZK 19354S001	E	0.73	0.53	-0.43	-0.68	-0.31	-0.57	-0.29	1.33
LAZK 19354S001	U	3.30	0.38	-4.32	4.79	-3.13	-0.78	3.11	1.91

LEIT 19428M001	N	1.97	-0.71	-1.07	-2.22	0.88	3.92	-0.65	0.21
LEIT 19428M001	E	0.78	-0.11	-1.28	0.35	-0.59	-0.53	0.41	1.04
LEIT 19428M001	U	6.20	-3.85	-6.35	-6.88	8.74	3.87	-5.58	2.35
ORON 19427M001	N	4.18	2.66	2.78	3.80	-8.31	-1.62	1.61	1.24
ORON 19427M001	E	1.82	1.25	-0.63	-0.36	-3.57	-0.51	1.59	1.53
ORON 19427M001	U	3.27	-2.62	-1.52	4.57	-3.00	-2.40	3.04	3.15
PASA 19351S001	N	1.13	0.55	0.65	1.03	1.23	1.70	1.06	-0.56
PASA 19351S001	E	1.27	0.35	-1.24	-1.64	1.41	1.20	0.20	1.33
PASA 19351S001	U	2.92	-3.15	-3.31	0.81	0.12	4.03	3.12	1.94
RIO1 13448M002	N	0.74	-0.08	-0.41	-0.46	-0.30	1.39	-0.05	-0.92
RIO1 13448M002	E	0.78	-0.16	-0.74	-0.97	-0.43	1.30	-0.09	0.52
RIO1 13448M002	U	4.47	-7.25	0.14	-3.08	0.63	5.53	-3.20	-4.08
SALA 13469M001	N	0.43	0.44	-0.38	0.44	-0.60	0.25	-0.26	0.29
SALA 13469M001	E	0.21	-0.29	-0.07	0.07	0.03	-0.19	0.35	-0.01
SALA 13469M001	U	2.90	1.78	4.63	-3.42	-1.74	-3.06	-0.18	1.37
SCDA 10088M002	N	1.19	0.93	0.48	2.41	-0.11	1.18	-0.00	-0.41
SCDA 10088M002	E	0.68	0.61	-0.48	0.78	-0.88	-0.70	0.06	0.52
SCDA 10088M002	U	2.36	1.94	-0.24	-4.59	2.03	1.33	0.04	1.66
SOPU 19386M001	N	1.40	1.29	0.72	1.35	0.85	2.05	-1.69	0.13
SOPU 19386M001	E	0.85	0.55	-1.24	-0.44	0.10	0.06	-0.66	1.35
SOPU 19386M001	U	2.86	-3.74	-0.80	3.84	0.44	1.18	3.38	-2.59
TERU 13487M001	N	0.78	0.70	0.50	-0.28	-0.45	-1.12	0.47	1.08
TERU 13487M001	E	1.06	0.41	0.46	0.80	0.60	-2.28	-0.23	0.39
TERU 13487M001	U	1.97	0.15	1.31	-1.80	-0.54	2.53	-2.09	-2.71
VITO 19385M001	N	1.96	1.22	0.67	0.97	-2.48	-3.51	1.19	0.42
VITO 19385M001	E	0.98	0.25	-1.13	-0.73	0.26	-1.03	0.68	1.52
VITO 19385M001	U	5.61	-2.73	3.04	-0.87	-4.88	-11.28	3.78	-2.42
YEBE 13420M001	N	0.61	0.04	0.42	-0.02	-0.95	-0.15	0.42	0.96
YEBE 13420M001	E	0.66	0.20	-0.23	0.85	-0.91	-0.10	-0.39	-0.87
YEBE 13420M001	U	2.84	-0.27	0.64	2.61	5.50	-1.30	0.40	-3.00
ZARA 13462M001	N	0.46	0.02	0.30	-0.16	-0.29	-0.97	0.31	0.17
ZARA 13462M001	E	0.70	-0.35	0.02	-1.07	0.31	1.24	0.12	0.13
ZARA 13462M001	U	2.56	-3.51	0.20	-4.55	-0.59	-0.91	-2.27	-0.08

6.2 Datum verification

In this section, the datum verification is shown. A 3 parameter Helmert 3D (3 translations) is computed to the minimally constrained sites.

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

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-1.40	-0.60	0.83
2	ALAC 13433M001	I W	0.68	-0.12	-1.51
3	ALBA 13452M001	I W	-0.14	-0.83	0.29
4	ALME 13437M001	I W	-0.56	2.76	5.67
5	BCLN 13412M001	I W	0.85	1.25	-0.71
6	BELL 13431M001	I W	1.61	2.04	-3.06
7	BORR 13480M001	I W	-0.55	-2.43	-1.97
8	BRST 10004M004	I W	-1.96	0.36	-2.12
9	CACE 13447M001	I W	0.65	0.43	1.38
10	CANT 13438M001	I W	0.64	0.43	1.58
11	CARG 19412M001	I W	1.44	-0.11	2.17
12	CASC 13909S001	I W	1.29	-2.69	0.98
13	CEU1 13449M002	I W	0.66	0.73	0.93
14	COBA 13453M001	I W	1.56	0.57	-3.61
15	CREU 13432M001	I W	-1.45	1.53	-4.54
16	EBRE 13410M001	I W	0.30	1.26	-4.15
17	ESCO 13435M001	I W	2.07	-1.38	2.99
18	FUNC 13911S001	I W	1.40	-1.44	2.04
19	GAIA 13902M001	I W	-1.68	-1.26	1.28
21	HUEL 13451M001	I W	-0.18	2.87	2.20
22	IZAN 13109M002	I W	-1.20	-2.17	2.57
23	LLIV 13436M001	I W	0.53	0.01	-1.19
24	LPAL 81701M001	I W	-2.37	-1.20	-0.12
25	LRDC 10023M001	I W	0.16	-0.19	0.17
26	MALA 13443M001	I W	0.73	-0.58	-0.94
27	MAS1 31303M002	I W	-0.38	-0.77	3.18
29	MELI 19379M001	I W	0.65	1.23	-0.43
30	PASA 19351S001	I W	0.35	0.15	-1.33
31	PDEL 13190M004	I W	0.40	-4.16	3.11
33	RIO1 13448M002	I W	-1.65	-0.01	-5.25
34	SALA 13469M001	I W	0.67	1.01	-2.03
35	SCOA 10088M002	I W	-3.40	-0.03	-2.38
38	SONS 13446M001	I W	1.23	1.18	-3.08
40	VALA 13463M002	I W	-0.91	0.75	-0.51
41	VALE 13439M001	I W	-0.19	1.47	-0.03
42	VIGO 13450M001	I W	-0.56	0.48	6.61
43	YEBE 13420M001	I W	0.61	-0.39	4.08
44	ZARA 13462M001	I W	-0.09	0.52	-2.85
45	ZIMM 14001M004	I W	0.24	-0.67	-0.27
RMS / COMPONENT			1.21	1.44	2.72
MEAN			-0.00	0.00	-0.00
MIN			-3.40	-4.16	-5.25
MAX			2.07	2.87	6.61

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 117
RMS OF TRANSFORMATION : 1.91 MM

BARYCENTER COORDINATES:

LATITUDE : 39 47 6.61
LONGITUDE : - 4 52 1.98
HEIGHT : -44.127 KM

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.31 MM
TRANSLATION IN E : -0.01 +- 0.31 MM
TRANSLATION IN U : -0.00 +- 0.31 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          17706682
NUMBER OF UNKNOWN               218083
NUMBER OF DEGREES OF FREEDOM    17488599
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  2.027434543267171

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
  1  0.00226     -0.0043 -0.0025  0.0017  0.0001 -0.0001 -0.0001  0.00028
  2  0.00220      0.0005 -0.0116 -0.0050  0.0002  0.0001 -0.0004  0.00031
  3  0.00250      0.0079 -0.0111  0.0008  0.0002  0.0001 -0.0002 -0.00107
  4  0.00239      0.0067  0.0037 -0.0027 -0.0001  0.0002  0.0001 -0.00052
  5  0.00263     -0.0024 -0.0059  0.0060  0.0002 -0.0002 -0.0001 -0.00036
  6  0.00192     -0.0112  0.0187  0.0017 -0.0003 -0.0003  0.0006  0.00141
  7  0.00212     -0.0105  0.0049  0.0058  0.0000 -0.0004  0.0002  0.00091
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00137      2481623      1.87      2512259      3      972      29667      0
  2  0.00141      2445401      1.99      2477233      3      990      30845      0
  3  0.00147      2501298      2.17      2534727      3      993      32439      0
  4  0.00145      2477125      2.11      2510495      3      1002      32371      0
  5  0.00150      2520435      2.25      2553313      3      1005      31876      0
  6  0.00136      2515361      1.85      2546447      3      987      30102      0
  7  0.00137      2541449      1.87      2572208      3      996      29766      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 19:111:00000 19:117:86370 LEICA GR10 -----
ALDA  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
ALSA  A  1 P 19:111:00000 19:117:86370 LEICA GR50 -----
AMUR  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
BIAZ  A  1 P 19:111:00000 19:117:86370 TRI SP90M -----
BIDA  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
BRZR  A  1 P 19:111:00000 19:117:86370 LEICA GR30 -----
CACE  A  1 P 19:111:00000 19:117:86370 TRIMBLE NETR9 -----
CANT  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
CHER  A  1 P 19:111:00000 19:117:86370 LEICA GRX1200+GNSS -----
CREU  A  1 P 19:116:34860 19:117:86370 LEICA GR50 -----
EBRE  A  1 P 19:111:00000 19:117:86370 LEICA GR50 -----
ELGE  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
EMAZ  A  1 P 19:111:00000 19:117:86370 LEICA GR30 -----
GERN  A  1 P 19:111:00000 19:117:86370 LEICA GR30 -----
IGEL  A  1 P 19:111:00000 19:117:86370 LEICA GR30 -----
ISPS  A  1 P 19:111:00000 19:117:86370 TRIMBLE NETR9 -----
KAST  A  1 P 19:111:00000 19:117:86370 LEICA GR30 -----
LARE  A  1 P 19:111:00000 19:117:86370 LEICA GRX1200GGPRO -----
LAZK  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
LEIT  A  1 P 19:111:00000 19:117:86370 LEICA GR50 -----
ORON  A  1 P 19:111:00000 19:117:86370 LEICA GR50 -----
PASA  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
RIO1  A  1 P 19:111:00000 19:117:86370 LEICA GR25 -----
SALA  A  1 P 19:111:00000 19:117:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 19:111:00000 19:117:86370 LEICA GR25 -----
SOPU  A  1 P 19:111:00000 19:117:86370 LEICA GR30 -----
TERU  A  1 P 19:111:00000 19:117:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 19:111:00000 19:117:86370 LEICA GR10 -----
YEBE  A  1 P 19:111:00000 19:117:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 19:111:00000 19:117:86370 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 19:111:00000 19:117:86370 LEIAT504      LEIS -----
ALDA  A  1 P 19:111:00000 19:117:86370 LEIAS10      NONE -----
ALSA  A  1 P 19:111:00000 19:117:86370 LEIAR10      NONE -----
AMUR  A  1 P 19:111:00000 19:117:86370 LEIAS10      NONE -----
BIAZ  A  1 P 19:111:00000 19:117:86370 LEIAR25      LEIT -----
```

```

BIDA A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
BRZR A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
CACE A 1 P 19:111.00000 19:117:86370 TRM29659.00 NONE -----
CANT A 1 P 19:111.00000 19:117:86370 LEIAR25.R4 LEIT 25066
CHER A 1 P 19:111.00000 19:117:86370 LEIAX1203+GNSS NONE -----
CREU A 1 P 19:116:34860 19:117:86370 LEIAR25.R4 NONE 26357
EBRE A 1 P 19:111.00000 19:117:86370 LEIAR25.R4 NONE 26359
ELGE A 1 P 19:111.00000 19:117:86370 LEIAR25.R4 LEIT -----
EMAZ A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
GERN A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
IGEL A 1 P 19:111.00000 19:117:86370 LEIAR20 LEIM -----
ISPS A 1 P 19:111.00000 19:117:86370 TRM59900.00 SCIS -----
KAST A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
LARE A 1 P 19:111.00000 19:117:86370 LEIAT504 NONE -----
LAZK A 1 P 19:111.00000 19:117:86370 LEIAR25.R4 LEIT -----
LEIT A 1 P 19:111.00000 19:117:86370 LEIAR10 NONE -----
ORDN A 1 P 19:111.00000 19:117:86370 LEIAR10 NONE -----
PASA A 1 P 19:111.00000 19:117:86370 LEIAR20 LEIM 73034
RID1 A 1 P 19:111.00000 19:117:86370 LEIAR25.R4 LEIT 25138
SALA A 1 P 19:111.00000 19:117:86370 LEIAR25 NONE -----
SCDA A 1 P 19:111.00000 19:117:86370 TRM55971.00 NONE -----
SOPU A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
TERU A 1 P 19:111.00000 19:117:86370 LEIAT504GG LEIS -----
VITO A 1 P 19:111.00000 19:117:86370 LEIAS10 NONE -----
YEBE A 1 P 19:111.00000 19:117:86370 TRM29659.00 NONE -----
ZARA A 1 P 19:111.00000 19:117:86370 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 19:111.00000 19:117:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 19:111.00000 19:117:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 19:111.00000 19:117:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 19:111.00000 19:117:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 19:116:34860 19:117:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 19:111.00000 19:117:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 19:111.00000 19:117:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 19:111.00000 19:117:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 19:111.00000 19:117:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 19:111.00000 19:117:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
RID1 A 1 P 19:111.00000 19:117:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 19:111.00000 19:117:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 19:111.00000 19:117:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 19:111.00000 19:117:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 19:111.00000 19:117:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 19:111.00000 19:117:86370 UNE 3.2590 0.0000 0.0000

```

8 References

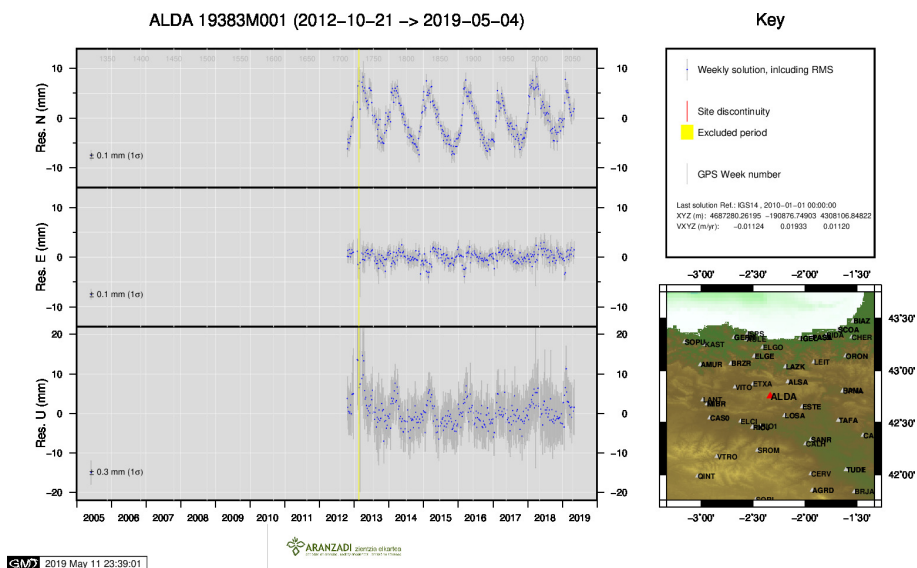
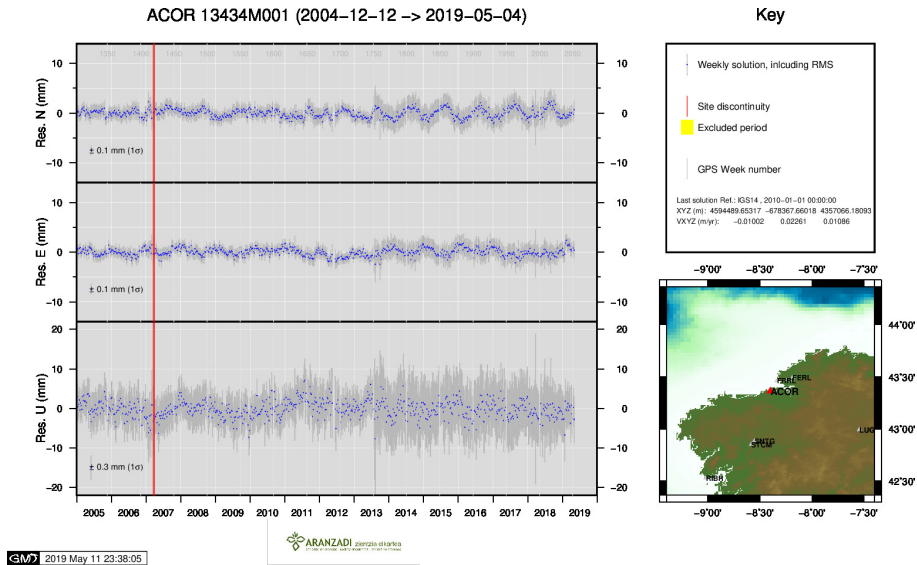
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. etrs89.ensg.ign.fr/memo-V8.pdf

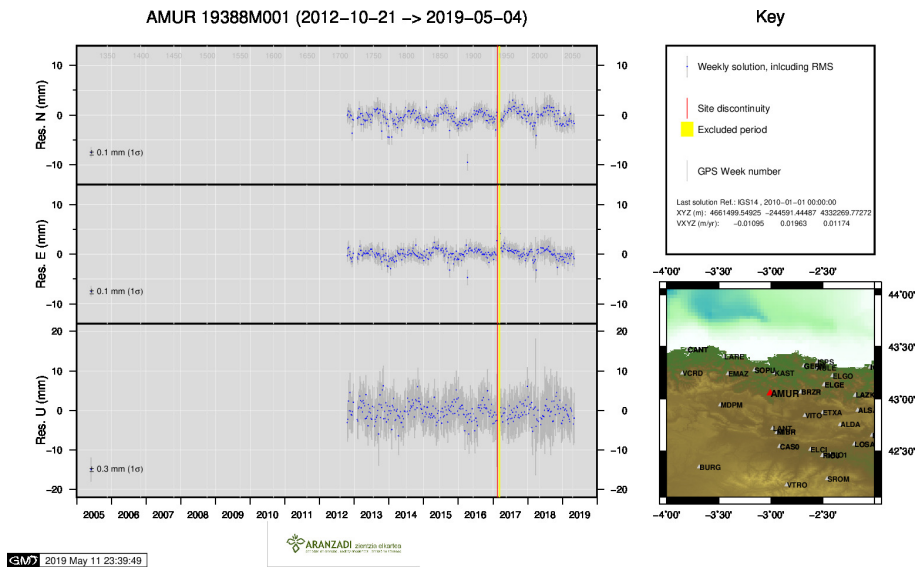
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

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

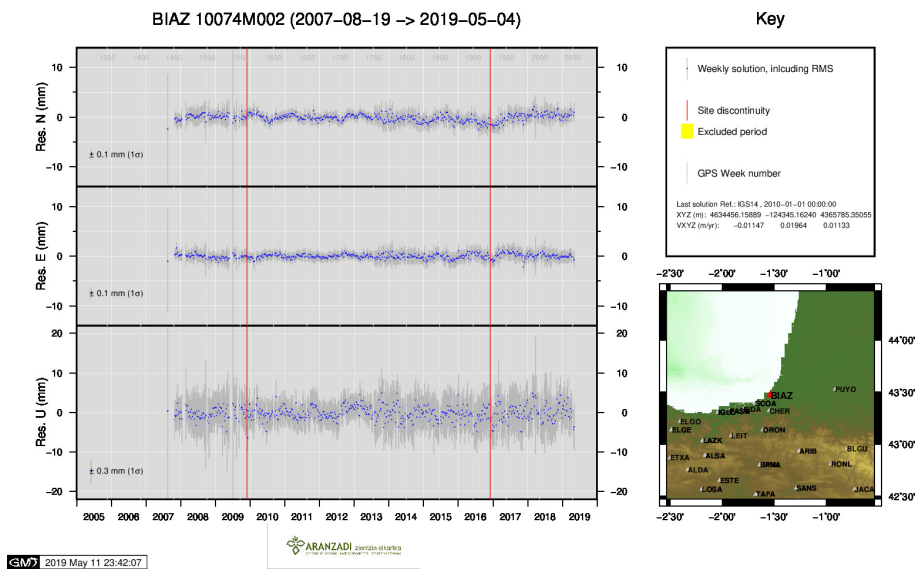
9 Cumulative Time Series

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

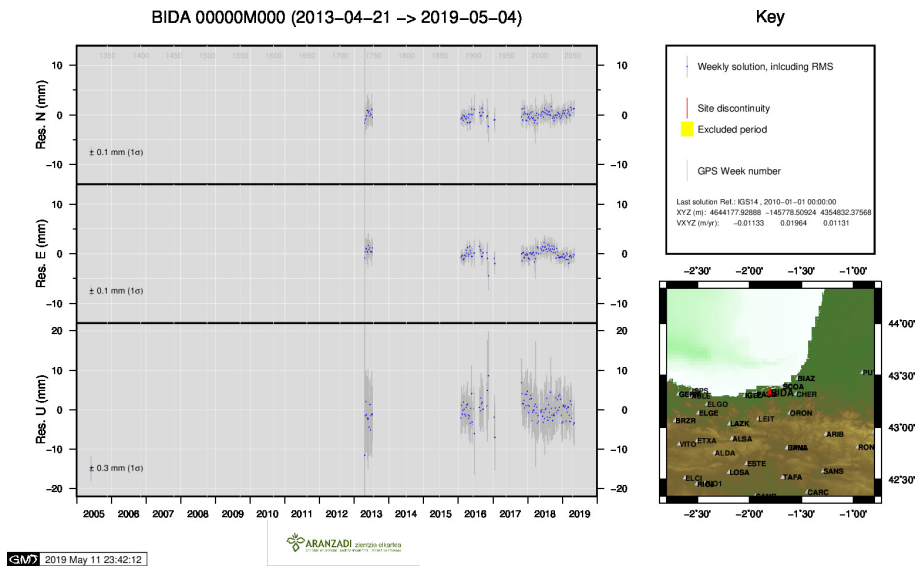




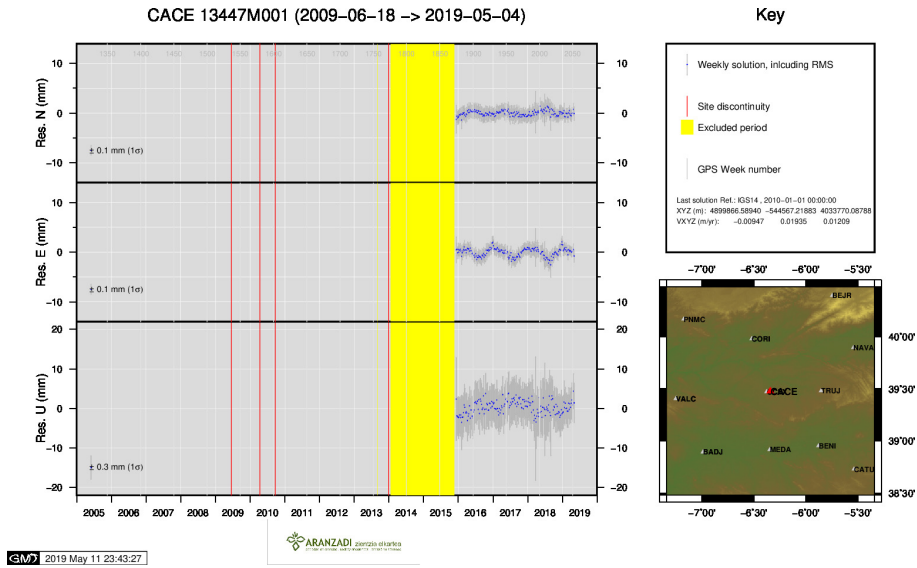
3) AMUR



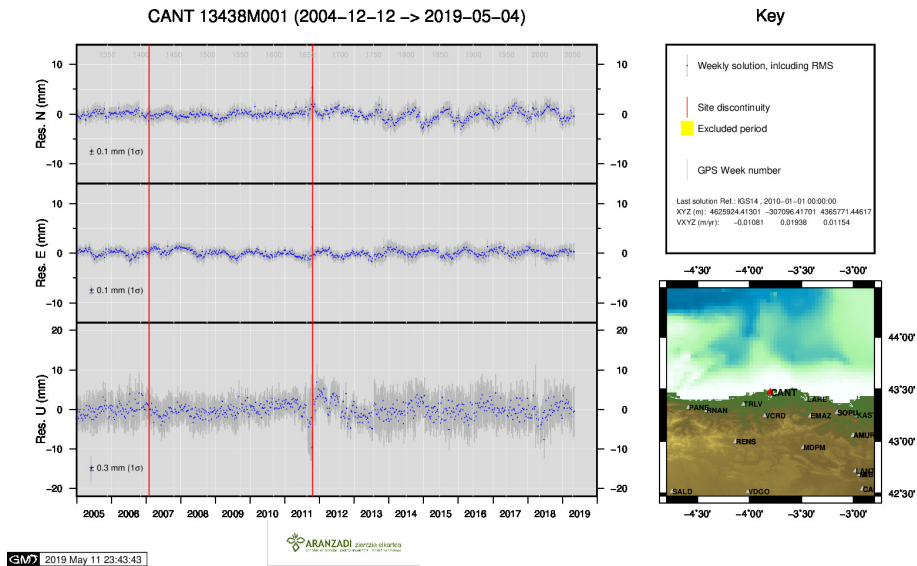
4) BIAZ



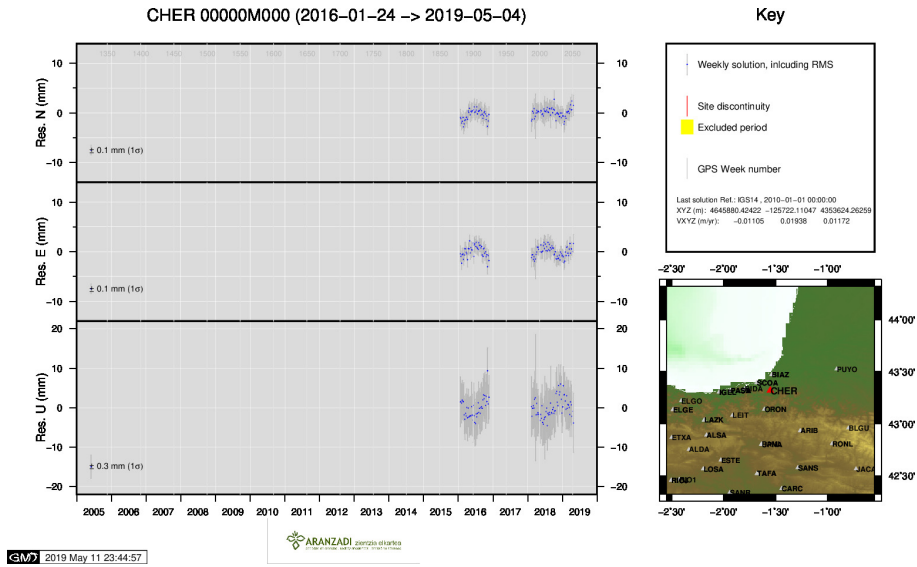
5) BIDA



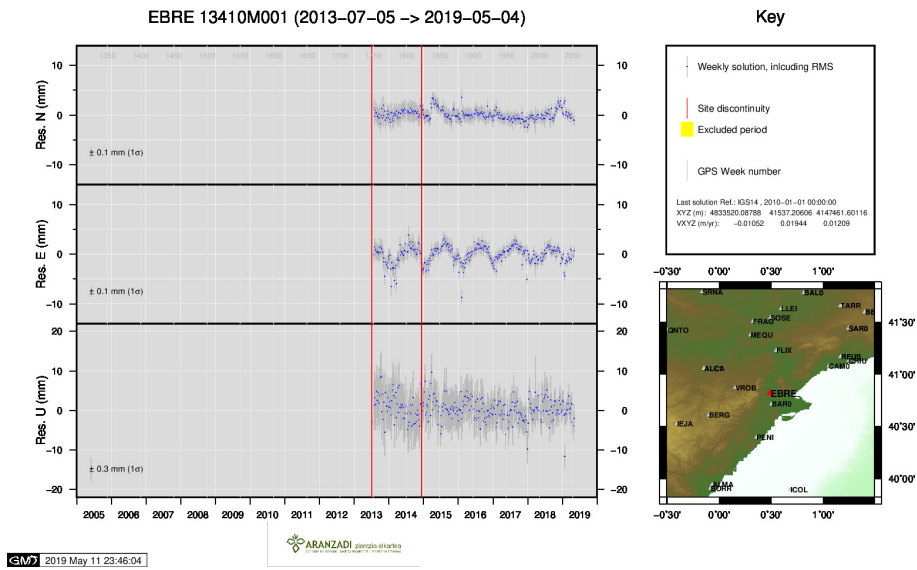
6) CACE



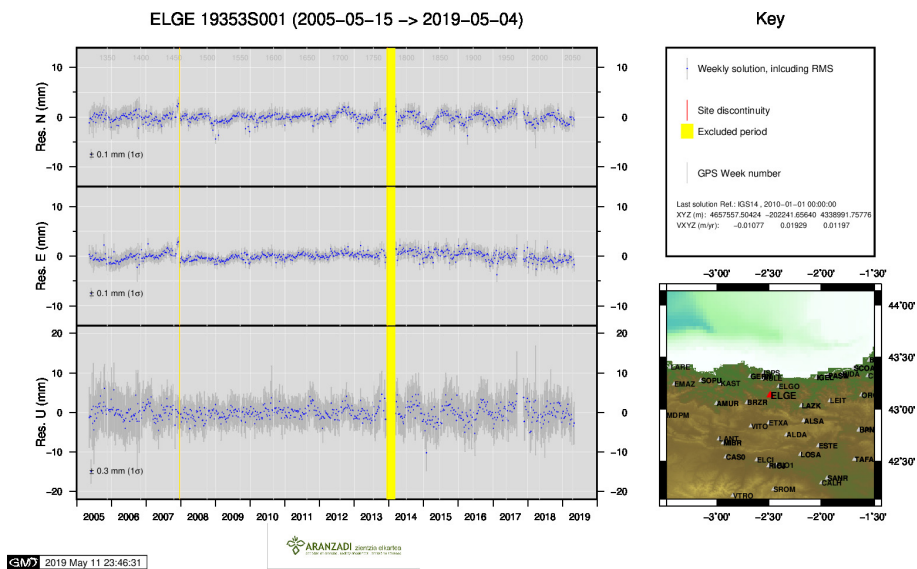
7) CANT



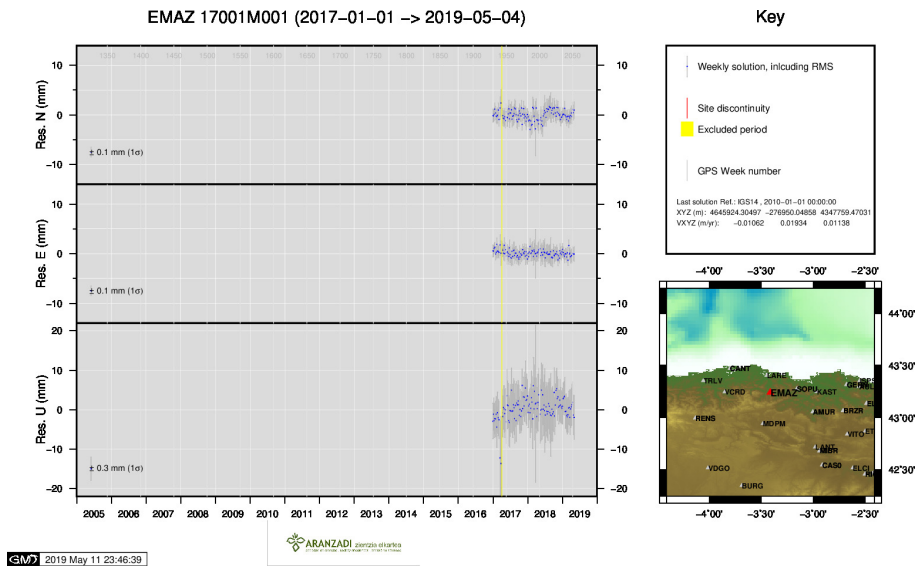
8) CHER



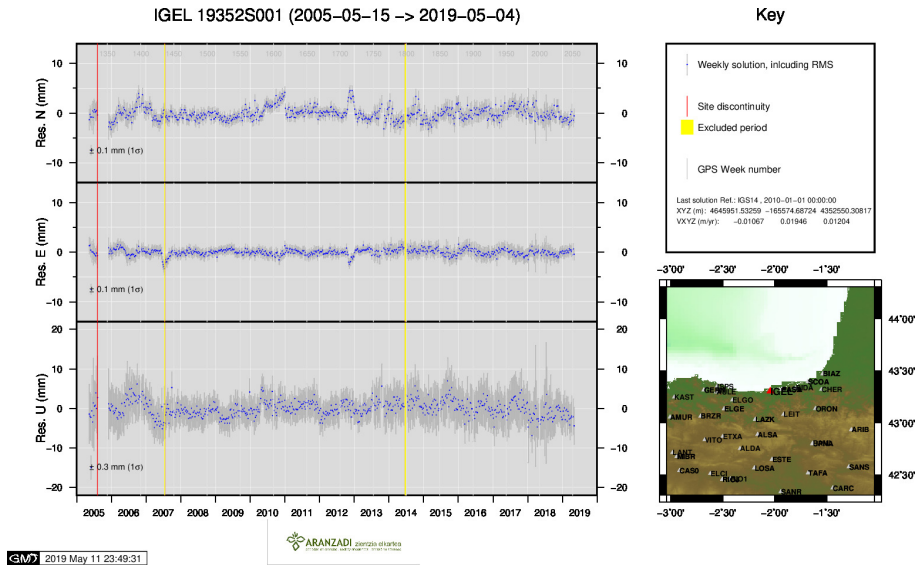
9) EBRE



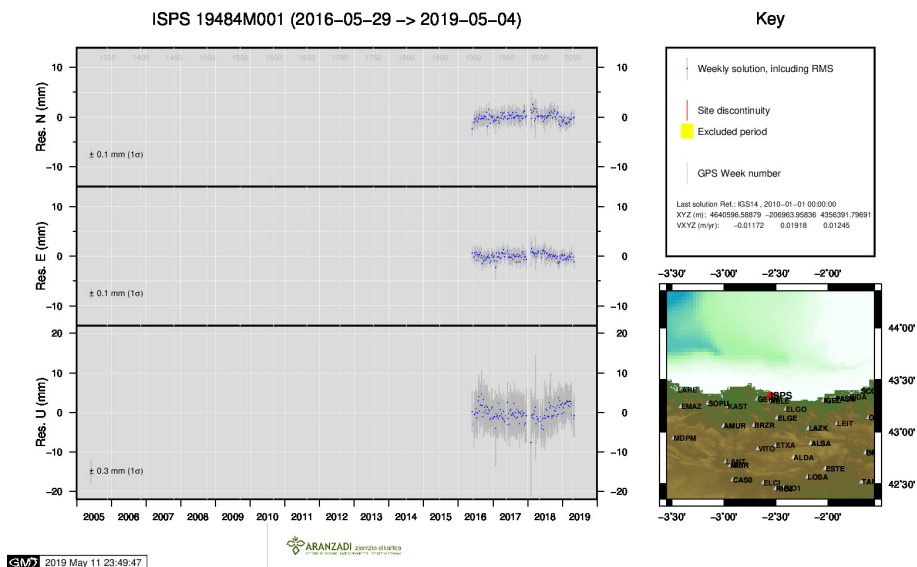
10) ELGE



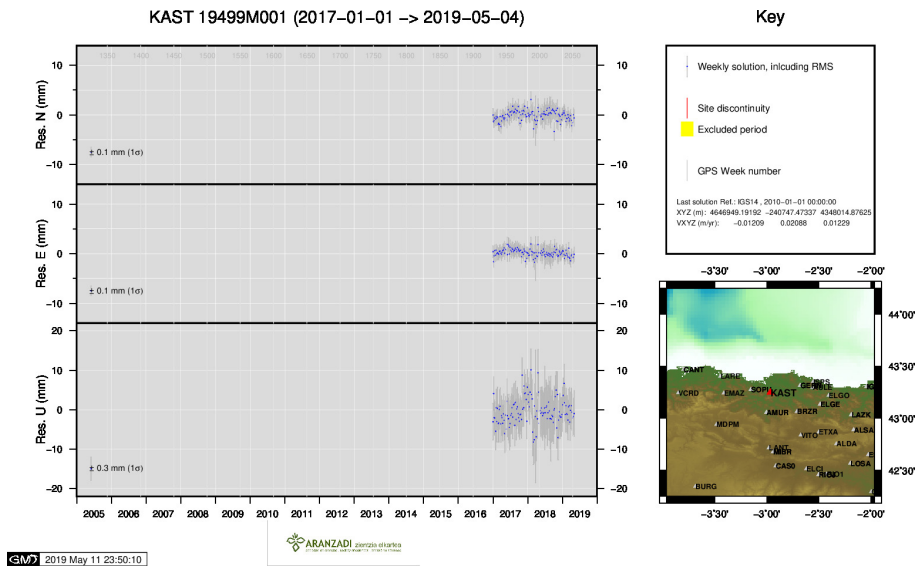
11) EMAZ



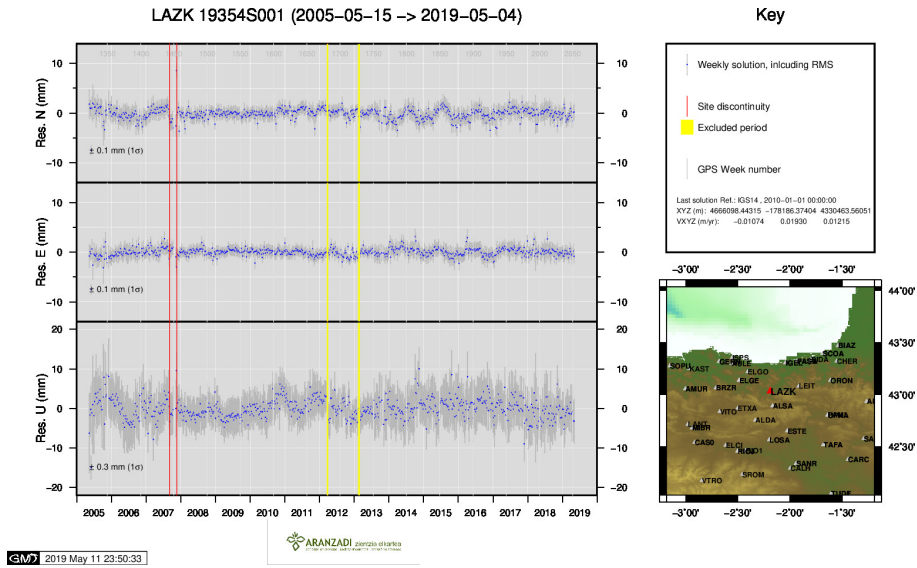
12) IGEL



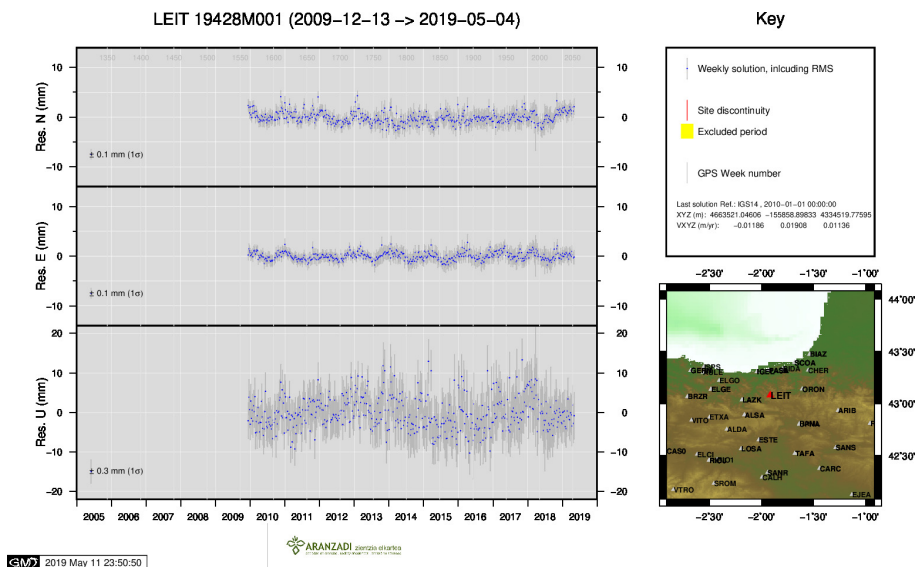
13) ISPS



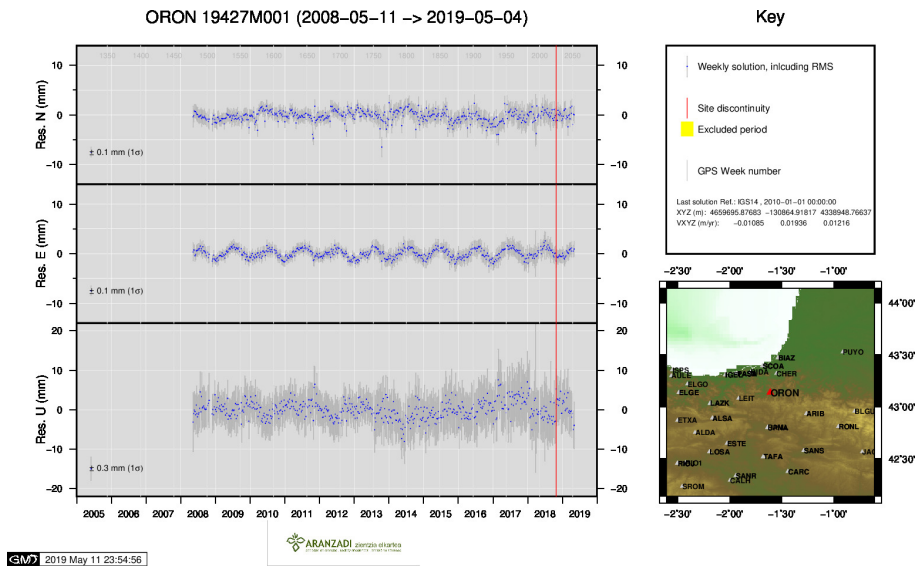
14) KAST



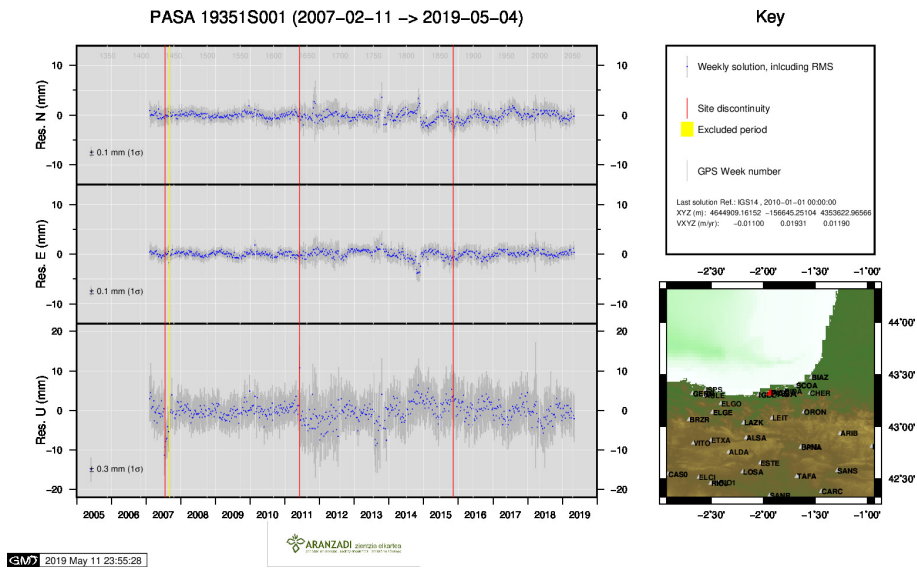
15) LAZK



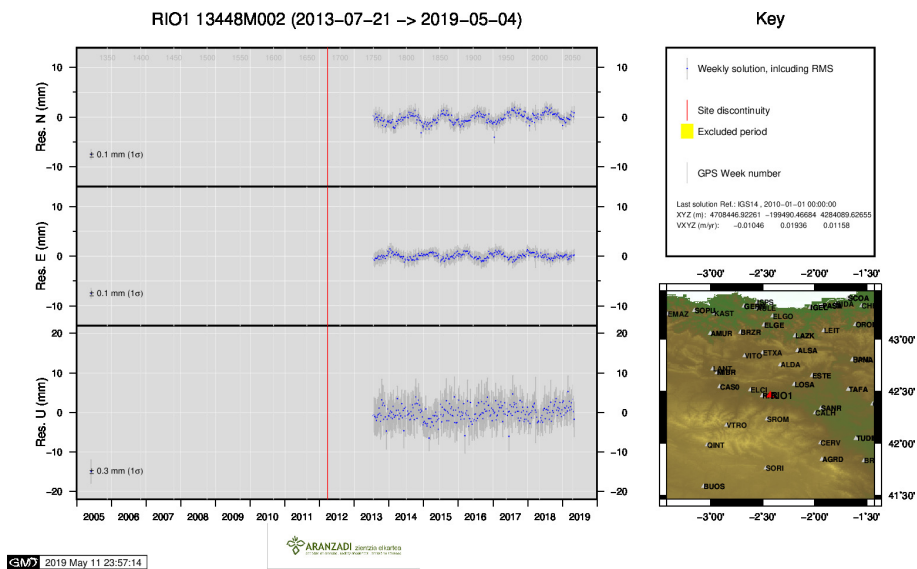
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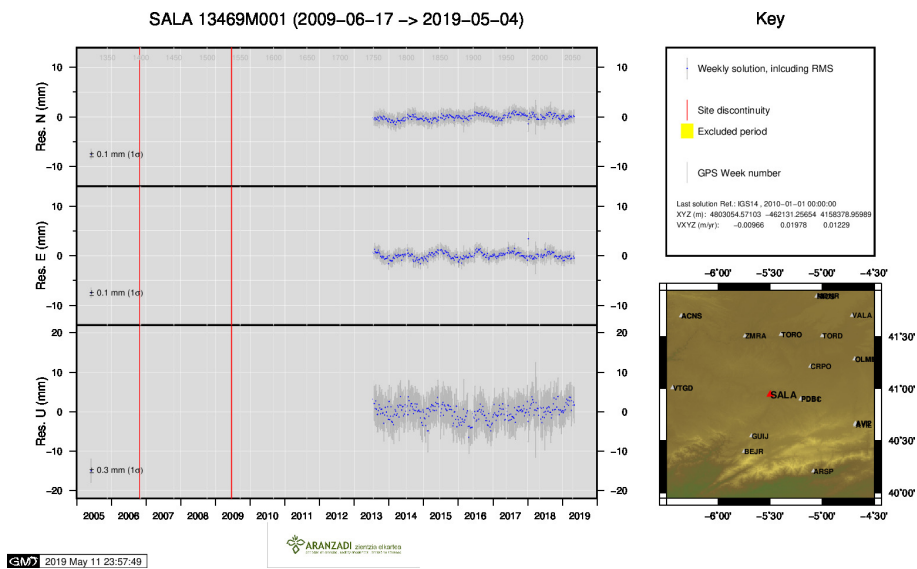
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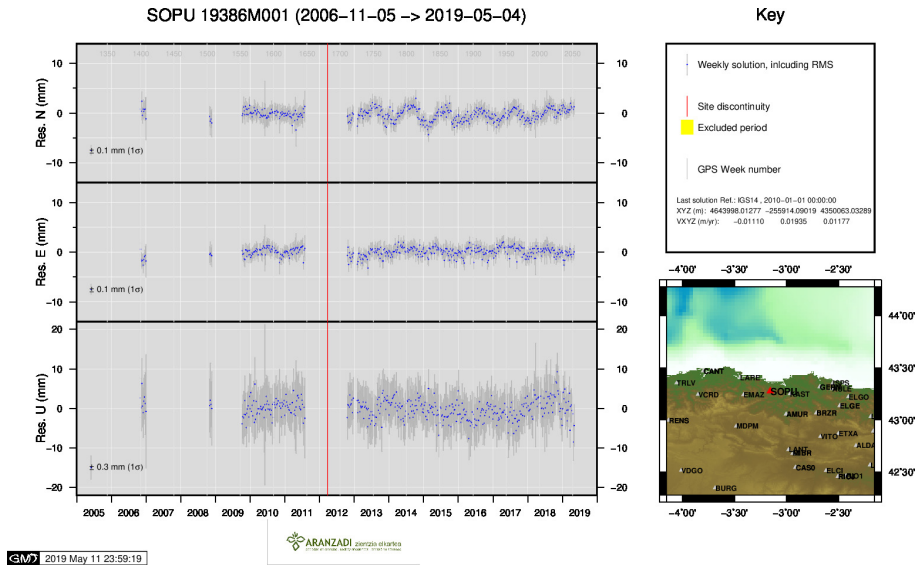
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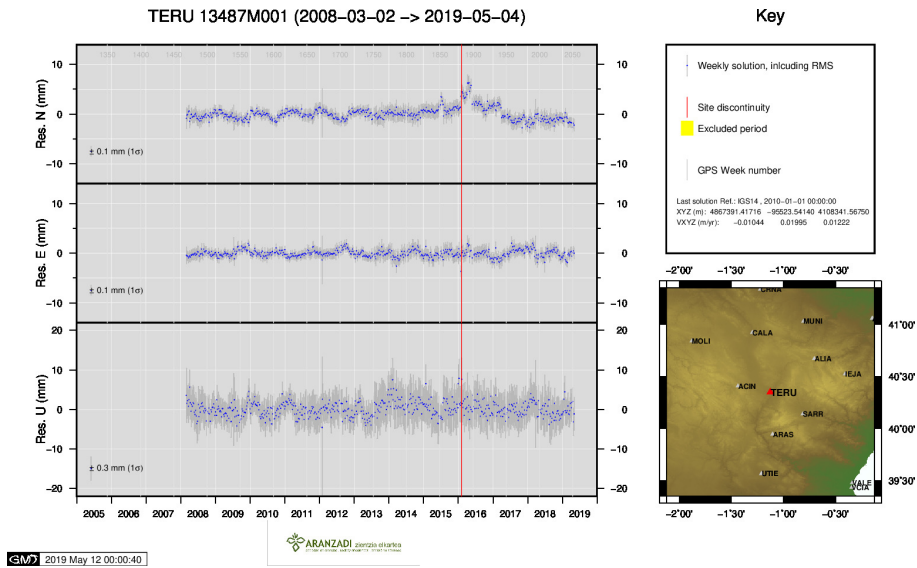
19) RIO1



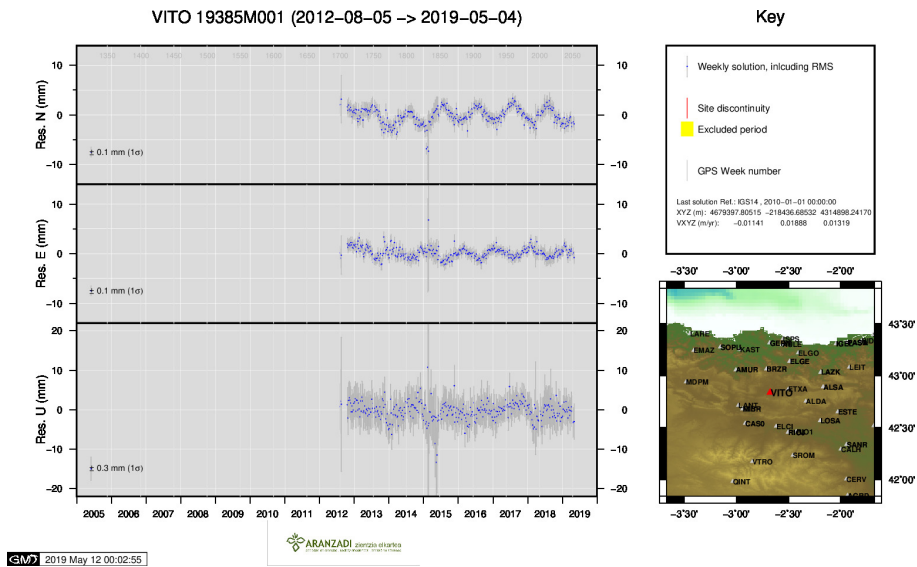
20) SALA



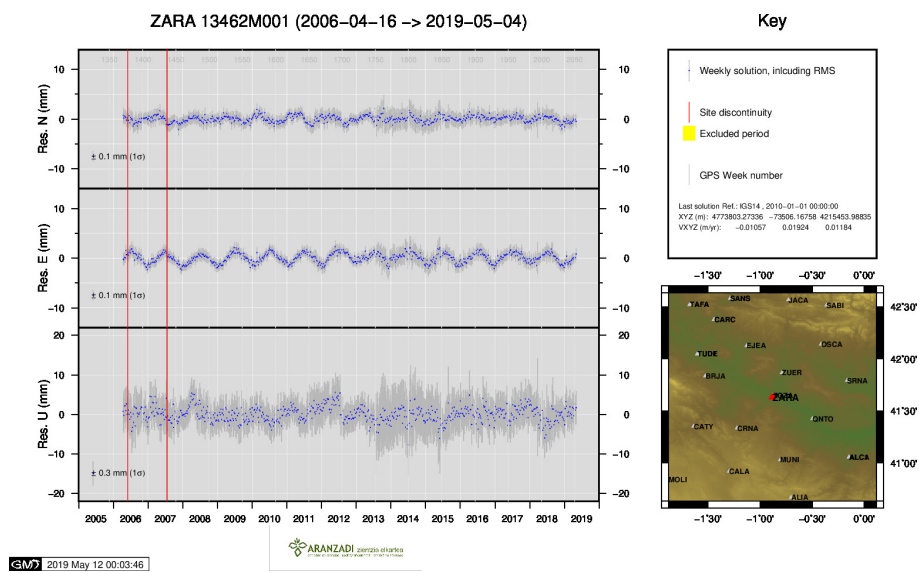
21) SOPU



22) TERU



23) VITO



24) ZARA