

# ARA-DAC Weekly Analysis Result: 2092 (GFA)

## Technical Report

**GPS Week: 2092 (GFA)**

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

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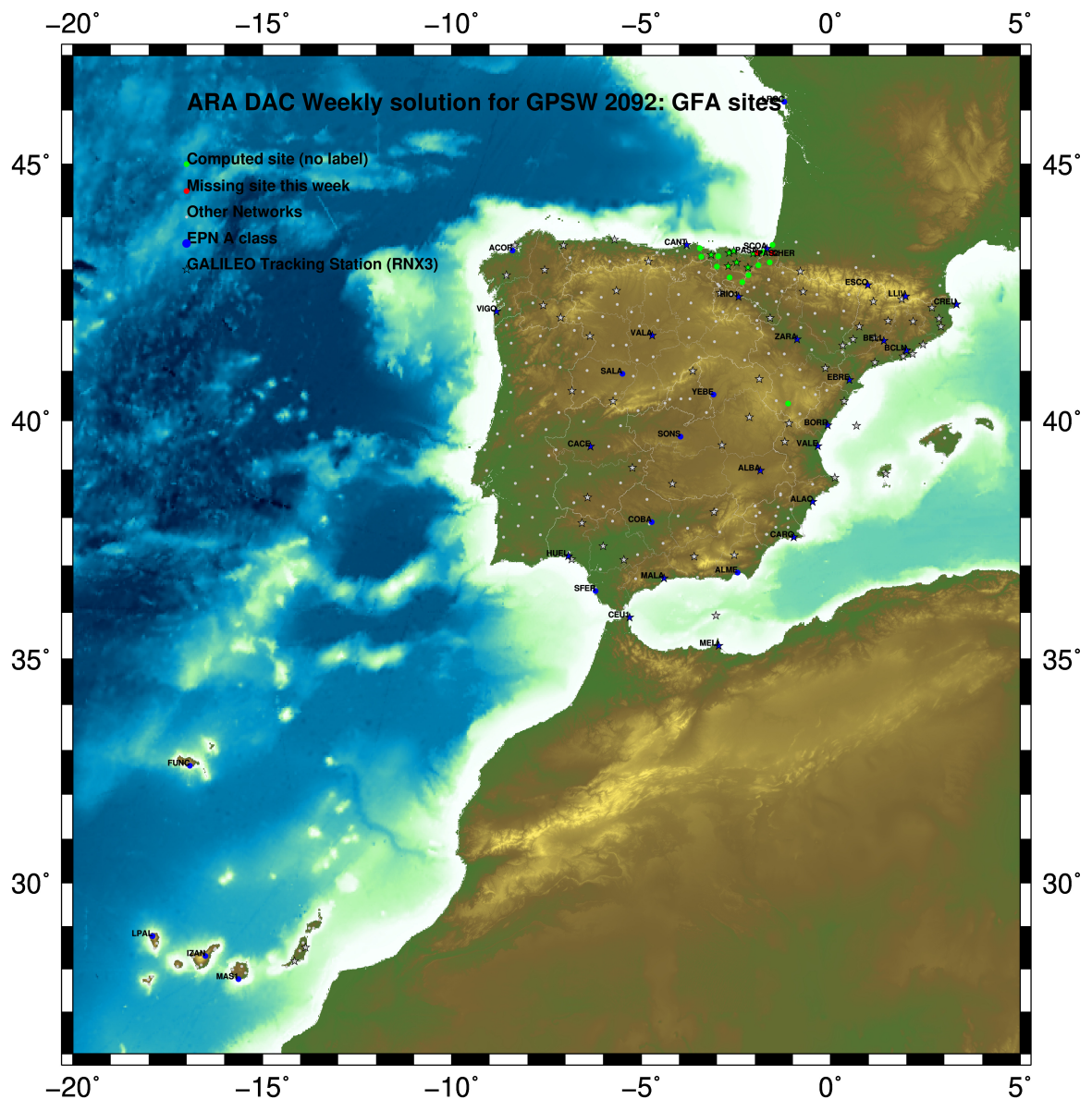
Report generated on 2020/03/01 at 03:16:28



# 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 2020 Mar 01 03:16:20

Fig.1: Computed Sites for GPS Week2092 (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 C2055.

ARA LAC 2092 WEEK FINAL COMBINATION: PRECISE ORBITS 29-FEB-20 23:35

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LOCAL GEODETIC DATUM: IGS14 EPOCH: 2020-02-12 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.55373	-678367.43115	4357066.29226	W
34	ALDA 19383M001	4687280.14740	-190876.55449	4308106.96500	A
43	ALSA 19419M001	4677250.82342	-176770.38096	4319079.88104	A
45	AMUR 19388M001	4661499.44156	-244591.24677	4332269.89310	A
81	BLAZ 10074M002	4634456.04190	-124344.96372	4365785.46625	A
82	BIDA 00000M000	4644177.81332	-145778.31118	4354832.49170	A
92	BRZR 19387M001	4662220.98452	-220769.88621	4333309.45148	A
9	CACE 13447M001	4899866.49244	-544567.02329	4033770.21125	W
10	CANT 13438M001	4625924.30605	-307096.22116	4365771.56548	W
15	CREU 13432M001	4715420.12110	273178.07096	4271946.85075	W
17	EBRE 13410M001	4833519.98116	41537.40312	4147461.72682	W
139	ELGE 19353S001	4657557.39629	-202241.46273	4338991.88006	A
141	EMAZ 17001M001	4645924.19837	-276949.85278	4347759.58535	A
209	GERN 19389M001	4642811.31272	-217222.91168	4353278.89001	A
183	IGEL 19352S001	4645951.42068	-165574.49156	4352550.42869	A
188	ISPS 19484M001	4640596.47157	-206963.76593	4356391.92250	A
193	KAST 19499M001	4646949.07131	-240747.26239	4348015.00087	A
198	LARE 19440M001	4632831.94227	-279026.12513	4360314.43494	A
199	LAZK 19354S001	4666098.33127	-178186.17836	4330463.68040	A
203	LEIT 19428M001	4663520.92857	-155858.70505	4334519.89341	A
260	ORON 19427M001	4659695.76996	-130864.72258	4338948.89141	A
33	PASA 19351S001	4644909.05018	-156645.05566	4353623.08544	W
36	RID1 13448M002	4708446.81719	-199490.27127	4284089.74503	W
37	SALA 13469M001	4803054.47376	-462131.05762	4158379.08558	W
38	SCDA 10088M002	4639940.48829	-136224.92855	4359552.42429	W
321	SOPU 19386M001	4643997.89911	-255913.89464	4350063.15071	A
342	TERU 13487M001	4867391.31197	-95523.33993	4108341.68879	A
375	VITO 19385M001	4679397.68972	-218436.49340	4314898.37259	A
49	YEBE 13420M001	4848724.55716	-261631.91789	4123094.33709	W
50	ZARA 13462M001	4773803.15779	-73505.97227	4215454.10435	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 2092 29-FEB-20 23:35

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LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2020-02-12 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.86627	-678367.98241	4357065.86678	W
34	ALDA 19383M001	4687280.51489	-190877.11453	4308106.53845	A
43	ALSA 19419M001	4677251.19337	-176770.93989	4319079.45544	A
45	AMUR 19388M001	4661499.80433	-244591.80421	4332269.46788	A
81	BLAZ 10074M002	4634456.42142	-124345.51792	4365785.04462	A
82	BIDA 00000M000	4644178.18950	-145778.86648	4354832.06905	A
92	BRZR 19387M001	4662221.35021	-220770.44367	4333309.02650	A
9	CACE 13447M001	4899866.79814	-544567.60662	4033769.76370	W
10	CANT 13438M001	4625924.66370	-307096.77498	4365771.14225	W
15	CREU 13432M001	4715420.54146	273177.50962	4271946.42766	W
17	EBRE 13410M001	4833520.36506	41536.82838	4147461.29174	W
139	ELGE 19353S001	4657557.76460	-202242.01964	4338991.45568	A
141	EMAZ 17001M001	4645924.55836	-276950.40867	4347759.16094	A
209	GERN 19389M001	4642811.68025	-217223.46705	4353278.46658	A
183	IGEL 19352S001	4645951.79433	-165575.04712	4352550.00566	A
188	ISPS 19484M001	4640596.84054	-206964.32104	4356391.49937	A
193	KAST 19499M001	4646949.43565	-240747.81827	4348014.57683	A
198	LARE 19440M001	4632832.30290	-279026.67961	4360314.01152	A
199	LAZK 19354S001	4666098.70186	-178186.73610	4330463.25565	A
203	LEIT 19428M001	4663521.30211	-155859.26245	4334519.46914	A
260	ORON 19427M001	4659696.14680	-130865.27949	4338948.46774	A
33	PASA 19351S001	4644909.42498	-156645.61107	4353622.66260	W
36	RID1 13448M002	4708447.18195	-199490.83358	4284089.31673	W
37	SALA 13469M001	4803054.79818	-462131.63061	4158378.64663	W
38	SCDA 10088M002	4639940.86595	-136225.48337	4359552.00209	W
321	SOPU 19386M001	4643998.26178	-255914.45025	4350062.72671	A
342	TERU 13487M001	4867391.67672	-95523.91872	4108341.24939	A
375	VITO 19385M001	4679398.05439	-218437.05268	4314897.94631	A
49	YEBE 13420M001	4848724.90309	-261632.49521	4123093.89709	W
50	ZARA 13462M001	4773803.53276	-73506.54111	4215453.67251	W

### 5.3 ETRF2014 (ETRS89) Coordinates

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

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ETRF2014 FINAL COORD. wk 2092                                29-FEB-20 23:35
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LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2020-02-12 12:00:00
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
1  ACDR 13434M001         4594489.82396   -678368.02073   4357065.91551   W
34 ALDA 19383M001         4687280.47033   -190877.15422   4308106.58707   A
43 ALSA 19419M001         4677251.14887   -176770.97966   4319079.50410   A
45 AMUR 19388M001         4661499.76019   -244591.84381   4332269.51655   A
81 BIAZ 10074M002         4634456.37718   -124345.55805   4365785.09341   A
82 BIDA 00000M000         4644178.14524   -145778.90650   4354832.11780   A
92 BRZR 19387M001         4662221.30600   -220770.48335   4333309.07517   A
9  CACE 13447M001         4899866.75231   -544567.64419   4033769.81176   W
10 CANT 13438M001         4625924.62010   -307096.81450   4365771.19098   W
15 CREU 13432M001         4715420.49504   273177.46843   4271946.47652   W
17 EBRE 13410M001         4833520.31822   41536.78847   4147461.34016   W
139 ELGE 19353S001         4657557.72038   -202242.05940   4338991.50437   A
141 EMAZ 17001M001         4645924.51448   -276950.44821   4347759.20963   A
209 GERN 19389M001         4642811.63621   -217223.50682   4353278.51531   A
183 IGEL 19352S001         4645951.75011   -165575.08706   4352550.05440   A
188 ISPS 19484M001         4640596.79650   -206964.36085   4356391.54810   A
193 KAST 19499M001         4646949.39165   -240747.85794   4348014.62553   A
198 LARE 19440M001         4632832.25915   -279026.71920   4360314.06024   A
199 LAZK 19354S001         4666098.65747   -178186.77591   4330463.30433   A
203 LEIT 19428M001         4663521.25769   -155859.30236   4334519.51783   A
260 ORON 19427M001         4659696.10234   -130865.31950   4338948.51646   A
33 PASA 19351S001         4644909.38074   -156645.65105   4353622.71134   W
36 RIO1 13448M002         4708447.13720   -199490.87315   4284089.36529   W
37 SALA 13469M001         4803054.75319   -462131.66888   4158378.69490   W
38 SOCA 10088M002         4639940.82169   -136225.52344   4359552.05085   W
321 SOPU 19386M001         4643998.21785   -255914.48988   4350062.77541   A
342 TERU 13487M001         4867391.62998   -95523.95802   4108341.29766   A
375 VITO 19385M001         4679398.01000   -218437.09230   4314897.99494   A
49 YEBE 13420M001         4848724.85705   -261632.53400   4123093.94532   W
50 ZARA 13462M001         4773803.48694   -73506.58086   4215453.72099   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 2092 WEEK FINAL COMBINATION: PRECISE ORBITS 29-FEB-20 23:35

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.75	1.26	2.23
ALDA 19383M001	7	XXXXXX	1.07	1.88	3.21
ALSA 19419M001	7	XXXXXX	1.11	0.74	4.39
AMUR 19388M001	7	XXXXXX	0.98	0.84	3.64
BIAZ 10074M002	7	XXXXXX	1.19	0.86	2.53
BIDA 00000M000	1	X	0.33	0.47	0.53
BRZR 19387M001	7	XXXXXX	0.70	1.71	6.59
CACE 13447M001	7	XXXXXX	0.39	0.27	3.42
CANT 13438M001	7	XXXXXX	0.48	0.43	3.41
CREU 13432M001	7	XXXXXX	0.77	0.81	3.75
EBRE 13410M001	7	XXXXXX	1.45	3.86	3.57
ELGE 19353S001	7	XXXXXX	1.11	1.31	2.76
EMAZ 17001M001	7	XXXXXX	0.93	0.87	3.32
GERN 19389M001	7	XXXXXX	1.21	0.77	4.81
IGEL 19352S001	7	XXXXXX	1.90	0.90	3.36
ISPS 19484M001	6	XXXXXX	0.92	1.75	5.30
KAST 19499M001	7	XXXXXX	0.74	0.98	6.15
LARE 19440M001	7	XXXXXX	1.03	0.42	2.95
LAZK 19354S001	7	XXXXXX	0.88	1.22	4.02
LEIT 19428M001	7	XXXXXX	0.85	0.83	2.62
ORDN 19427M001	7	XXXXXX	0.48	0.62	2.09
PASA 19351S001	7	XXXXXX	0.80	0.35	3.18
RI01 13448M002	7	XXXXXX	0.48	0.38	2.80
SALA 13469M001	7	XXXXXX	0.47	0.32	2.03
SCDA 10088M002	7	XXXXXX	0.73	0.58	3.20
SOPU 19386M001	7	XXXXXX	0.57	0.59	3.13
TERU 13487M001	7	XXXXXX	0.57	0.57	2.33
VITO 19385M001	7	XXXXXX	0.56	1.25	3.39
YEBE 13420M001	7	XXXXXX	0.41	0.59	3.09
ZARA 13462M001	7	XXXXXX	0.64	0.55	2.79

Comparison of individual solutions:

ACOR 13434M001	N	0.75	-0.71	0.34	0.57	-0.77	0.60	1.00	-0.64
ACOR 13434M001	E	1.26	-0.42	0.05	-0.78	-1.98	-0.79	2.03	0.21
ACOR 13434M001	U	2.23	3.16	1.46	-2.80	-2.47	-1.54	-0.27	-1.15
ALDA 19383M001	N	1.07	-0.63	1.26	1.83	-0.53	0.91	-0.32	-0.57
ALDA 19383M001	E	1.88	2.93	-3.16	-0.51	0.61	-1.10	0.46	0.72
ALDA 19383M001	U	3.21	2.72	-2.29	-0.13	-4.37	-3.65	3.03	-2.71
ALSA 19419M001	N	1.11	-0.03	-0.52	2.26	-0.41	-0.99	0.22	-0.91
ALSA 19419M001	E	0.74	-0.11	-1.46	-0.26	0.27	0.60	0.62	0.50
ALSA 19419M001	U	4.39	-0.07	-8.00	0.99	1.70	-3.01	5.92	-1.86
AMUR 19388M001	N	0.98	0.86	0.55	0.12	0.08	1.92	-0.49	-0.88
AMUR 19388M001	E	0.84	-0.22	-0.40	0.15	-0.22	1.92	-0.33	-0.44
AMUR 19388M001	U	3.64	0.02	1.26	-3.22	-6.22	4.42	0.26	-3.04
BIAZ 10074M002	N	1.19	0.73	-1.66	-1.42	0.86	-0.98	-1.18	-0.16
BIAZ 10074M002	E	0.86	1.25	-0.67	0.43	0.10	0.54	-1.29	0.51
BIAZ 10074M002	U	2.53	-0.18	4.60	0.32	-1.64	-0.42	2.79	-2.53
BIDA 00000M000	N	0.33							
BIDA 00000M000	E	0.47							
BIDA 00000M000	U	0.53							
BRZR 19387M001	N	0.70	0.71	0.65	0.58	0.31	-1.24	0.03	-0.09
BRZR 19387M001	E	1.71	1.44	-0.79	0.75	-0.20	-3.04	0.92	2.07
BRZR 19387M001	U	6.59	1.26	0.42	4.53	-6.53	-13.20	2.80	-3.70
CACE 13447M001	N	0.39	-0.09	-0.50	-0.34	-0.04	-0.25	0.27	0.66
CACE 13447M001	E	0.27	0.24	-0.48	0.04	-0.07	0.11	0.31	0.15
CACE 13447M001	U	3.42	5.51	-6.08	0.98	0.99	0.59	-0.87	0.19
CANT 13438M001	N	0.48	-0.32	0.24	0.24	0.16	-0.07	-0.33	1.00
CANT 13438M001	E	0.43	-0.62	0.45	-0.23	0.29	0.48	0.32	-0.18
CANT 13438M001	U	3.41	-2.57	1.38	-4.84	-0.58	2.66	-0.92	-5.46
CREU 13432M001	N	0.77	-0.91	0.56	0.84	-1.06	-0.55	0.05	-0.51
CREU 13432M001	E	0.81	1.07	0.67	0.51	0.73	0.13	-1.20	-0.32
CREU 13432M001	U	3.75	-2.90	4.69	4.97	-0.51	-5.07	0.87	-1.67
EBRE 13410M001	N	1.45	0.22	-0.46	-3.21	-0.09	0.86	0.80	0.79
EBRE 13410M001	E	3.86	-0.61	0.20	8.71	-0.20	-2.32	-2.07	-1.85
EBRE 13410M001	U	3.57	-1.71	5.18	-2.12	5.41	0.22	-0.80	-3.51
ELGE 19353S001	N	1.11	0.85	-0.63	-0.68	-0.59	0.26	-0.98	2.11
ELGE 19353S001	E	1.31	1.00	-1.19	0.71	1.41	-0.01	0.80	-2.20
ELGE 19353S001	U	2.76	-1.25	2.95	-2.43	-2.26	0.07	-2.36	-4.36
EMAZ 17001M001	N	0.93	-0.43	1.07	-1.66	0.22	0.37	0.44	0.86
EMAZ 17001M001	E	0.87	-0.40	0.01	-1.59	0.06	0.96	0.53	0.79
EMAZ 17001M001	U	3.32	-2.10	-1.59	4.20	-1.48	-3.51	0.09	-5.19
GERN 19389M001	N	1.21	0.98	-1.19	0.77	0.15	0.54	-1.77	1.56
GERN 19389M001	E	0.77	0.62	-0.76	-0.68	0.23	-0.43	0.95	0.98
GERN 19389M001	U	4.81	1.03	-5.05	4.21	0.20	-7.29	-4.24	-4.82
IGEL 19352S001	N	1.90	2.71	-0.71	-1.86	-0.85	0.82	-1.58	2.55
IGEL 19352S001	E	0.90	-1.24	0.10	1.55	0.42	-0.50	0.68	0.18
IGEL 19352S001	U	3.36	-4.92	1.00	-3.40	-2.40	-4.84	0.78	-1.11
ISPS 19484M001	N	0.92		0.37	0.92	0.82	-0.77	0.40	-1.34
ISPS 19484M001	E	1.75		0.59	1.82	0.52	-1.04	1.66	-2.74
ISPS 19484M001	U	5.30		-1.10	1.97	-5.59	-3.69	4.28	-8.51
KAST 19499M001	N	0.74	-0.88	-0.19	0.71	0.96	-0.55	0.15	0.86
KAST 19499M001	E	0.98	-0.41	-0.16	-0.21	1.09	-1.33	0.32	1.56
KAST 19499M001	U	6.15	-6.51	-2.52	6.31	3.83	-6.93	-0.80	-8.69
LARE 19440M001	N	1.03	0.18	2.03	-0.62	-0.90	-0.59	0.77	0.17
LARE 19440M001	E	0.42	0.85	-0.17	0.25	0.23	-0.02	-0.36	-0.25
LARE 19440M001	U	2.95	0.27	0.18	-5.67	-1.07	-1.25	1.26	-3.94
LAZK 19354S001	N	0.88	-0.69	0.09	1.86	-0.43	-0.39	-0.16	-0.55
LAZK 19354S001	E	1.22	-0.23	0.44	-1.23	-0.58	0.33	-0.83	2.46
LAZK 19354S001	U	4.02	3.09	2.97	-2.05	-8.03	-1.68	2.55	-0.81
LEIT 19428M001	N	0.85	-0.83	0.25	1.63	-0.16	-0.63	0.15	-0.73
LEIT 19428M001	E	0.83	0.01	0.30	-0.16	-0.41	-0.78	-0.41	1.75
LEIT 19428M001	U	2.62	-4.04	-1.08	0.98	0.17	1.65	1.94	-4.03
ORDN 19427M001	N	0.48	0.68	-0.00	0.12	-0.40	0.28	-0.79	-0.25

ORDN 19427M001	E	0.62	0.36	-1.03	1.03	0.20	0.03	-0.17	-0.06
ORDN 19427M001	U	2.09	0.62	1.79	-3.14	-0.78	0.11	0.28	-3.46
PASA 19351S001	N	0.80	-0.23	-0.52	1.57	0.52	0.56	-0.37	-0.54
PASA 19351S001	E	0.35	0.51	-0.04	0.33	0.17	0.01	-0.24	0.54
PASA 19351S001	U	3.18	-0.04	-0.75	0.00	-2.48	-4.69	-2.77	-4.93
RIO1 13448M002	N	0.48	-0.71	-0.62	0.19	0.06	0.31	-0.09	0.61
RIO1 13448M002	E	0.38	-0.00	0.01	0.24	0.35	-0.10	-0.28	0.79
RIO1 13448M002	U	2.80	-3.47	-1.05	-0.22	-0.31	-1.73	2.51	-4.95
SALA 13469M001	N	0.47	-0.51	-0.32	0.52	-0.17	0.44	0.69	0.08
SALA 13469M001	E	0.32	-0.05	-0.22	-0.68	0.20	-0.21	-0.08	0.04
SALA 13469M001	U	2.03	0.68	-1.35	1.30	3.52	1.26	-1.29	2.27
SCDA 10088M002	N	0.73	0.04	-0.61	0.43	-0.31	-0.68	0.16	1.42
SCDA 10088M002	E	0.58	0.13	0.46	0.12	0.17	-0.30	0.14	1.27
SCDA 10088M002	U	3.20	0.53	2.04	-5.59	0.60	0.05	-0.33	-5.03
SOPU 19386M001	N	0.57	0.11	0.08	-0.02	0.62	0.44	0.77	-0.87
SOPU 19386M001	E	0.59	-0.50	0.66	-0.85	0.62	0.22	0.32	0.35
SOPU 19386M001	U	3.13	-5.15	-2.52	0.84	-1.71	-1.90	-0.41	-4.29
TERU 13487M001	N	0.57	0.69	-0.15	1.02	0.21	-0.54	-0.09	-0.25
TERU 13487M001	E	0.57	0.45	-0.12	-0.68	0.13	-0.33	-0.10	-1.05
TERU 13487M001	U	2.33	2.63	-0.18	-2.52	0.76	2.52	-0.14	3.50
VITO 19385M001	N	0.56	0.29	0.93	-0.19	-0.30	-0.04	0.19	0.86
VITO 19385M001	E	1.25	1.13	-1.56	0.35	-0.58	-0.64	-0.72	2.06
VITO 19385M001	U	3.39	5.56	-1.89	-1.02	-4.77	-1.00	1.92	-2.49
YEBE 13420M001	N	0.41	-0.13	-0.62	0.44	0.20	-0.17	-0.60	0.07
YEBE 13420M001	E	0.59	-0.33	0.50	-0.90	-0.16	0.68	0.65	-0.12
YEBE 13420M001	U	3.09	3.13	4.88	-3.38	-1.79	-1.62	-1.91	-1.61
ZARA 13462M001	N	0.64	-0.65	0.51	-0.00	-0.96	-0.73	0.54	0.02
ZARA 13462M001	E	0.55	-0.56	0.20	0.83	0.08	0.05	0.18	-0.86
ZARA 13462M001	U	2.79	-5.17	-0.77	0.86	1.79	0.69	-1.14	-3.68



## 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	-0.04	-0.36	-2.97
2	ALAC 13433M001	I W	0.26	0.41	1.45
3	ALBA 13452M001	I W	0.22	-1.30	2.45
4	ALME 13437M001	I W	-2.15	0.66	1.49
5	BCLN 13412M001	I W	-0.47	0.39	-0.87
6	BELL 13431M001	I W	0.06	0.55	-2.65
7	BORR 13480M001	I W	0.48	-1.42	-1.56
8	BRST 10004M004	I W	-0.41	-0.89	-4.13
9	CACE 13447M001	I W	0.24	0.78	5.10
10	CANT 13438M001	I W	0.01	-0.59	-2.22
11	CARG 19412M001	I W	0.37	-1.14	1.58
13	CEU1 13449M002	I W	0.03	-0.95	-2.08
14	COBA 13453M001	I W	0.26	0.44	0.01
15	CREU 13432M001	I W	-0.65	1.84	-1.40
17	EBRE 13410M001	I W	-2.01	0.58	-2.80
18	ESCO 13435M001	I W	0.98	0.04	2.25
19	FUNC 13911S001	I W	0.51	-1.12	1.17
22	HUEL 13451M001	I W	-0.59	4.71	-3.77
23	IZAN 13109M002	I W	-0.69	-1.59	1.55
25	LLIV 13436M001	I W	-0.13	0.59	2.50
26	LPAL 81701M001	I W	-2.60	0.05	-0.32
27	LROC 10023M001	I W	0.16	-0.28	-0.62
28	MALA 13443M001	I W	-0.73	-0.54	4.79
29	MAS1 31303M002	I W	0.21	0.42	-0.13
32	MELI 19379M001	I W	0.37	0.01	-2.77
33	PASA 19351S001	I W	0.45	-0.07	-0.39
34	PDEL 31906M004	I W	2.65	0.64	-4.07
36	RID1 13448M002	I W	-0.66	-0.10	-1.67
37	SALA 13469M001	I W	0.12	1.15	-0.56
38	SCOA 10088M002	I W	-2.86	-0.44	-2.25
39	SFER 13402M004	I W	-0.24	-2.32	3.69
42	SONS 13446M001	I W	1.42	0.42	0.82
44	TERC 31909M001	I W	3.61	-3.56	-6.37
46	VALA 13463M002	I W	-0.35	0.58	3.08
47	VALE 13439M001	I W	-0.17	2.19	2.54
48	VIGO 13450M001	I W	1.24	-1.23	4.14
49	YEBE 13420M001	I W	0.93	1.16	5.38
50	ZARA 13462M001	I W	0.36	0.43	0.83
51	ZIMM 14001M004	I W	-0.19	-0.16	-1.20
RMS / COMPONENT			1.18	1.34	2.80
MEAN			-0.00	0.00	-0.00
MIN			-2.86	-3.56	-6.37
MAX			3.61	4.71	5.38

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 117  
RMS OF TRANSFORMATION : 1.92 MM

BARYCENTER COORDINATES:

LATITUDE : 39 43 1.41  
LONGITUDE : - 5 15 34.67  
HEIGHT : -51.112 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.31 MM  
TRANSLATION IN E : -0.00 +- 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          16878550
NUMBER OF UNKNOWN               197425
NUMBER OF DEGREES OF FREEDOM    16681125
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  1.717627474359429

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")
      X          Y          Z          X          Y          Z      Scale (ppm)
-----
  1  0.00250     0.0170 -0.0099 -0.0319  0.0003 0.0011 -0.0002  0.00107
  2  0.00220     0.0093  0.0047 -0.0144 -0.0001 0.0006  0.0001  0.00055
  3  0.00175    -0.0014 -0.0082 -0.0098  0.0002 0.0002 -0.0002  0.00095
  4  0.00168    -0.0145 -0.0246  0.0104  0.0004 -0.0006 -0.0007  0.00054
  5  0.00178     0.0030 -0.0064 -0.0030  0.0002 0.0001 -0.0001 -0.00023
  6  0.00147     0.0069  0.0102  0.0034 -0.0002 0.0001  0.0003 -0.00117
  7  0.00267     0.0158  0.0176 -0.0073 -0.0003 0.0005  0.0005 -0.00115
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00132     1927696      1.73           1951986      3           801      23492      0
  2  0.00138     2306397      1.90           2336367      3           924      29049      0
  3  0.00132     2498971      1.74           2529254      3           990      29296      0
  4  0.00131     2492738      1.71           2523141      3           990      29416      0
  5  0.00132     2449903      1.73           2479029      3           984      28145      0
  6  0.00125     2504526      1.55           2533280      3           990      27767      0
  7  0.00128     2495239      1.64           2525493      3           990      29267      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 20:04:00000 20:04:86370 LEICA GR50 -----
ALDA  A  1 P 20:04:00000 20:04:86370 LEICA GR10 -----
ALSA  A  1 P 20:04:00000 20:04:86370 LEICA GR50 -----
AMUR  A  1 P 20:04:00000 20:04:86370 LEICA GR10 -----
BIAZ  A  1 P 20:04:00000 20:04:86370 TRI SP90M -----
BIDA  A  1 P 20:04:45840 20:04:86370 LEICA GR10 -----
BRZR  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
CACE  A  1 P 20:04:00000 20:04:86370 TRIMBLE NETR9 -----
CANT  A  1 P 20:04:00000 20:04:86370 LEICA GR10 -----
CREU  A  1 P 20:04:00000 20:04:86370 LEICA GR50 -----
EBRE  A  1 P 20:04:00000 20:04:86370 LEICA GR50 -----
ELGE  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
EMAZ  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
GERN  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
IGEL  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
ISPS  A  1 P 20:04:0100000 20:04:86370 TRIMBLE NETR9 -----
KAST  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
LARE  A  1 P 20:04:00000 20:04:86370 LEICA GRX1200GGPRO -----
LAZK  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
LEIT  A  1 P 20:04:00000 20:04:86370 LEICA GR50 -----
ORON  A  1 P 20:04:00000 20:04:86370 LEICA GR50 -----
PASA  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
RIO1  A  1 P 20:04:00000 20:04:86370 LEICA GR25 -----
SALA  A  1 P 20:04:00000 20:04:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 20:04:00000 20:04:86370 LEICA GR25 -----
SOPU  A  1 P 20:04:00000 20:04:86370 LEICA GR30 -----
TERU  A  1 P 20:04:00000 20:04:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 20:04:00000 20:04:86370 LEICA GR10 -----
YEBE  A  1 P 20:04:00000 20:04:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 20:04:00000 20:04:86370 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 20:04:00000 20:04:86370 LEIAT504      LEIS -----
ALDA  A  1 P 20:04:00000 20:04:86370 LEIAS10       NONE -----
ALSA  A  1 P 20:04:00000 20:04:86370 LEIAS10       NONE -----
AMUR  A  1 P 20:04:00000 20:04:86370 LEIAS10       NONE -----
BIAZ  A  1 P 20:04:00000 20:04:86370 LEIAR25      LEIT -----
BIDA  A  1 P 20:04:45840 20:04:86370 LEIAS10       NONE -----
```

BRZR	A	1	P	20:04:00000	20:04:86370	LEIAS10	NONE	----
CACE	A	1	P	20:04:00000	20:04:86370	TRM29659.00	NONE	----
CANT	A	1	P	20:04:00000	20:04:86370	LEIAR25.R4	LEIT	25066
CREU	A	1	P	20:04:00000	20:04:86370	LEIAR25.R4	NONE	26357
EBRE	A	1	P	20:04:00000	20:04:86370	LEIAR25.R4	NONE	26359
ELGE	A	1	P	20:04:00000	20:04:86370	LEIAR25.R4	LEIT	----
EMAZ	A	1	P	20:04:00000	20:04:86370	LEIAS10	NONE	----
GERN	A	1	P	20:04:00000	20:04:86370	LEIAS10	NONE	----
IGEL	A	1	P	20:04:00000	20:04:86370	LEIAR20	LEIM	----
ISPS	A	1	P	20:041:00000	20:04:86370	TRM59900.00	SCIS	----
KAST	A	1	P	20:04:00000	20:04:86370	LEIAS10	NONE	----
LARE	A	1	P	20:04:00000	20:04:86370	LEIAT504	NONE	----
LAZK	A	1	P	20:04:00000	20:04:86370	LEIAR25.R4	LEIT	----
LEIT	A	1	P	20:04:00000	20:04:86370	LEIAR10	NONE	----
ORDN	A	1	P	20:04:00000	20:04:86370	LEIAR10	NONE	----
PASA	A	1	P	20:04:00000	20:04:86370	LEIAR20	LEIM	73034
RIO1	A	1	P	20:04:00000	20:04:86370	LEIAR25.R4	LEIT	25138
SALA	A	1	P	20:04:00000	20:04:86370	LEIAR25	NONE	----
SCDA	A	1	P	20:04:00000	20:04:86370	TRM55971.00	NONE	----
SOPU	A	1	P	20:04:00000	20:04:86370	LEIAS10	NONE	----
TERU	A	1	P	20:04:00000	20:04:86370	LEIAT504GG	LEIS	----
VITO	A	1	P	20:04:00000	20:04:86370	LEIAS10	NONE	----
YEBE	A	1	P	20:04:00000	20:04:86370	TRM29659.00	NONE	----
ZARA	A	1	P	20:04:00000	20:04:86370	TRM29659.00	NONE	----

### 7.3 Eccentricities

*SITE	PT	SOLN	T	DATA_START_	DATA_END_	AXE	UP_	NORTH_	EAST_
							ARP->BENCHMARK(M)	-----	
ACOR	A	1	P	20:04:00000	20:04:86370	UNE	3.0460	0.0000	0.0000
ALDA	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
ALSA	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
AMUR	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
BIAZ	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
BIDA	A	1	P	20:042:45840	20:042:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	20:04:00000	20:04:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	20:04:00000	20:04:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	20:04:00000	20:04:86370	UNE	3.0490	0.0000	0.0000
CREU	A	1	P	20:04:00000	20:04:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	20:04:00000	20:04:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
EMAZ	A	1	P	20:04:00000	20:04:86370	UNE	0.0350	0.0000	0.0000
GERN	A	1	P	20:04:00000	20:04:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	20:041:00000	20:04:86370	UNE	0.0350	0.0000	0.0000
KAST	A	1	P	20:04:00000	20:04:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
LAZK	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
ORDN	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
RIO1	A	1	P	20:04:00000	20:04:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	20:04:00000	20:04:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	20:04:00000	20:04:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	20:04:00000	20:04:86370	UNE	0.0600	0.0000	0.0000
VITO	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
YEBE	A	1	P	20:04:00000	20:04:86370	UNE	0.0000	0.0000	0.0000
ZARA	A	1	P	20:04:00000	20:04:86370	UNE	3.2590	0.0000	0.0000

## 8 References

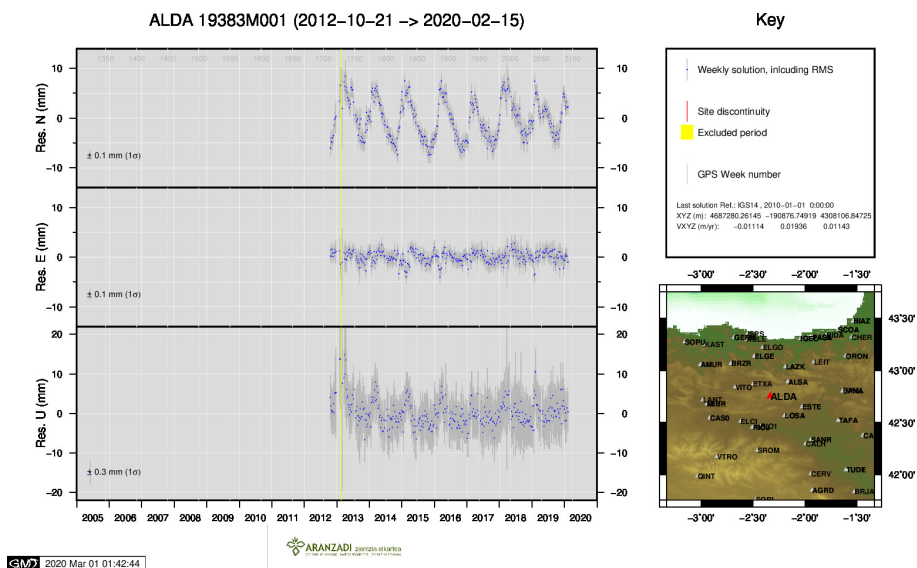
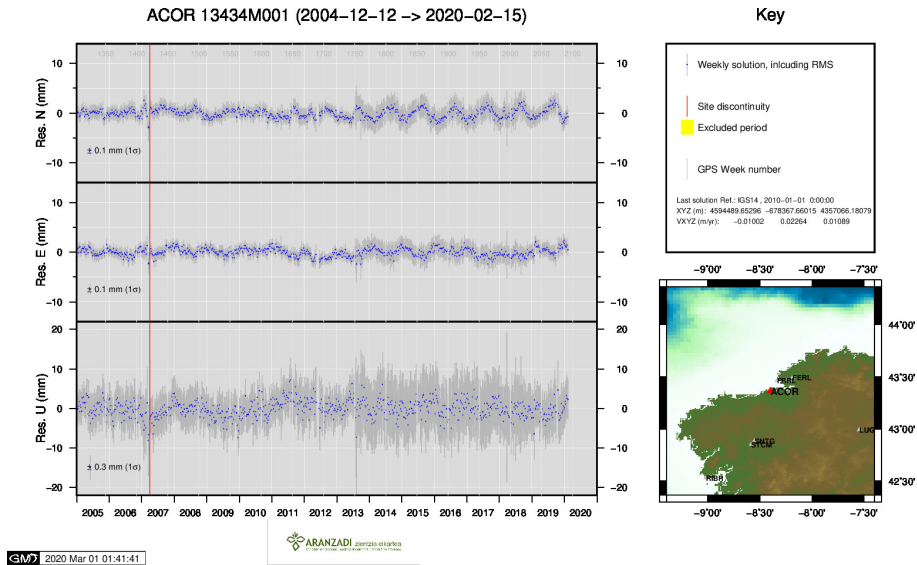
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](http://etrs89.ensg.ign.fr/memo-V8.pdf)

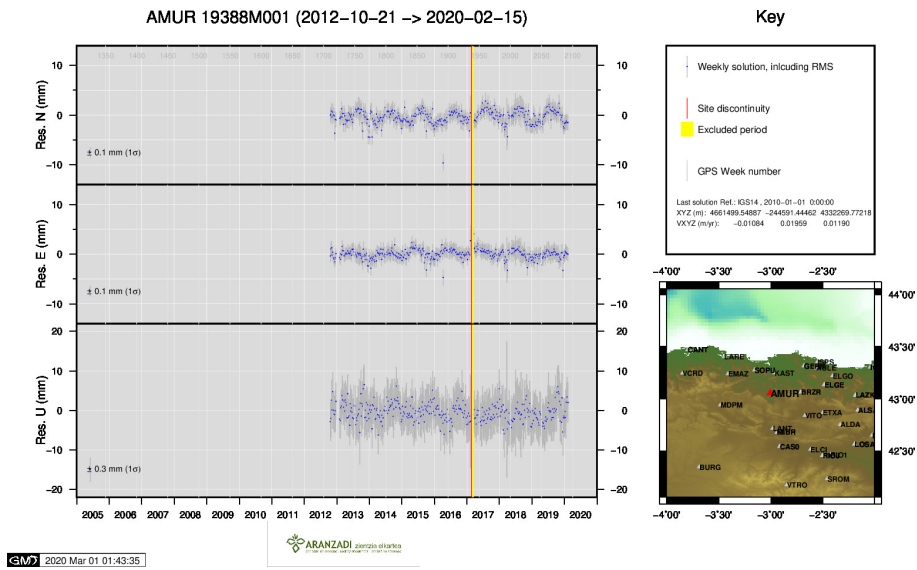
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](http://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

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](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

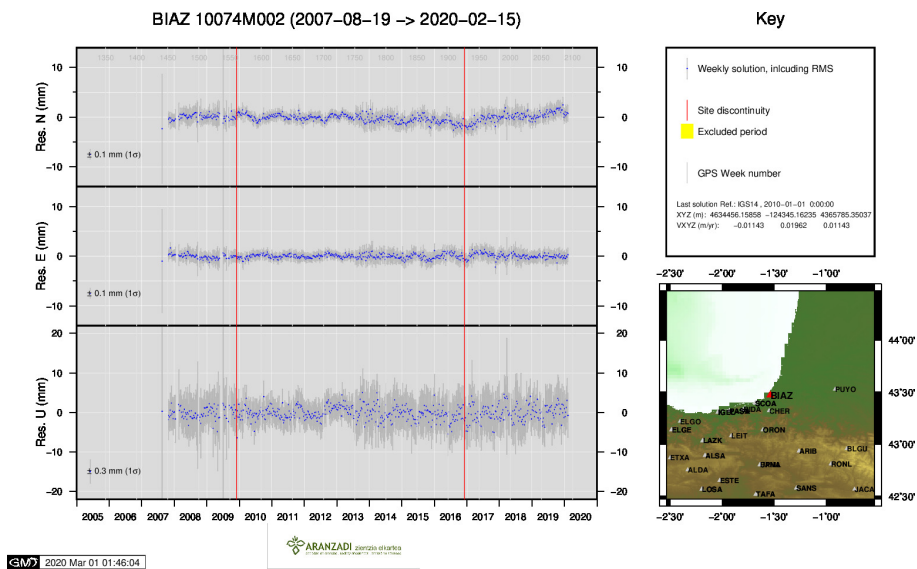
## 9 Cumulative Time Series

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

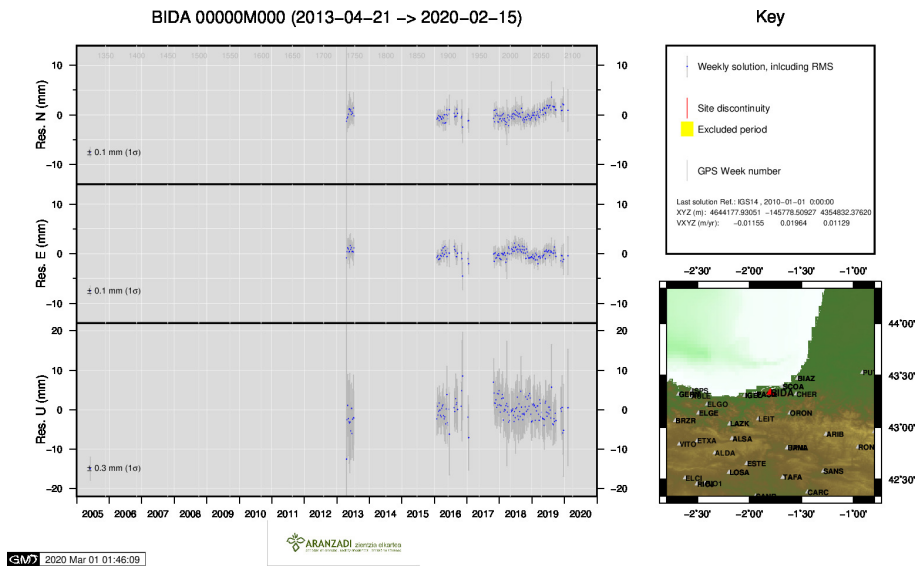




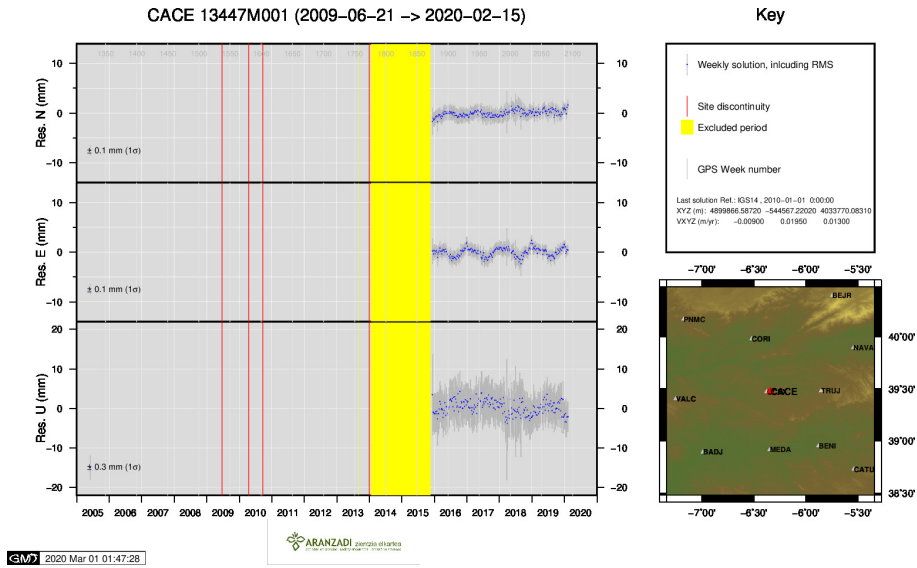
3 ) AMUR



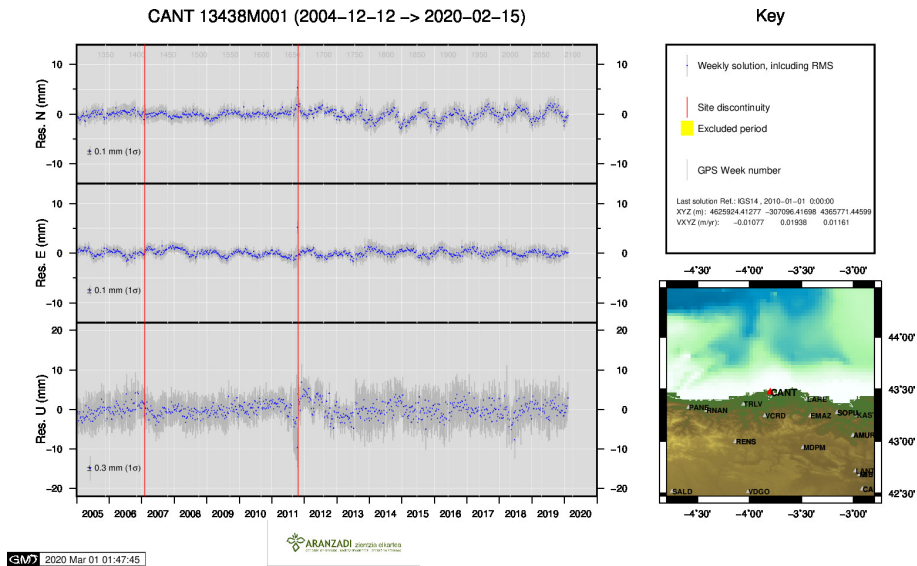
4 ) BIAZ



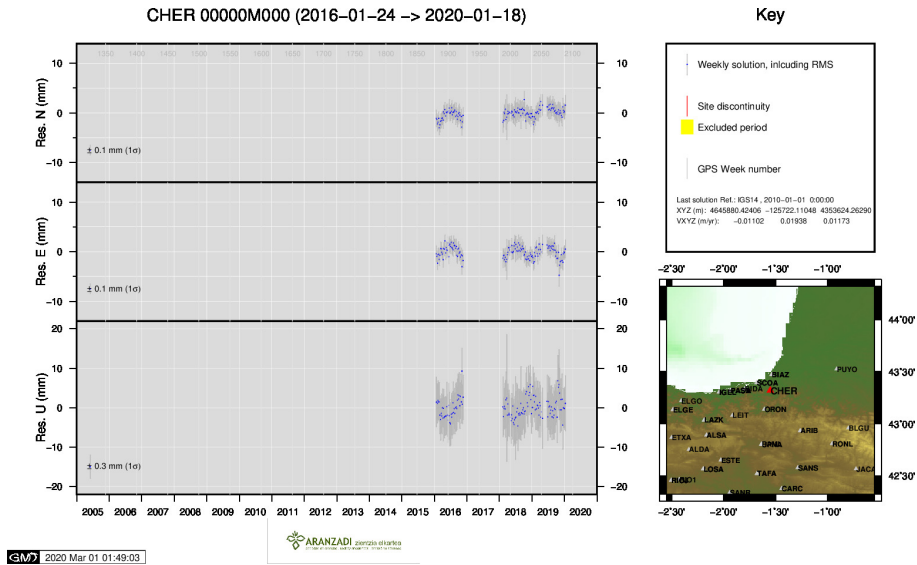
5 ) BIDA



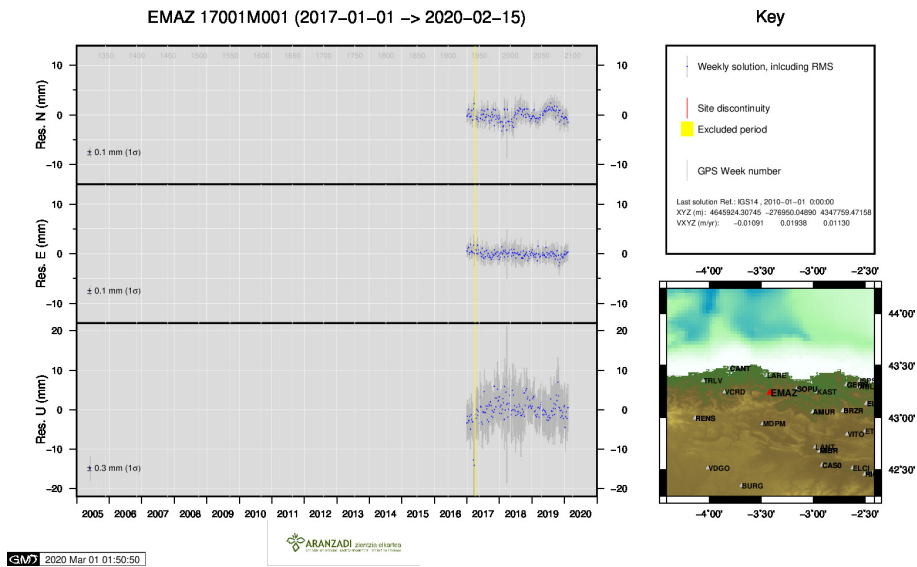
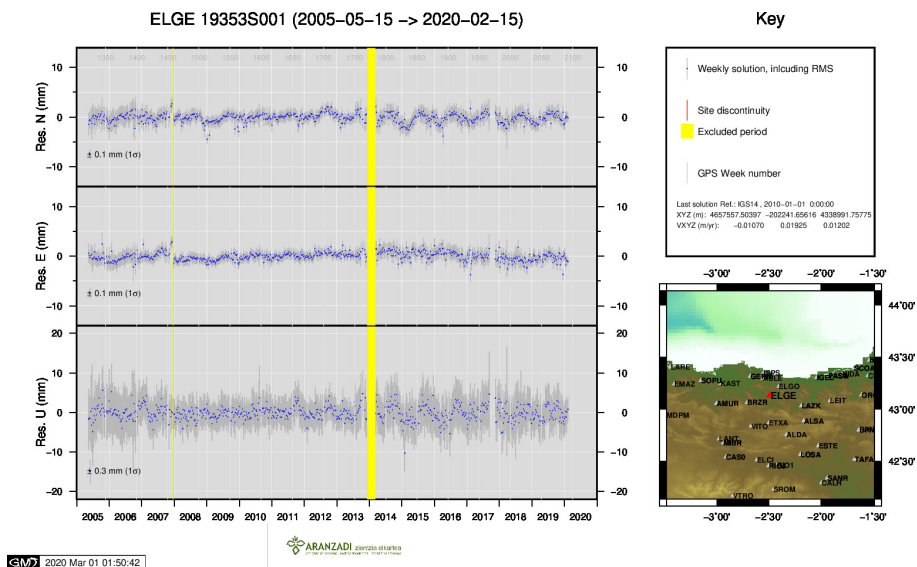
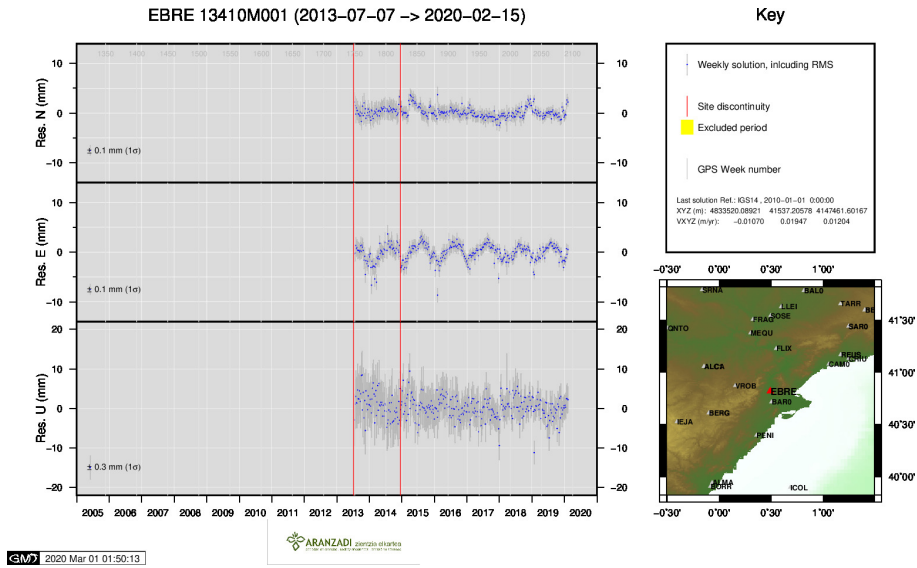
6 ) CACE



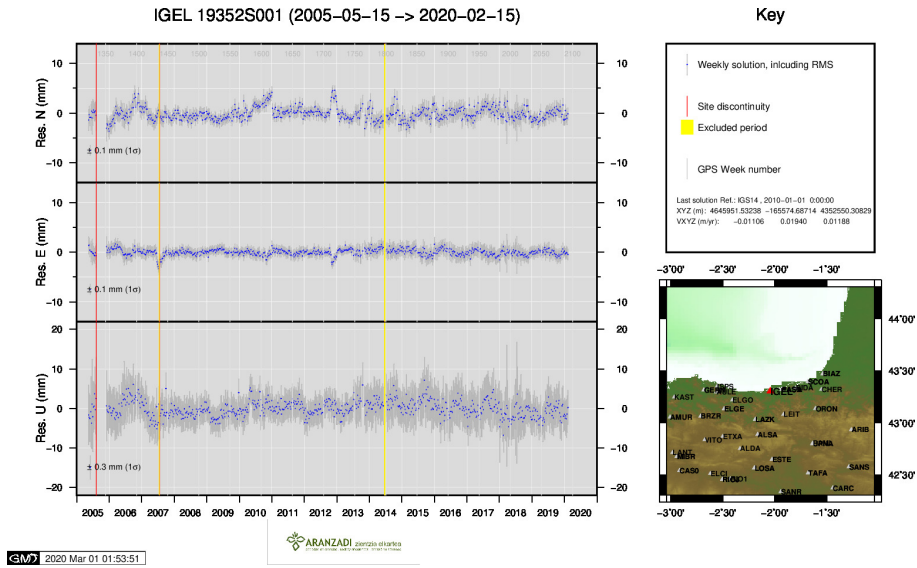
7 ) CANT



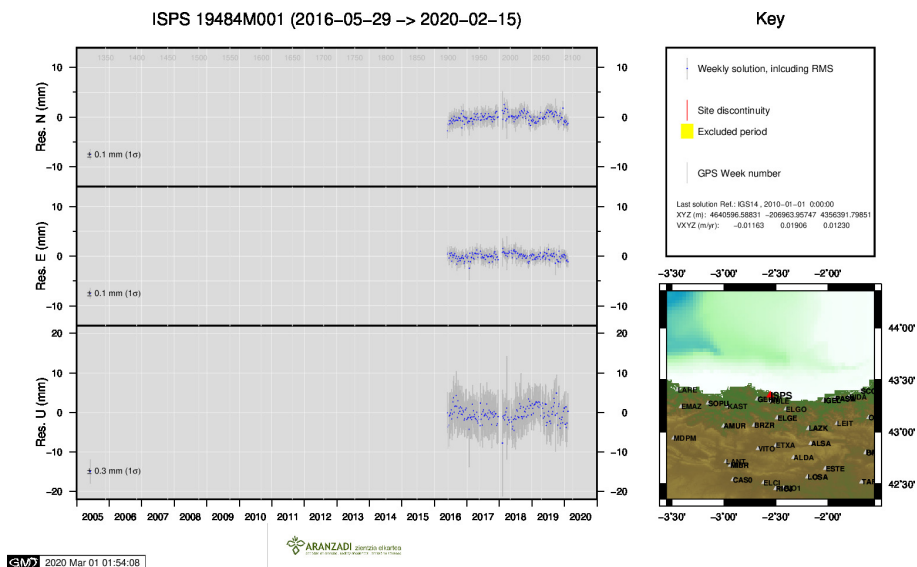
8 ) CHER



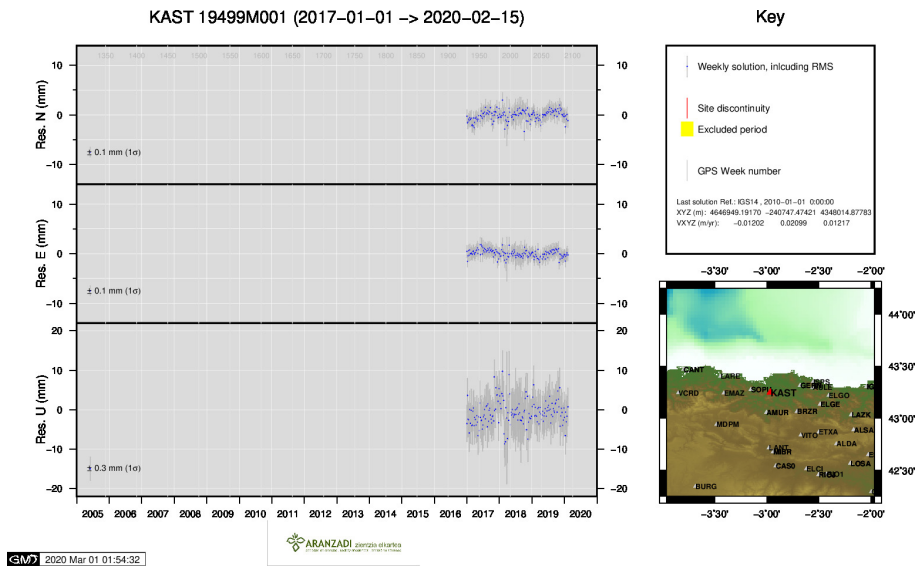




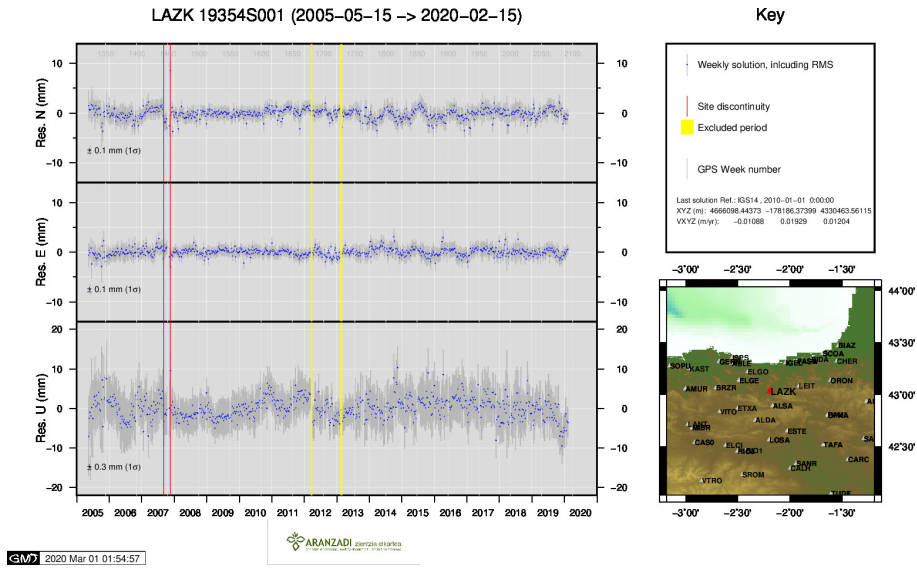
12 ) IGEL



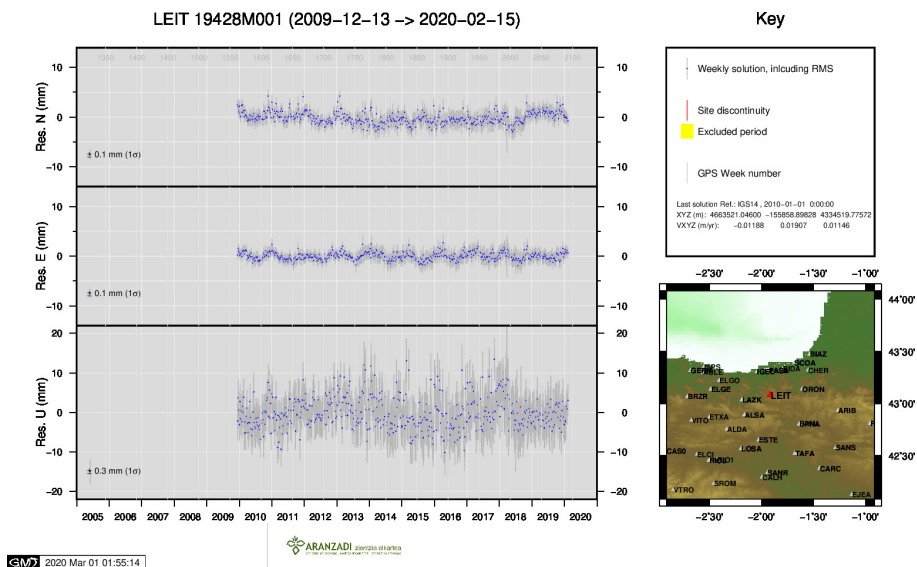
13 ) ISPS



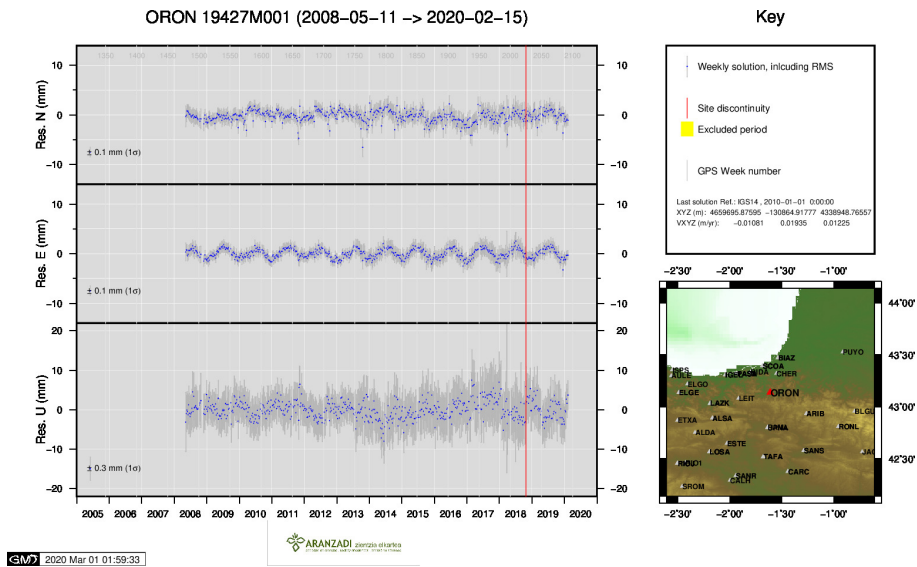
14 ) KAST



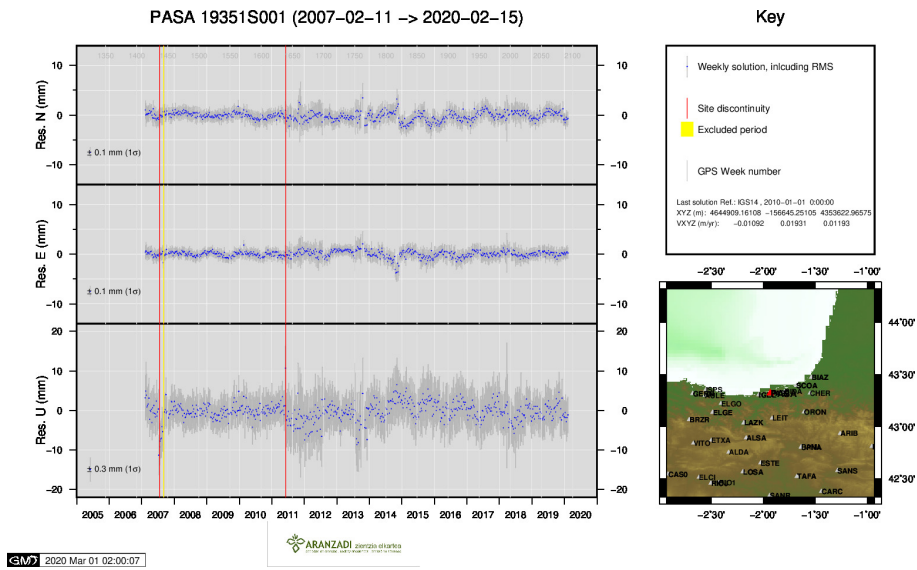
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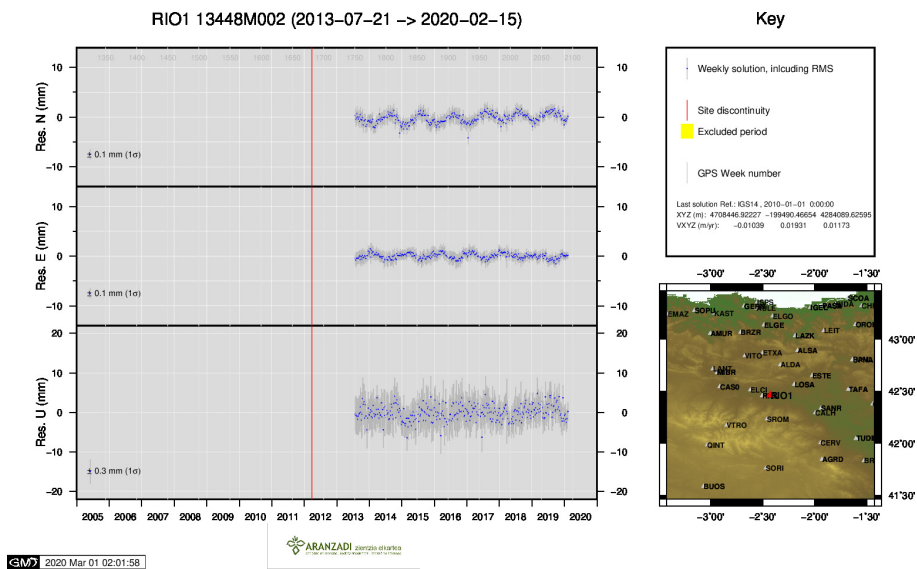
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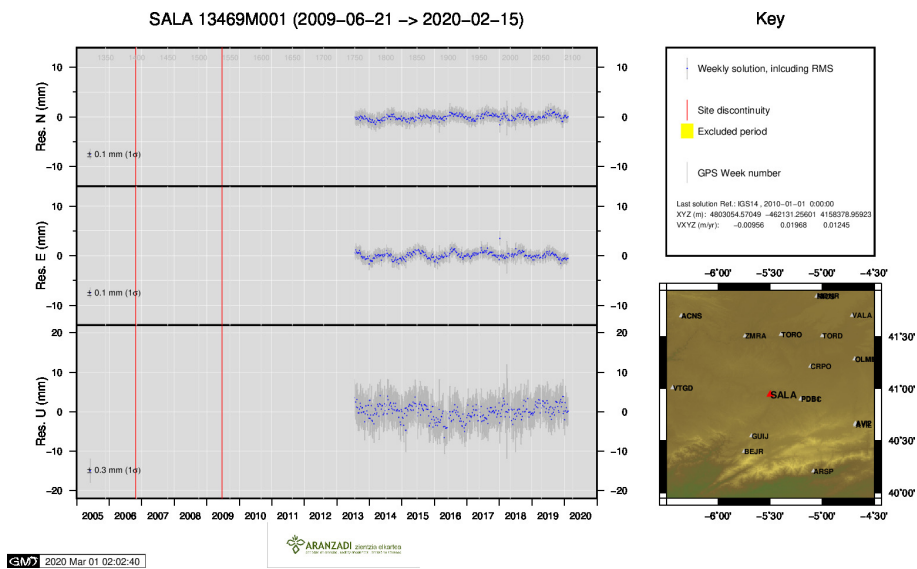
17 ) ORON



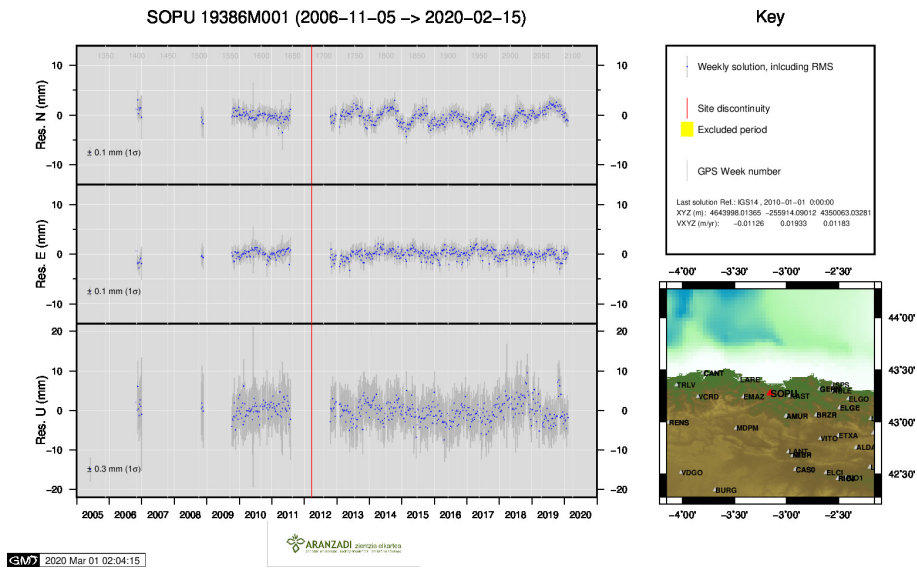
18 ) PASA



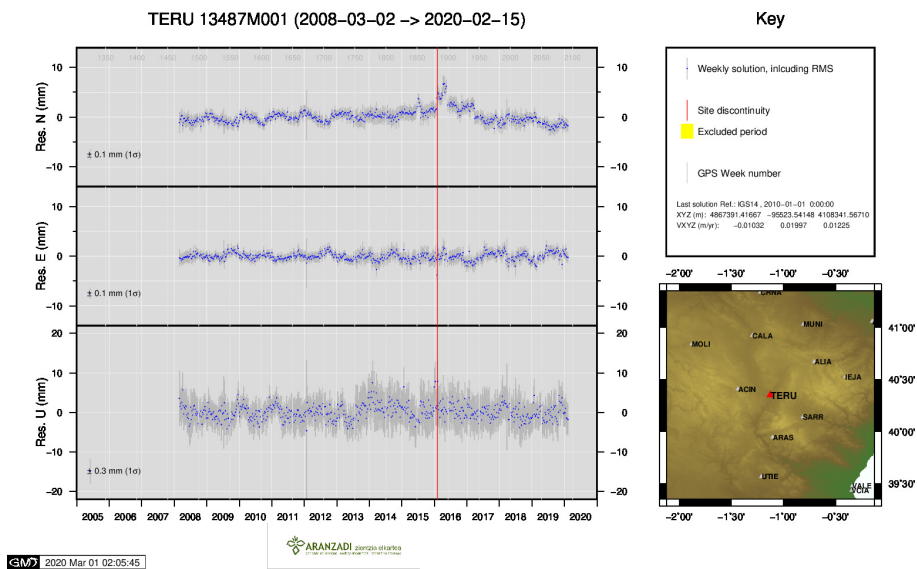
19 ) RIO1



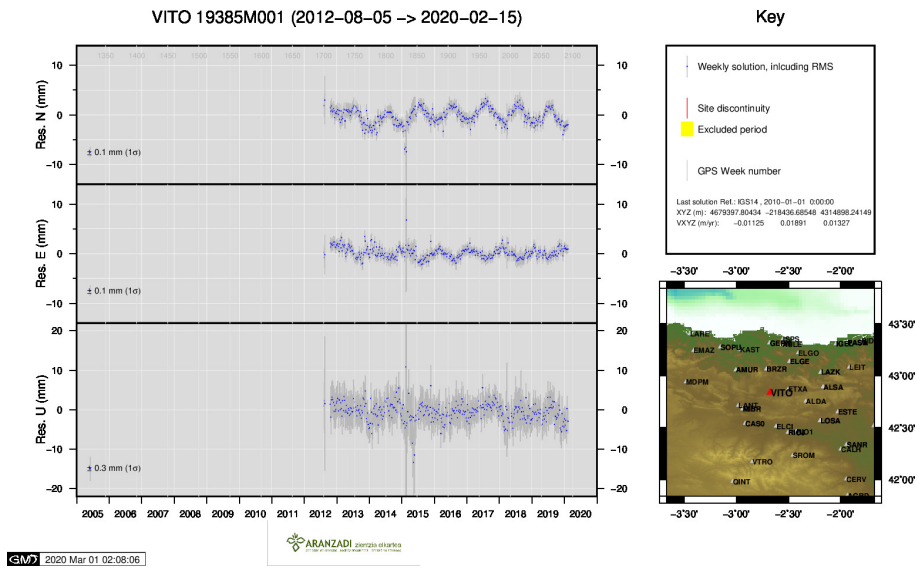
20 ) SALA



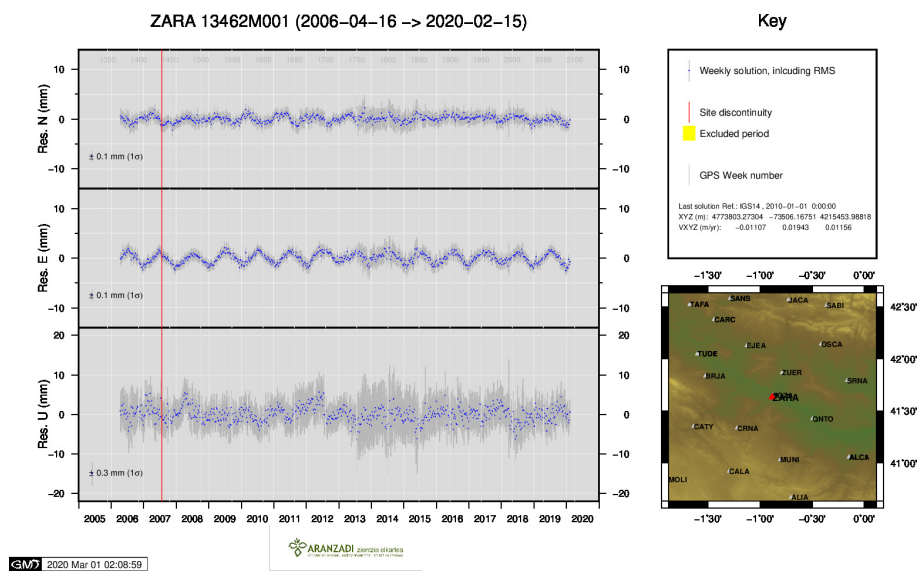
21 ) SOPU



22 ) TERU



23 ) VITO



24 ) ZARA