ARA-DAC Weekly Analysis Result: 2110 (GFA)

Technical Report

GPS Week: 2110 (GFA)

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

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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

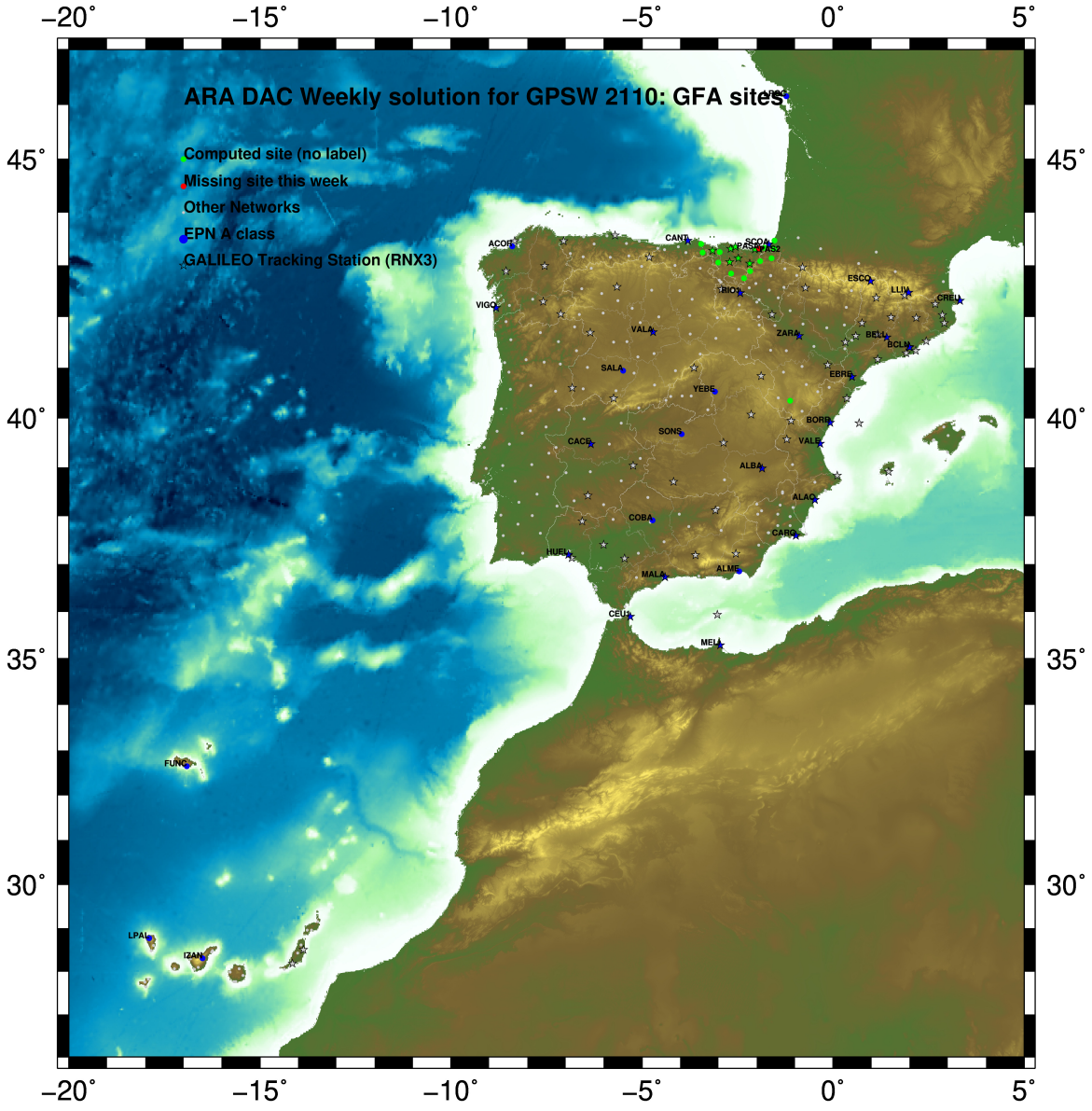

Fig.1: Computed Sites for GPS Week2110 (GFA)

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 avalaible from GPSW 1986 on)
- Modelled observable: Double differences of carrier phase using different combinations based on the distance.
- Ground antenna phase center calibrations: Group APCV used from the PCV_COD.I14 file and individual calibrations from EPNC_14.ATX. EPN_A class sites (CRD + VEL) IGS14 used to define the reference frame (from GPSW 1934). If individual calibrations, other from these, are available, they are also included in the analysis.
- Troposphere:
  - 3 deg elev. cutoff; elevation dependent weighting
  - VMF1 mapping function. ZPD parameters are estimated using the VMF1 mapping function.
  - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2004 (Scherneck).
- Atmosph. Loading: computed from a global grid using the GRDS1S2 program of Bernese 5.2.

4 Estimated Parameters

- Adjustment: Least Squares
- Rejection Criteria: 3*rms of single differences, in the weekly combination of daily normal equations (ADDNEQ)
- Station coordinates: minimum constraints (MC) to EPN A class sites (only translations).
- Troposphere: 3 deg. After having obtained coordinates valid for the entire week, tropospheric zenith delay is solved at each site at intervals of 1 hour throughout the week, holding the coordinates constrained at the weekly values.
- Ionospheric: second and third "High Order Ionosphere (HOI)" corrections used, using CODE files, to improve Ambiguity Resolution.
- Satellite clock bias: not estimated because are eliminated by double differencing the phase data.
- Receiver clock bias: not estimated because are eliminated by double differencing the phase data.
- Orbits and ERPs: CODE's orbits and ERP for both rapid and final solutions. DE405 planetary ephemeris and JGM3 Earth geopotential model is used.
- Tidal displacements: according to IERS2010 Conventions. Atmospheric loading corrections used.

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

5 Computed Coordinates

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

5.1 IGS14

The Reference Frame considered in this section is IGS14, release C2085.

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ARA LAC 2110 WEEK FINAL COMBINATION: PRECISE ORBITS             07-JUL-20 09:47
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: IGS14             EPOCH: 2020-06-17 12:00:00

NUM  STATION NAME          X (M)          Y (M)          Z (M)     FLAG

  4  ACOR 13434M001    4594489.54734  -678367.42360  4357066.29578    W
 39  ALDA 19383M001    4687280.14211  -190876.54666  4308106.96708    A
 50  ALSA 19419M001    4677250.81846  -176770.37371  4319079.88746    A
 53  AMUR 19388M001    4661499.43384  -244591.23984  4332269.89679    A
100  BIAZ 10074M002    4634456.03682  -124344.95732  4365785.47049    A
101  BIDA 00000M000    4644177.80688  -145778.30404  4354832.49478    A
113  BRZR 19387M001    4662220.97528  -220769.88029  4333309.45235    A
 98  CACE 13447M001    4899866.49266  -544567.01735  4033770.21850    W
109  CANT 13438M001    4625924.29791  -307096.21504  4365771.56716    W
154  CHER 00000M000    4645880.30527  -125721.90724  4353624.38618    A
154  CREU 13432M001    4715420.11673   273178.07835  4271946.85565    W
190  EBRE 13410M001    4833519.97600    41537.41024  4147461.73344    W
180  ELGE 19353S001    4657557.38859  -202241.45556  4338991.88149    A
182  EMAZ 17001M001    4645924.19227  -276949.84706  4347759.59041    A
209  GERN 19389M001    4642811.30395  -217222.90604  4353278.89084    A
235  IGEL 19352S001    4645951.41352  -165574.48475  4352550.43066    A
240  ISPS 19484M001    4640596.46370  -206963.75882  4356391.92530    A
245  KAST 19499M001    4646949.06507  -240747.25501  4348015.00567    A
252  LARE 19440M001    4632831.93650  -279026.12046  4360314.43850    A
256  LAZK 19354S001    4666098.32521  -178186.17186  4330463.68320    A
261  LEIT 19428M001    4663520.92179  -155858.69894  4334519.89592    A
334  ORON 19427M001    4659695.76241  -130864.71493  4338948.89390    A
456  PASA 19351S001    4644909.04181  -156645.04966  4353623.08754    W
513  RIO1 13448M002    4708446.81207  -199490.26497  4284089.74863    W
518  SALA 13469M001    4803054.47032  -462131.05175  4158379.09074    W
526  SCOA 10088M002    4639940.48259  -136224.92409  4359552.42717    W
418  SOPU 19386M001    4643997.89226  -255913.88813  4350063.15456    A
443  TERU 13487M001    4867391.30895   -95523.33473  4108341.69551    A
493  VITO 19385M001    4679397.68464  -218436.48698  4314898.37825    A
698  YEBE 13420M001    4848724.55341  -261631.91141  4123094.34161    W
701  ZARA 13462M001    4773803.15119   -73505.96414  4215454.10650    W
```

5.2 ETRF2000 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

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ETRF2000 FINAL COORD. wk 2110                                   07-JUL-20 09:47
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2000          EPOCH: 2020-06-17 12:00:00

NUM  STATION NAME          X (M)          Y (M)          Z (M)     FLAG

  4  ACOR 13434M001    4594489.86278  -678367.98153  4357065.86597    W
 39  ALDA 19383M001    4687280.51311  -190877.11347  4308106.53619    A
 50  ALSA 19419M001    4677251.19195  -176770.93939  4319079.45753    A
 53  AMUR 19388M001    4661499.80006  -244591.80402  4332269.46724    A
100  BIAZ 10074M002    4634456.41998  -124345.51822  4365785.04457    A
101  BIDA 00000M000    4644178.18666  -145778.86606  4354832.06783    A
113  BRZR 19387M001    4662221.34446  -220770.44449  4333309.02305    A
 98  CACE 13447M001    4899866.80118  -544567.60770  4033769.76637    W
109  CANT 13438M001    4625924.65896  -307096.77556  4365771.13962    W
154  CHER 00000M000    4645880.68739  -125722.46938  4353623.95935    A
154  CREU 13432M001    4715420.54118   273177.51024  4271946.42826    W
190  EBRE 13410M001    4833520.36359    41536.82858  4147461.29392    W
180  ELGE 19353S001    4657557.76042  -202242.01920  4338991.45279    A
182  EMAZ 17001M001    4645924.55569  -276950.40967  4347759.16168    A
209  GERN 19389M001    4642811.67498  -217223.46813  4353278.46310    A
235  IGEL 19352S001    4645951.79075  -165575.04702  4352550.00332    A
240  ISPS 19484M001    4640596.83620  -206964.32064  4356391.49787    A
245  KAST 19499M001    4646949.43288  -240747.81761  4348014.57731    A
252  LARE 19440M001    4632832.30056  -279026.68165  4360314.01077    A
256  LAZK 19354S001    4666098.69934  -178186.73634  4330463.25412    A
261  LEIT 19428M001    4663521.29891  -155859.26308  4334519.46733    A
334  ORON 19427M001    4659696.14286  -130865.27857  4338948.46592    A
456  PASA 19351S001    4644909.42019  -156645.61179  4353622.66040    W
513  RIO1 13448M002    4708447.18031  -199490.83407  4284089.31596    W
518  SALA 13469M001    4803054.79777  -462131.63165  4158378.64731    W
526  SCOA 10088M002    4639940.86387  -136225.48562  4359552.00067    W
418  SOPU 19386M001    4643998.25838  -255914.45046  4350062.72625    A
443  TERU 13487M001    4867391.67717   -95523.92049  4108341.25162    A
493  VITO 19385M001    4679398.05279  -218437.05302  4314897.94763    A
698  YEBE 13420M001    4848724.90260  -261632.49569  4123093.89712    W
701  ZARA 13462M001    4773803.52975   -73506.53984  4215453.67026    W
```

5.3 ETRF2014 (ETRS89) Coordinates

European **T**errestrial **R**eference **S**ystem, **1989** (**ETRS89**) is realized by ETRF2014 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

ETRF2014 FINAL COORD. wk 2110 07-JUL-20 09:47

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2020-06-17 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.82056	-678368.01971	4357065.91486	W
39	ALDA 19383M001	4687280.46862	-190877.15304	4308106.58496	A
50	ALSA 19419M001	4677251.14752	-176770.97905	4319079.50634	A
53	AMUR 19388M001	4661499.75600	-244591.84350	4332269.51606	A
100	BIAZ 10074M002	4634456.37582	-124345.55824	4365785.09351	A
101	BIDA 00000M000	4644178.14248	-145778.90596	4354832.11674	A
113	BRZR 19387M001	4662221.30033	-220770.48405	4333309.07187	A
98	CACE 13447M001	4899866.75541	-544567.64514	4033769.81458	W
109	CANT 13438M001	4625924.61545	-307096.81496	4365771.18850	W
154	CHER 00000M000	4645880.64312	-125722.50934	4353624.00826	A
154	CREU 13432M001	4715420.49482	273177.46914	4271946.47727	W
190	EBRE 13410M001	4833520.31680	41536.78877	4147461.34249	W
180	ELGE 19353S001	4657557.71627	-202242.05884	4338991.50163	A
182	EMAZ 17001M001	4645924.51189	-276950.44909	4347759.21052	A
209	GERN 19389M001	4642811.63103	-217223.50778	4353278.51198	A
235	IGEL 19352S001	4645951.74661	-165575.08685	4352550.05222	A
240	ISPS 19484M001	4640596.79224	-206964.36034	4356391.54675	A
245	KAST 19499M001	4646949.38896	-240747.85717	4348014.62617	A
252	LARE 19440M001	4632832.25689	-279026.72112	4360314.05965	A
256	LAZK 19354S001	4666098.65503	-178186.77604	4330463.30296	A
261	LEIT 19428M001	4663521.25456	-155859.30287	4334519.51618	A
334	ORON 19427M001	4659696.09847	-130865.31847	4338948.51479	A
456	PASA 19351S001	4644909.37603	-156645.65165	4353622.70930	W
513	RIO1 13448M002	4708447.13563	-199490.87352	4284089.36468	W
518	SALA 13469M001	4803054.75285	-462131.66978	4158378.69573	W
526	SCOA 10088M002	4639940.81969	-136225.52557	4359552.04959	W
418	SOPU 19386M001	4643998.21453	-255914.48997	4350062.77510	A
443	TERU 13487M001	4867391.63048	-95523.95967	4108341.30004	A
493	VITO 19385M001	4679398.00847	-218437.09252	4314897.99641	A
698	YEBE 13420M001	4848724.85663	-261632.53435	4123093.94550	W
701	ZARA 13462M001	4773803.48399	-73506.57948	4215453.71889	W

6 Quality Control

6.1 Mean and Daily Repeatabilities

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

ARA LAC 2110 WEEK FINAL COMBINATION: PRECISE ORBITS 07-JUL-20 09:47

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	7	XXXXXXX	0.53	0.24	3.86
ALDA 19383M001	7	XXXXXXX	0.88	0.68	2.87
ALSA 19419M001	6	XXXXXX	0.43	0.62	2.68
AMUR 19388M001	7	XXXXXXX	0.67	0.73	2.10
BIAZ 10074M002	7	XXXXXXX	0.69	0.67	3.45
BIDA 00000M000	4	XXXX	0.66	1.76	2.34
BRZR 19387M001	7	XXXXXXX	0.58	0.88	2.15
CACE 13447M001	7	XXXXXXX	0.57	0.49	3.03
CANT 13438M001	7	XXXXXXX	0.76	0.71	2.42
CHER 00000M000	7	XXXXXXX	1.31	0.66	2.85
CREU 13432M001	7	XXXXXXX	0.92	1.00	3.08
EBRE 13410M001	7	XXXXXXX	0.88	0.48	4.24
ELGE 19353S001	7	XXXXXXX	0.48	0.75	2.31
EMAZ 17001M001	7	XXXXXXX	0.93	0.94	2.58
GERN 19389M001	7	XXXXXXX	0.73	0.87	2.71
IGEL 19352S001	7	XXXXXXX	0.69	0.56	3.47
ISPS 19484M001	7	XXXXXXX	0.80	1.64	3.78
KAST 19499M001	7	XXXXXXX	0.92	1.34	4.27
LARE 19440M001	5	XXXXX	2.29	1.45	2.99
LAZK 19354S001	7	XXXXXXX	0.44	0.85	4.32
LEIT 19428M001	6	XXXXXX	0.63	0.67	1.64
ORON 19427M001	6	XXXXXX	0.87	0.67	1.53
PASA 19351S001	7	XXXXXXX	0.75	0.44	2.93
RIO1 13448M002	7	XXXXXXX	0.61	0.38	2.40
SALA 13469M001	7	XXXXXXX	0.35	0.64	2.79
SCOA 10088M002	7	XXXXXXX	1.37	1.02	3.60
SOPU 19386M001	7	XXXXXXX	1.09	1.03	4.60
TERU 13487M001	7	XXXXXXX	1.20	0.56	2.88
VITO 19385M001	7	XXXXXXX	0.92	0.66	2.97
YEBE 13420M001	7	XXXXXXX	0.53	0.78	1.68
ZARA 13462M001	7	XXXXXXX	0.48	0.58	2.49

Comparison of individual solutions:

ACOR 13434M001	N	0.53	0.35	-0.12	-0.36	-0.35	-0.56	-0.98	-0.10
ACOR 13434M001	E	0.24	-0.20	0.02	-0.01	0.25	-0.27	0.29	-0.27
ACOR 13434M001	U	3.86	0.70	-4.65	1.32	4.43	-2.80	2.32	5.74
ALDA 19383M001	N	0.88	-0.16	-0.61	0.47	1.57	0.16	0.33	-1.19
ALDA 19383M001	E	0.68	-0.21	-0.57	0.64	-1.26	-0.18	-0.57	0.02
ALDA 19383M001	U	2.87	4.15	-1.76	2.88	-4.04	-0.14	2.08	0.02
ALSA 19419M001	N	0.43	-0.72	0.32	-0.18	0.49	-0.14	0.17	
ALSA 19419M001	E	0.62	-0.13	-0.45	-0.33	-1.12	-0.33	-0.46	
ALSA 19419M001	U	2.68	0.03	-2.95	2.73	0.98	-4.18	1.21	
AMUR 19388M001	N	0.67	-0.71	-0.84	0.06	1.10	-0.48	0.13	-0.19
AMUR 19388M001	E	0.73	1.25	-0.31	-0.12	-1.03	-0.23	-0.68	0.01
AMUR 19388M001	U	2.10	-1.83	-3.22	1.91	1.25	-0.66	-2.21	-1.48
BIAZ 10074M002	N	0.69	-0.80	-0.74	0.47	-0.89	-0.45	-0.66	0.12
BIAZ 10074M002	E	0.67	-0.79	-0.95	-0.69	0.76	-0.22	-0.20	-0.07
BIAZ 10074M002	U	3.45	3.44	5.73	1.40	0.73	-4.61	-0.35	1.77
BIDA 00000M000	N	0.66				-1.04	-0.37	-0.31	0.02
BIDA 00000M000	E	1.76				-2.94	0.51	0.43	-0.43
BIDA 00000M000	U	2.34				-3.73	-0.05	1.39	0.81
BRZR 19387M001	N	0.58	-0.10	-0.40	0.17	0.16	-0.16	1.15	0.67
BRZR 19387M001	E	0.88	0.78	-1.31	0.73	-0.03	-0.76	-1.08	0.20
BRZR 19387M001	U	2.15	2.30	-2.61	1.52	2.77	1.26	-1.11	1.67
CACE 13447M001	N	0.57	0.59	0.28	-0.09	1.02	-0.08	-0.69	0.04
CACE 13447M001	E	0.49	0.52	0.39	-0.49	0.42	0.39	0.63	0.14
CACE 13447M001	U	3.03	-1.65	-1.20	-3.41	3.05	2.51	2.98	3.85
CANT 13438M001	N	0.76	-1.36	0.15	-0.52	0.72	0.54	0.08	-0.73
CANT 13438M001	E	0.71	-0.75	-0.47	-0.26	-1.03	-0.71	-0.48	0.57
CANT 13438M001	U	2.42	-1.86	3.02	-1.25	-0.29	-4.14	1.60	1.13
CHER 00000M000	N	1.31	-0.43	-1.22	-2.69	-0.23	0.28	-0.79	0.76
CHER 00000M000	E	0.66	0.01	0.55	0.20	-1.36	-0.50	0.14	-0.37
CHER 00000M000	U	2.85	3.43	0.95	-3.61	0.69	-2.33	3.90	1.45
CREU 13432M001	N	0.92	-0.08	1.28	0.82	0.67	-0.48	-0.81	-1.21
CREU 13432M001	E	1.00	-0.06	0.12	-0.39	0.36	0.88	-0.64	-2.14
CREU 13432M001	U	3.08	1.88	2.33	-1.08	2.65	-2.43	-2.46	-5.29
EBRE 13410M001	N	0.88	-0.63	-0.45	1.33	1.01	0.55	-0.48	-0.86
EBRE 13410M001	E	0.48	-0.40	0.17	-0.15	-0.87	0.51	-0.42	0.03
EBRE 13410M001	U	4.24	-1.08	-4.18	-0.58	-0.77	6.74	1.55	-6.38
ELGE 19353S001	N	0.48	-0.74	0.37	0.29	0.30	0.38	0.43	0.47
ELGE 19353S001	E	0.75	-0.18	-0.87	-0.11	-1.11	0.08	-0.37	1.08
ELGE 19353S001	U	2.31	-0.83	0.32	1.64	-1.48	-0.37	1.18	5.00
EMAZ 17001M001	N	0.93	-1.18	0.18	-1.57	-0.17	0.28	0.85	0.72
EMAZ 17001M001	E	0.94	-0.59	-0.48	-1.46	0.44	-0.34	-1.06	1.10
EMAZ 17001M001	U	2.58	-1.73	2.08	1.77	-5.09	-1.36	-0.38	-1.28
GERN 19389M001	N	0.73	-0.98	0.35	-0.18	0.77	-0.24	0.88	0.81
GERN 19389M001	E	0.87	1.13	0.01	-0.29	-1.74	-0.08	-0.41	-0.08
GERN 19389M001	U	2.71	0.16	0.68	-0.28	-0.81	4.39	4.21	-2.40
IGEL 19352S001	N	0.69	-0.19	0.66	-0.59	0.72	0.02	1.16	-0.36
IGEL 19352S001	E	0.56	0.48	-0.46	-0.09	-0.88	-0.36	-0.66	0.33
IGEL 19352S001	U	3.47	-0.74	1.50	4.84	0.05	-3.57	5.45	-1.87
ISPS 19484M001	N	0.80	0.21	1.35	0.25	-0.78	0.12	0.88	-0.71
ISPS 19484M001	E	1.64	-1.36	-0.66	-0.53	-1.81	0.39	-0.61	3.13
ISPS 19484M001	U	3.78	-1.46	4.57	1.91	-3.24	-2.31	6.57	-0.14
KAST 19499M001	N	0.92	-0.27	1.59	-0.42	-0.43	1.12	-0.77	0.47
KAST 19499M001	E	1.34	-1.26	-1.32	2.40	-1.20	0.39	-0.28	-0.10
KAST 19499M001	U	4.27	-3.99	-0.17	8.76	0.74	3.59	-0.95	-1.57
LARE 19440M001	N	2.29			-4.46	0.98	-0.06	0.10	0.27
LARE 19440M001	E	1.45			-1.92	-0.75	-0.26	-1.30	1.57
LARE 19440M001	U	2.99			-4.96	-0.19	0.02	-0.55	-3.30
LAZK 19354S001	N	0.44	-0.55	-0.07	0.08	-0.19	-0.24	0.29	0.81
LAZK 19354S001	E	0.85	-0.33	-0.40	-0.38	-1.82	0.01	-0.01	0.78
LAZK 19354S001	U	4.32	1.47	5.57	-0.45	-5.52	-4.34	-2.95	4.54

LEIT	19428M001	N	0.63	-0.87	-0.53	0.27	0.84	-0.11	0.38	
LEIT	19428M001	E	0.67	-0.19	-0.74	-0.09	-0.53	-0.22	-1.15	
LEIT	19428M001	U	1.64	2.17	-0.88	-0.77	-2.60	-0.65	0.51	
ORON	19427M001	N	0.87	-1.39	0.50	0.26	0.95	-0.71	0.39	
ORON	19427M001	E	0.67	0.13	-0.97	-0.65	-0.42	-0.24	-0.78	
ORON	19427M001	U	1.53	0.33	-1.46	0.10	0.57	-2.83	1.03	
PASA	19351S001	N	0.75	-0.58	-0.40	-0.01	1.40	0.66	0.63	-0.26
PASA	19351S001	E	0.44	-0.15	-0.56	0.05	-0.32	-0.09	-0.81	0.18
PASA	19351S001	U	2.93	-1.46	3.27	2.57	-0.08	-3.81	4.06	0.99
RIO1	13448M002	N	0.61	-0.52	-0.65	0.76	0.92	-0.36	-0.14	0.00
RIO1	13448M002	E	0.38	-0.09	-0.40	-0.31	-0.42	-0.65	-0.09	-0.09
RIO1	13448M002	U	2.40	3.21	1.03	-0.32	-4.10	-1.96	-1.40	-0.81
SALA	13469M001	N	0.35	0.25	-0.14	0.25	-0.32	0.19	-0.48	-0.49
SALA	13469M001	E	0.64	0.49	0.41	-0.24	-0.25	1.07	-0.88	0.23
SALA	13469M001	U	2.79	3.69	3.11	1.58	0.41	-0.75	-4.24	1.55
SCOA	10088M002	N	1.37	1.60	0.21	-2.01	-1.56	-0.56	-1.26	0.55
SCOA	10088M002	E	1.02	0.38	1.33	-0.77	-1.66	0.32	-0.71	-0.63
SCOA	10088M002	U	3.60	1.25	6.21	1.22	0.75	-4.87	3.38	0.68
SOPU	19386M001	N	1.09	-1.13	0.44	-1.19	0.68	-0.22	1.51	1.19
SOPU	19386M001	E	1.03	1.04	-0.43	-0.52	-2.11	0.51	-0.09	0.23
SOPU	19386M001	U	4.60	2.61	5.31	1.76	-5.83	6.01	-4.26	0.81
TERU	13487M001	N	1.20	1.06	0.73	-0.18	0.23	-2.12	1.01	-1.18
TERU	13487M001	E	0.56	-0.50	-0.66	0.29	-0.51	0.89	-0.12	0.18
TERU	13487M001	U	2.88	-1.12	1.68	-1.36	0.75	-6.11	2.12	1.17
VITO	19385M001	N	0.92	-0.96	1.49	-0.87	-0.59	-0.40	0.84	-0.10
VITO	19385M001	E	0.66	0.06	-0.73	-0.44	-1.07	0.64	-0.58	0.15
VITO	19385M001	U	2.97	0.79	-6.53	1.49	0.54	1.14	0.16	-2.43
YEBE	13420M001	N	0.53	0.54	-0.16	0.68	0.15	0.38	-0.41	-0.77
YEBE	13420M001	E	0.78	0.68	-0.03	1.34	1.15	0.16	-0.14	0.22
YEBE	13420M001	U	1.68	2.13	1.50	-0.75	0.01	2.67	-1.51	0.27
ZARA	13462M001	N	0.48	-0.79	0.12	0.01	0.34	-0.38	0.62	-0.28
ZARA	13462M001	E	0.58	-0.10	-1.08	-0.82	0.18	-0.09	-0.38	-0.02
ZARA	13462M001	U	2.49	-1.03	-0.37	1.65	-3.73	0.16	-4.02	-1.74

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		
4	ACOR 13434M001	I W	-1.37	0.09	0.29
10	ALAC 13433M001	I W	-1.50	1.47	1.81
13	ALBA 13452M001	I W	0.15	-0.62	0.48
19	ALME 13437M001	I W	-0.42	2.12	-4.11
41	BCLN 13412M001	I W	-0.78	0.72	1.24
46	BELL 13431M001	I W	0.25	-0.39	2.10
65	BORR 13480M001	I W	0.69	-2.06	-2.77
70	BRST 10004M004	I W	-1.34	0.04	-0.66
98	CACE 13447M001	I W	0.31	1.33	0.38
109	CANT 13438M001	I W	-0.43	0.06	2.54
110	CARG 19412M001	I W	-0.01	1.00	-0.02
121	CEU1 13449M002	I W	0.09	0.78	-5.53
135	COBA 13453M001	I W	1.21	0.28	-2.84
154	CREU 13432M001	I W	-1.42	1.63	-1.77
190	EBRE 13410M001	I W	-3.73	-0.13	-3.14
208	ESCO 13435M001	I W	0.37	3.76	-2.52
219	FUNC 13911S001	I W	-2.58	-10.85	-4.58
286	HUEL 13451M001	I W	1.76	-2.13	-8.12
300	IZAN 31309M002	I W	0.40	-1.31	-3.17
359	LLIV 13436M001	I W	0.82	0.51	2.38
364	LPAL 81701M001	I W	-1.14	-2.31	-1.36
366	LROC 10023M001	I W	1.13	-0.04	2.24
400	MELI 19379M001	I W	1.19	1.02	-2.31
456	PASA 19351S001	I W	-1.14	0.82	4.07
464	PDEL 31906M004	I W	5.13	0.06	5.11
513	RIO1 13448M002	I W	-0.84	0.90	0.76
518	SALA 13469M001	I W	-0.01	1.81	-0.05
526	SCOA 10088M002	I W	-3.58	2.04	-0.65
557	SONS 13446M001	I W	-0.68	1.78	-1.55
588	TERC 31909M001	I W	5.84	-5.91	0.05
654	VALA 13463M002	I W	0.60	0.52	0.60
658	VALE 13439M001	I W	-0.53	1.06	-0.46
669	VIGO 13450M001	I W	0.74	0.15	2.77
698	YEBE 13420M001	I W	0.60	1.73	5.79
701	ZARA 13462M001	I W	-0.22	-0.66	4.81
710	ZIMM 14001M004	I W	0.18	0.53	6.03
84	MALA 13443M001	I W	0.30	0.16	2.18
	RMS / COMPONENT		1.80	2.44	3.19
	MEAN		0.00	-0.00	-0.00
	MIN		-3.73	-10.85	-8.12
	MAX		5.84	3.76	6.03

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 111
RMS OF TRANSFORMATION : 2.54 MM

BARYCENTER COORDINATES:

LATITUDE : 40 6 47.82
LONGITUDE : - 4 54 27.69
HEIGHT : -47.728 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.42 MM
TRANSLATION IN E : 0.00 +- 0.42 MM
TRANSLATION IN U : -0.00 +- 0.42 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                       15174169
 NUMBER OF UNKNOWNS                             189587
 NUMBER OF DEGREES OF FREEDOM                 14984582
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                    2.065182486115710
```

Helmert Transformation Parameters With Respect to Combined Solution:

		Translation (m)			Rotation (")			
Sol	Rms (m)	X	Y	Z	X	Y	Z	Scale (ppm)
1	0.00189	0.0109	-0.0017	-0.0121	0.0001	0.0005	0.0000	-0.00005
2	0.00231	-0.0087	-0.0118	0.0095	0.0003	-0.0004	-0.0003	0.00001
3	0.00225	0.0008	-0.0077	0.0014	0.0001	-0.0000	-0.0002	-0.00016
4	0.00247	-0.0045	-0.0132	0.0076	0.0001	-0.0003	-0.0005	-0.00041
5	0.00220	-0.0092	-0.0133	0.0152	0.0002	-0.0006	-0.0004	-0.00053
6	0.00214	-0.0061	-0.0080	0.0116	0.0001	-0.0004	-0.0002	-0.00057
7	0.00223	0.0130	-0.0077	-0.0119	0.0002	0.0006	-0.0001	-0.00066

Statistics of individual solutions:

File	RMS (m)	DOF	Chi**2/DOF	#Observations authentic	/ pseudo	#Parameters explicit	/ implicit	/ singular
1	0.00142	2159814	2.03	2187886	3	882	27193	0
2	0.00138	2089429	1.90	2115982	3	855	25701	0
3	0.00147	2122546	2.17	2150529	3	882	27104	0
4	0.00144	2147063	2.06	2174227	3	876	26291	0
5	0.00144	2189260	2.09	2218832	3	894	28681	0
6	0.00144	2199095	2.08	2227638	3	894	27652	0
7	0.00143	2072164	2.05	2099075	3	852	26062	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 20:166:00000 20:172:86370 LEICA GR50           ----- -----------
 ALDA  A    1 P 20:166:00000 20:172:86370 LEICA GR10           ----- -----------
 ALSA  A    1 P 20:166:00000 20:171:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 20:166:00000 20:172:86370 LEICA GR10           ----- -----------
 BIAZ  A    1 P 20:166:00000 20:172:82770 TRI SP90M            ----- -----------
 BIDA  A    1 P 20:169:27030 20:172:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 20:166:00000 20:172:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 20:166:00000 20:172:86370 LEICA GR10           ----- -----------
 CHER  A    1 P 20:166:00000 20:172:86370 LEICA GRX1200+GNSS   ----- -----------
 CREU  A    1 P 20:166:00000 20:172:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 20:166:00000 20:172:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 EMAZ  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 IGEL  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 20:166:00000 20:172:86370 TRIMBLE NETR9        ----- -----------
 KAST  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 LARE  A    1 P 20:168:45780 20:172:86370 LEICA GRX1200GGPRO   ----- -----------
 LAZK  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 LEIT  A    1 P 20:166:00000 20:171:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 20:166:00000 20:171:86370 LEICA GR50           ----- -----------
 PASA  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 20:166:00000 20:172:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 20:166:00000 20:172:86370 LEICA GRX1200+GNSS   ----- -----------
 SCOA  A    1 P 20:166:00000 20:172:86370 LEICA GR25           ----- -----------
 SOPU  A    1 P 20:166:00000 20:172:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 20:166:00000 20:172:53970 LEICA GRX1200GGPRO   ----- -----------
 VITO  A    1 P 20:166:00000 20:172:86370 LEICA GR10           ----- -----------
 YEBE  A    1 P 20:166:00000 20:172:86370 TRIMBLE NETR9        ----- -----------
 ZARA  A    1 P 20:166:00000 20:172:86370 TRIMBLE NETR9        ----- -----------
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are vailable.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__
 ACOR  A    1 P 20:166:00000 20:172:86370 LEIAT504        LEIS -----
 ALDA  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 ALSA  A    1 P 20:166:00000 20:171:86370 LEIAR10         NONE -----
 AMUR  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 BIAZ  A    1 P 20:166:00000 20:172:82770 LEIAR25         LEIT -----
```

```
 BIDA  A    1 P 20:169:27030 20:172:86370 LEIAS10         NONE -----
 BRZR  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 CACE  A    1 P 20:166:00000 20:172:86370 TRM29659.00     NONE -----
 CANT  A    1 P 20:166:00000 20:172:86370 LEIAR25.R4      LEIT 25066
 CHER  A    1 P 20:166:00000 20:172:86370 LEIAX1203+GNSS  NONE -----
 CREU  A    1 P 20:166:00000 20:172:86370 LEIAR25.R4      NONE 26357
 EBRE  A    1 P 20:166:00000 20:172:86370 LEIAR25.R4      NONE 26359
 ELGE  A    1 P 20:166:00000 20:172:86370 LEIAR25.R4      LEIT -----
 EMAZ  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 GERN  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 IGEL  A    1 P 20:166:00000 20:172:86370 LEIAR20         LEIM -----
 ISPS  A    1 P 20:166:00000 20:172:86370 TRM59900.00     SCIS -----
 KAST  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 LARE  A    1 P 20:168:45780 20:172:86370 LEIAT504        NONE -----
 LAZK  A    1 P 20:166:00000 20:172:86370 LEIAR25.R4      LEIT -----
 LEIT  A    1 P 20:166:00000 20:171:86370 LEIAR10         NONE -----
 ORON  A    1 P 20:166:00000 20:171:86370 LEIAR10         NONE -----
 PASA  A    1 P 20:166:00000 20:172:86370 LEIAR20         LEIM 73034
 RIO1  A    1 P 20:166:00000 20:172:86370 LEIAR25.R4      LEIT 25138
 SALA  A    1 P 20:166:00000 20:172:86370 LEIAR25         NONE -----
 SCOA  A    1 P 20:166:00000 20:172:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 TERU  A    1 P 20:166:00000 20:172:53970 LEIAT504GG      LEIS -----
 VITO  A    1 P 20:166:00000 20:172:86370 LEIAS10         NONE -----
 YEBE  A    1 P 20:166:00000 20:172:86370 TRM29659.00     NONE -----
 ZARA  A    1 P 20:166:00000 20:172:86370 TRM29659.00     NONE -----
```

7.3 Eccentricities

```
*                                          UP______ NORTH___ EAST____
*SITE PT SOLN T DATA_START__ DATA_END____ AXE ARP->BENCHMARK(M)_________
 ACOR  A    1 P 20:166:00000 20:172:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 20:166:00000 20:171:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 20:166:00000 20:172:82770 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 20:169:27030 20:172:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 20:166:00000 20:172:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 20:166:00000 20:172:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 20:166:00000 20:172:86370 UNE   3.0490   0.0000   0.0000
 CHER  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 CREU  A    1 P 20:166:00000 20:172:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 20:166:00000 20:172:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 EMAZ  A    1 P 20:166:00000 20:172:86370 UNE   0.0350   0.0000   0.0000
 GERN  A    1 P 20:166:00000 20:172:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 20:166:00000 20:172:86370 UNE   0.0350   0.0000   0.0000
 KAST  A    1 P 20:166:00000 20:172:86370 UNE   0.0350   0.0000   0.0000
 LARE  A    1 P 20:168:45780 20:172:86370 UNE   0.0000   0.0000   0.0000
 LAZK  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 LEIT  A    1 P 20:166:00000 20:171:86370 UNE   0.0000   0.0000   0.0000
 ORON  A    1 P 20:166:00000 20:171:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 20:166:00000 20:172:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 20:166:00000 20:172:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 20:166:00000 20:172:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 20:166:00000 20:172:53970 UNE   0.0600   0.0000   0.0000
 VITO  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 YEBE  A    1 P 20:166:00000 20:172:86370 UNE   0.0000   0.0000   0.0000
 ZARA  A    1 P 20:166:00000 20:172:86370 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:

```
2020-06-30 22:58 UTC | LARE1680.20O | RECEIVER FIRM. VERS. |  8.71 -> 8.71/3.822
2020-07-01 22:58 UTC | LARE1690.20O | RECEIVER FIRM. VERS. |  8.71 -> 8.71/3.822
2020-07-02 23:10 UTC | LARE1700.20O | RECEIVER FIRM. VERS. |  8.71 -> 8.71/3.822
2020-07-03 23:04 UTC | LARE1710.20O | RECEIVER FIRM. VERS. |  8.71 -> 8.71/3.822
2020-07-04 22:56 UTC | LARE1720.20O | RECEIVER FIRM. VERS. |  8.71 -> 8.71/3.822
```

9 References

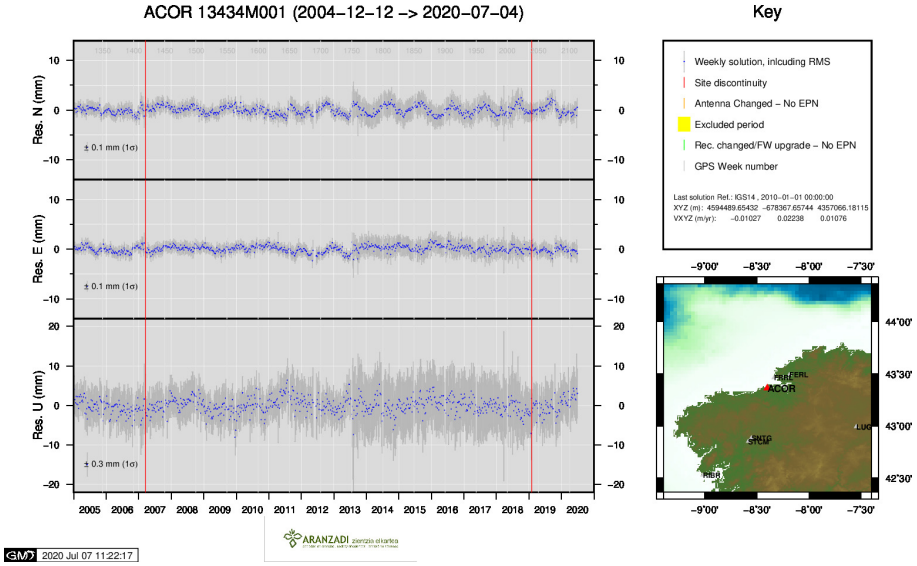
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres.* epncb.oma.be/$_d$*ocumentation/guidelines/guidelines*$_a$*nalysis*$_c$*entres.pdf*

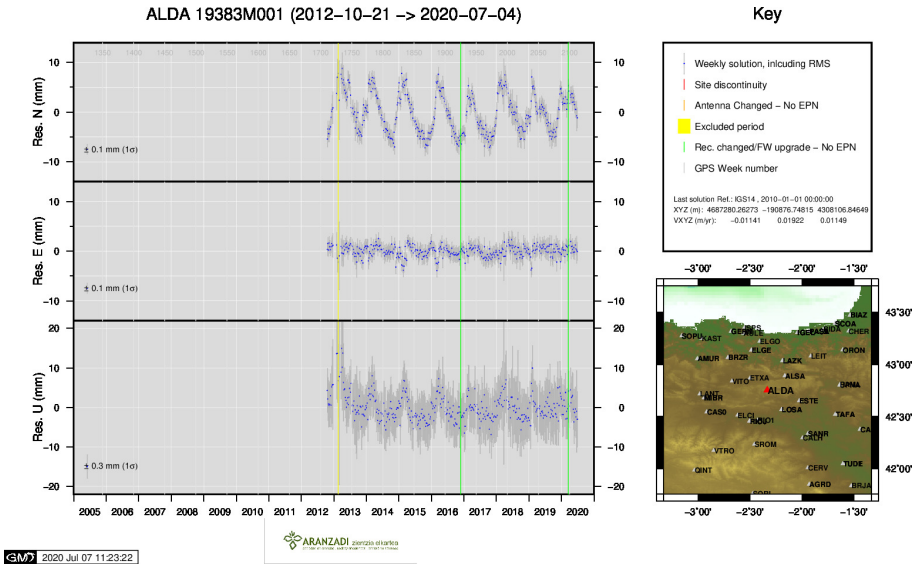
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

10 Cumulative Time Series

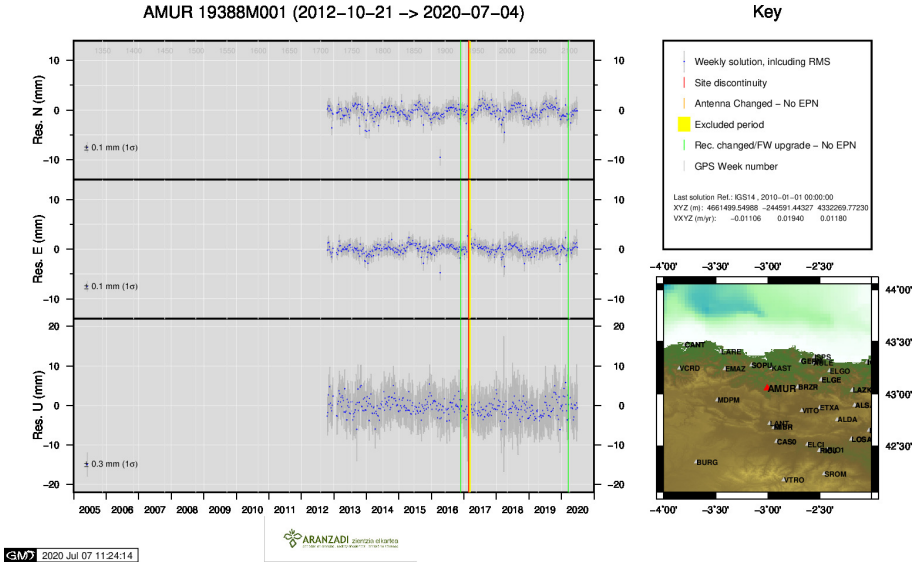
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



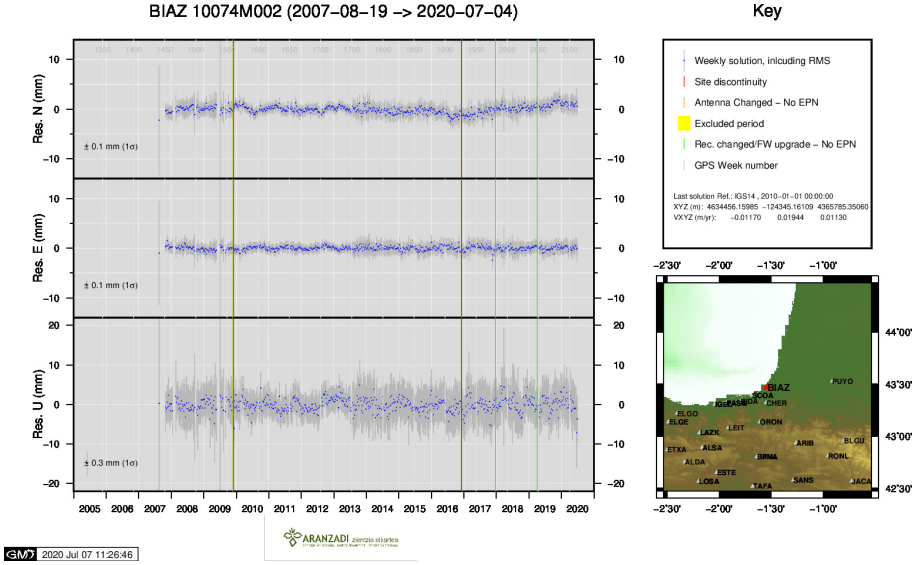
1) ACOR



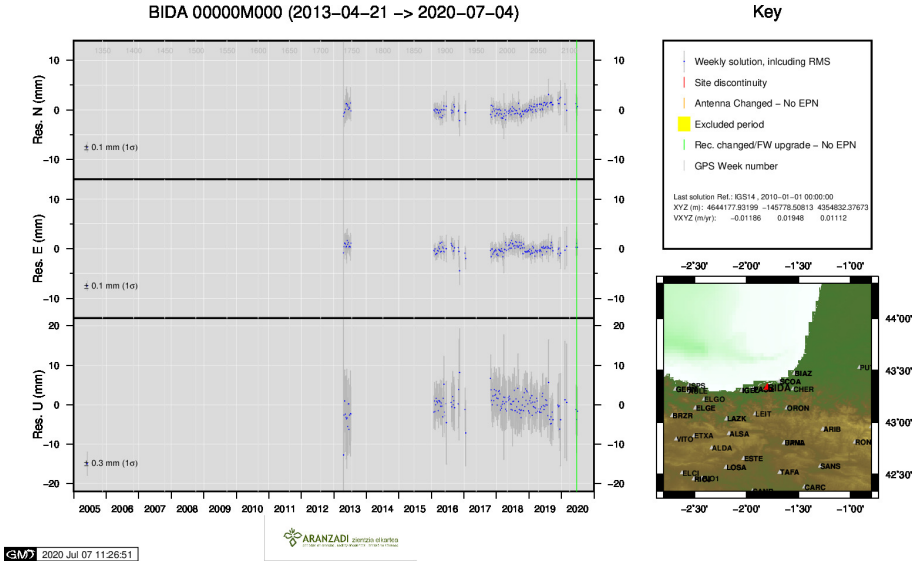
2) ALDA



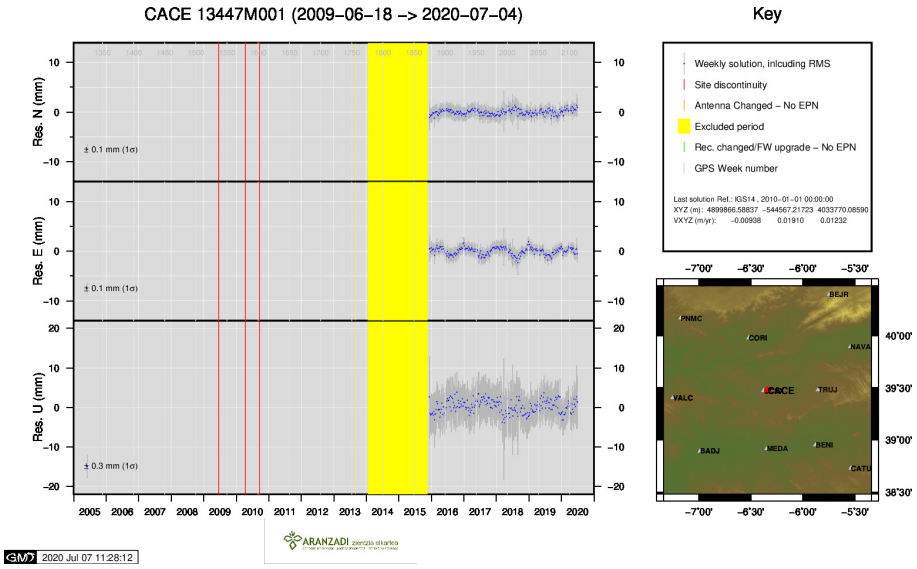
3) AMUR



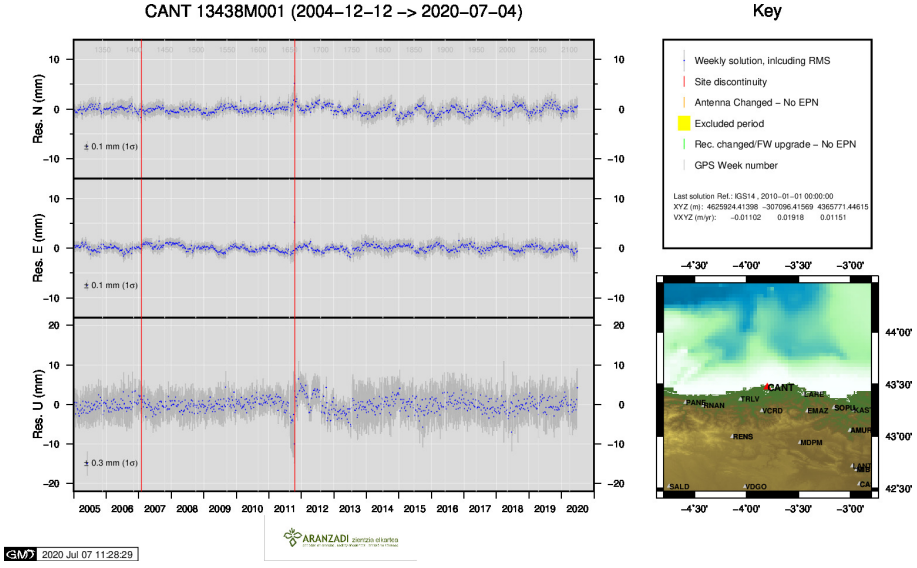
4) BIAZ



5) BIDA



6) CACE



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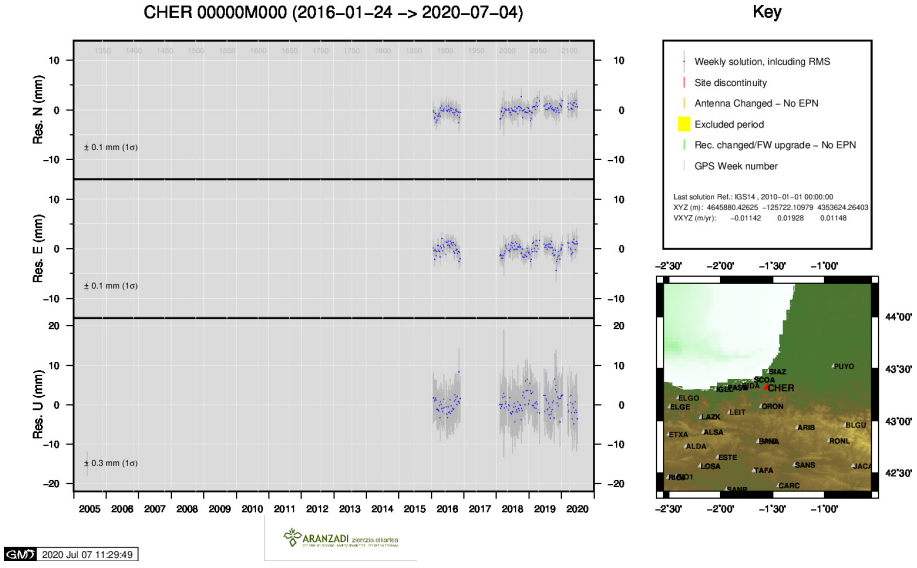

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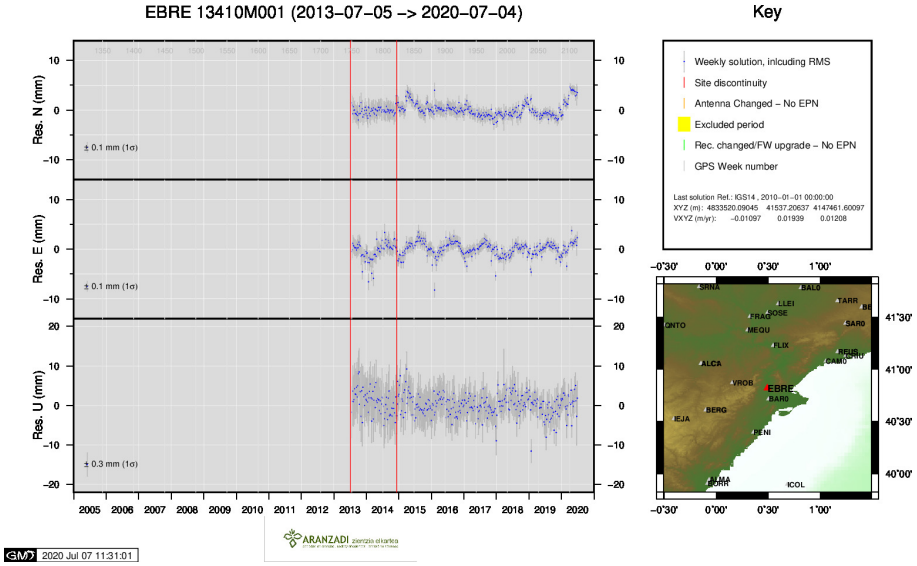

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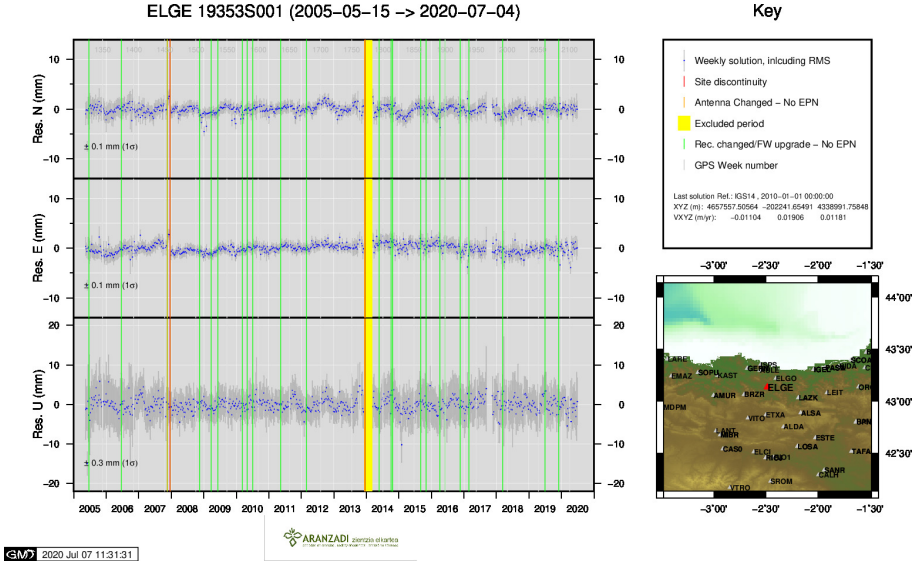

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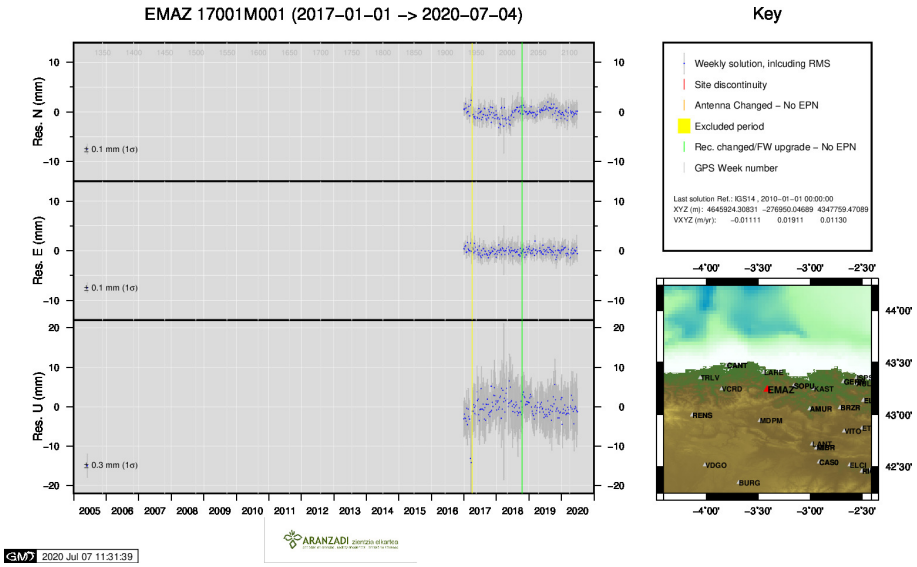

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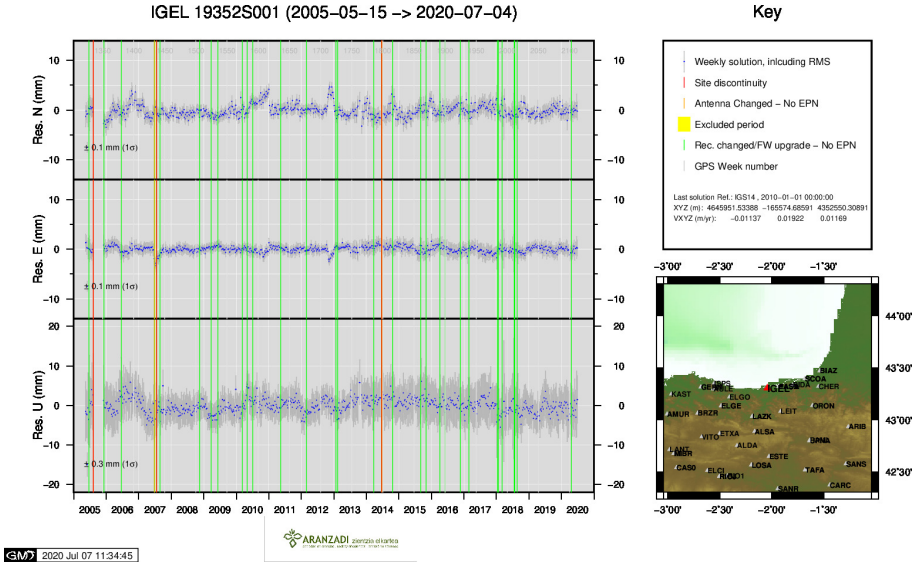

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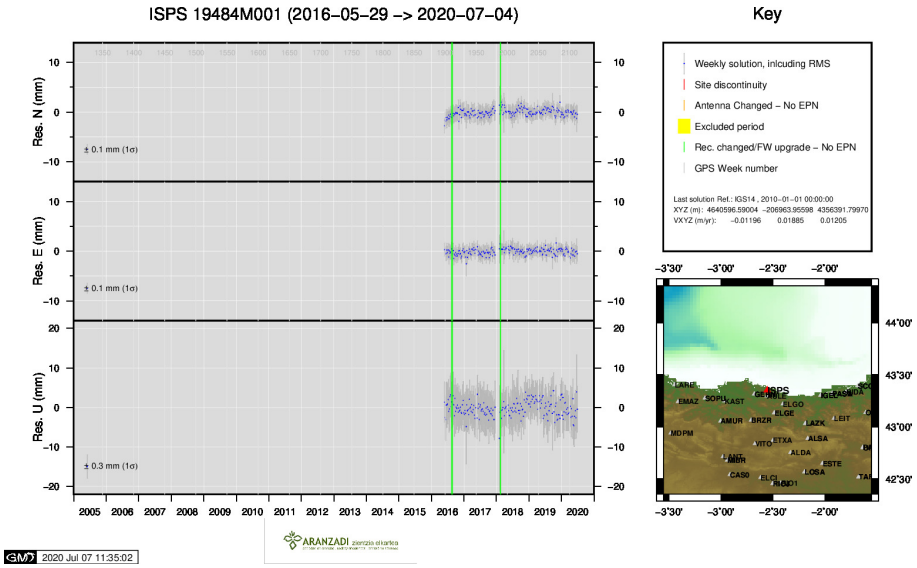

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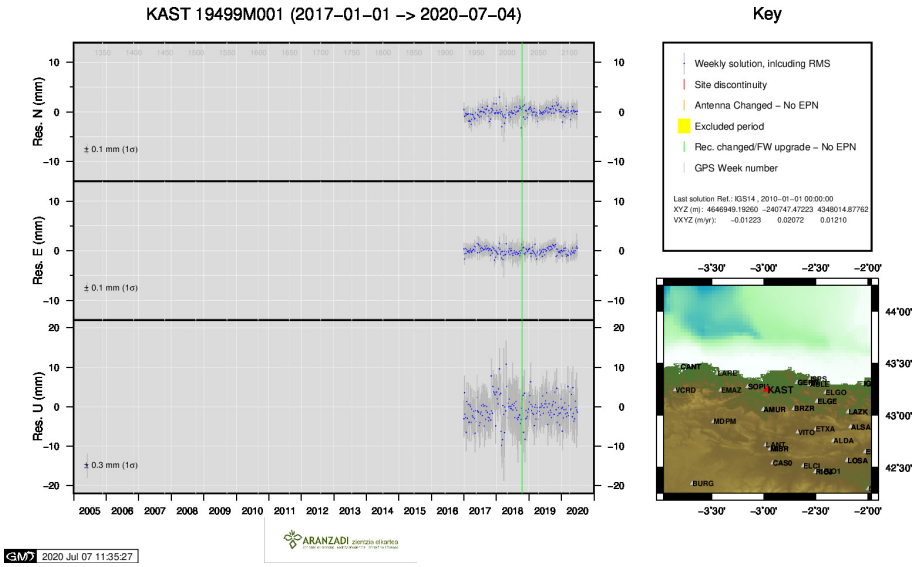

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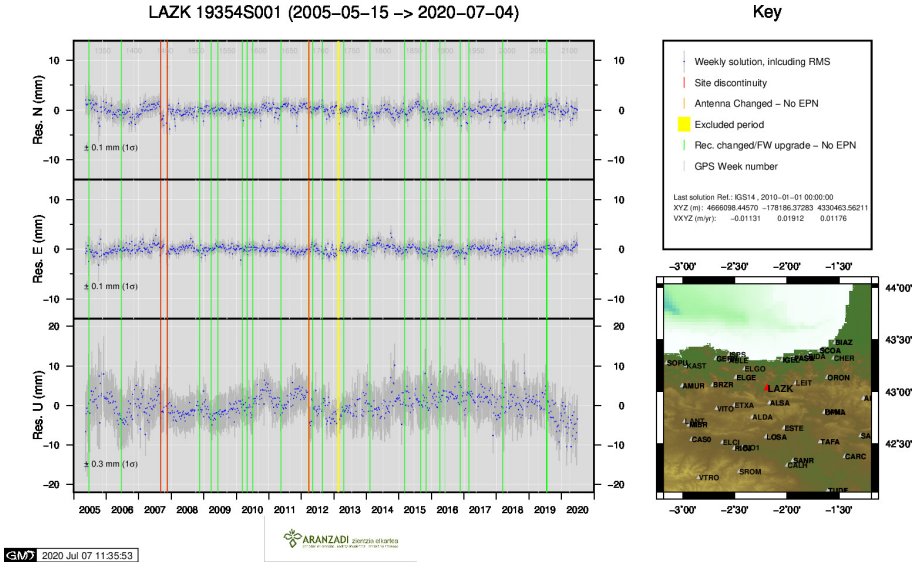

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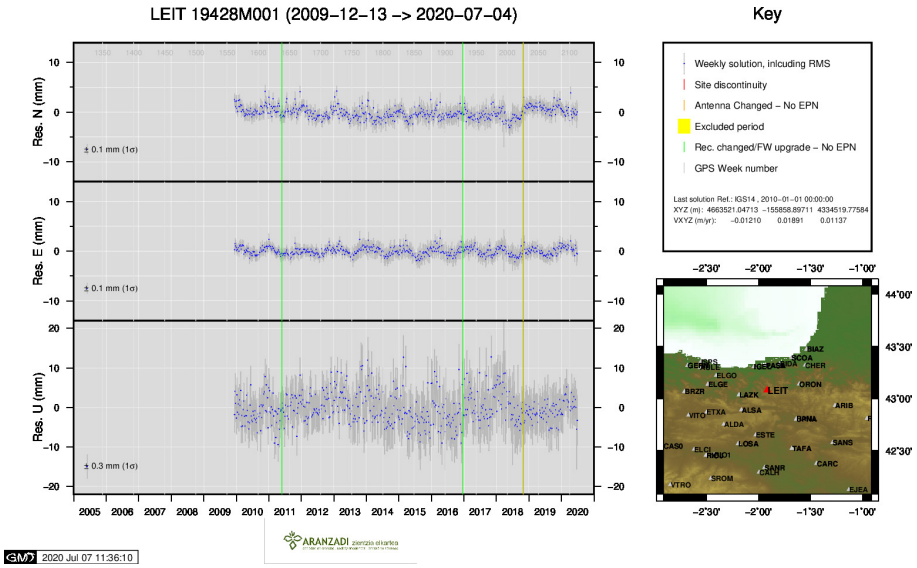

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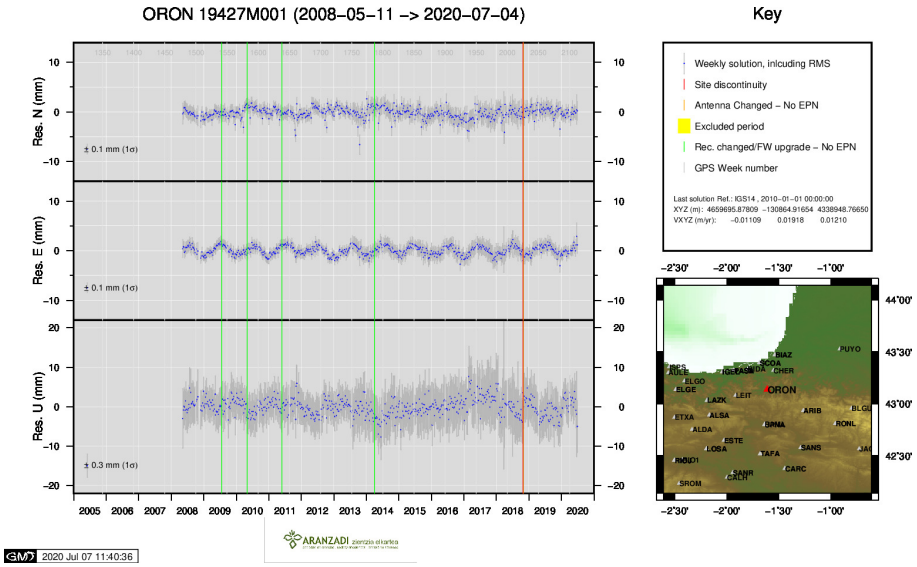

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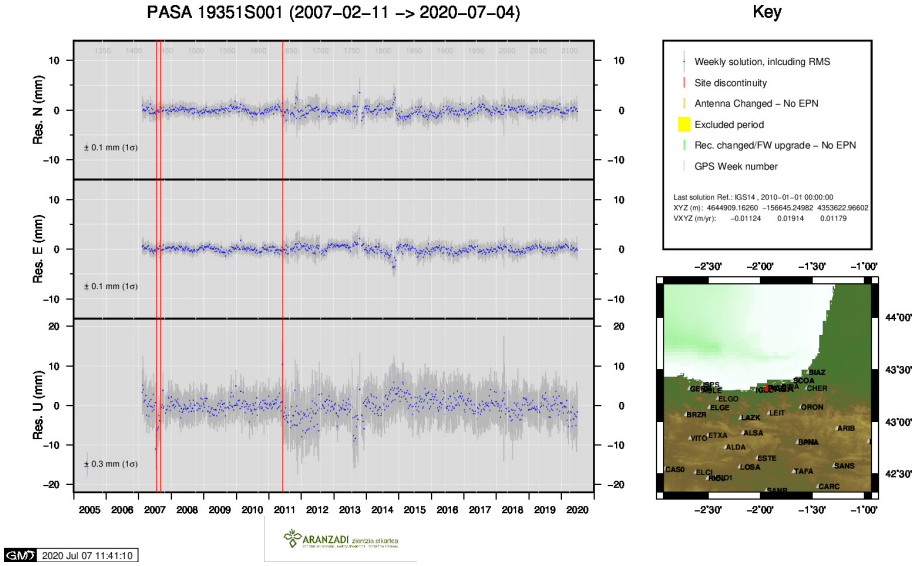

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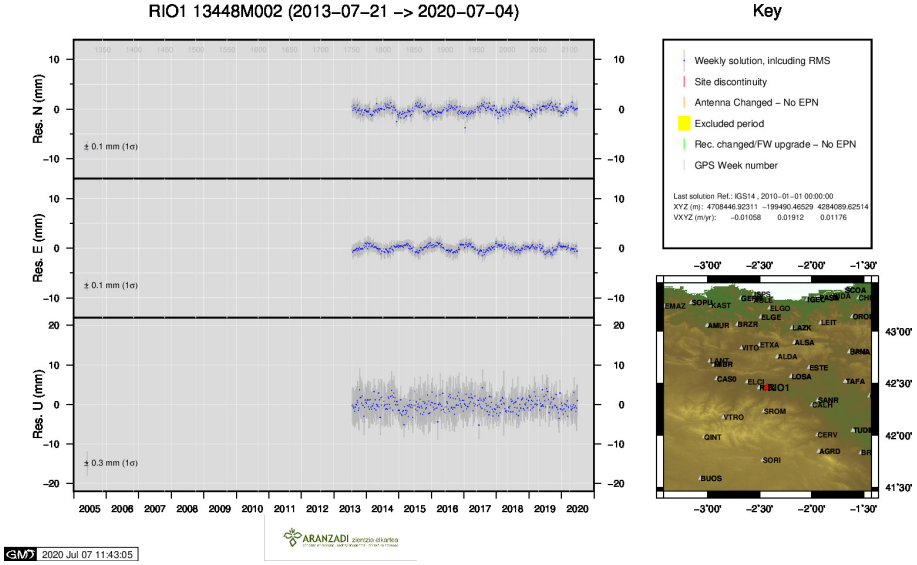

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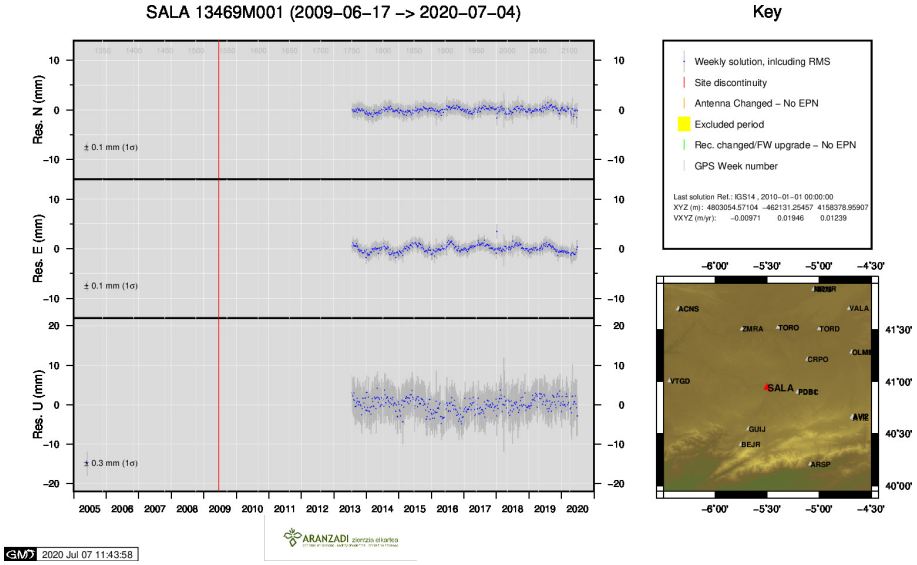

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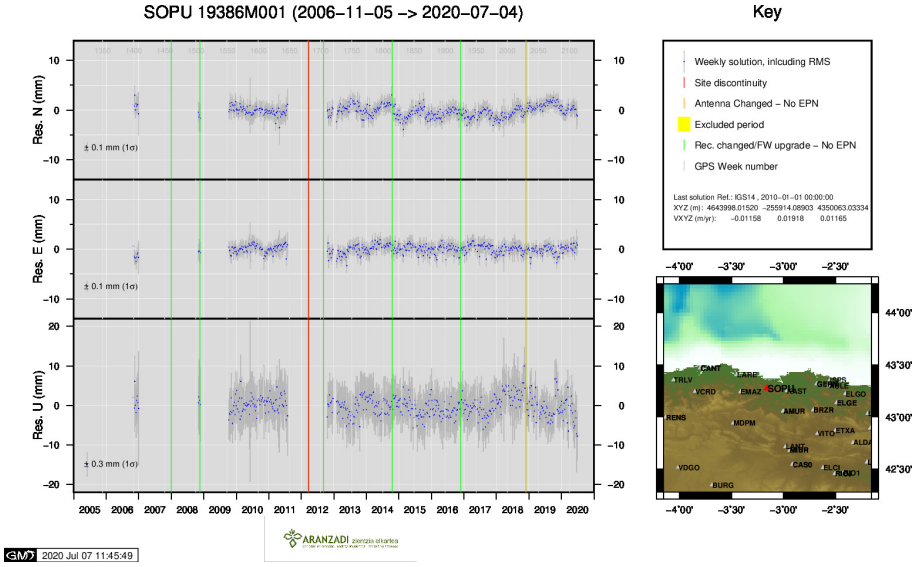

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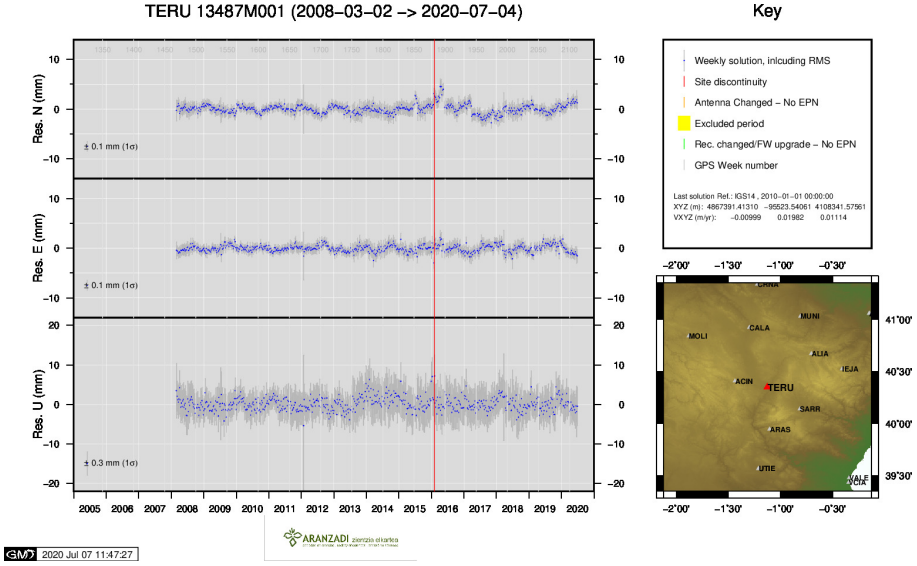

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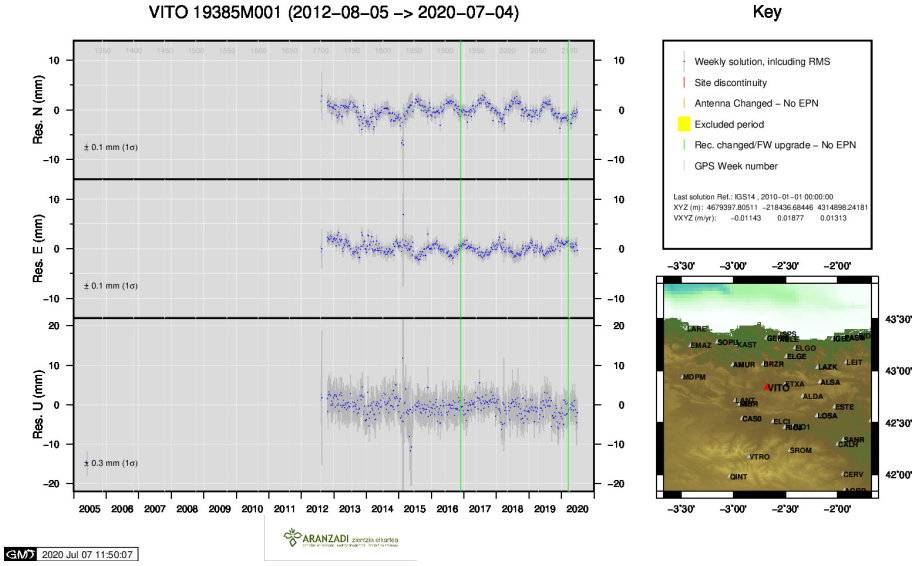
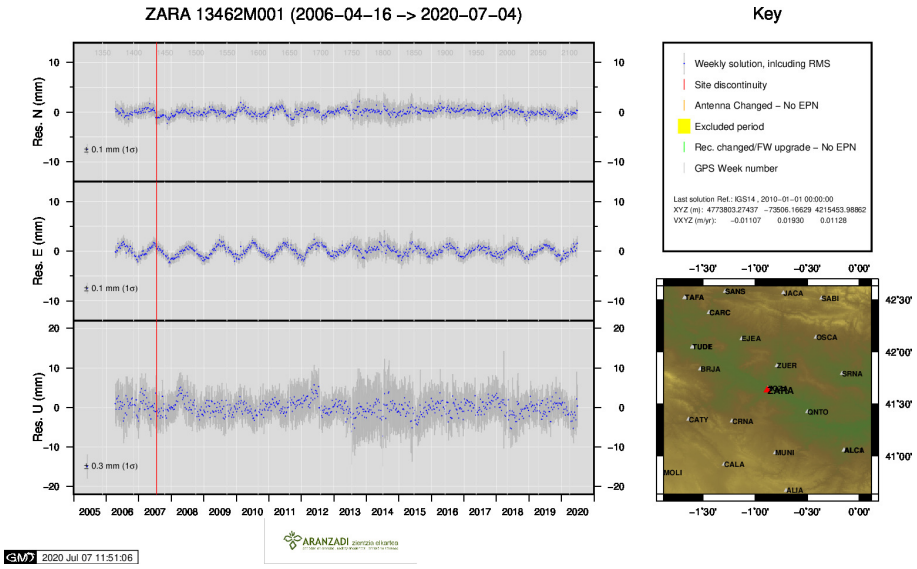


23) VITO


ZARA 13462M001 (2006–04–16 –> 2020–07–04)
Res. N (mm)
Res. E (mm)
Res. U (mm)
± 0.1 mm (1σ)
± 0.1 mm (1σ)
± 0.3 mm (1σ)
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
Key
Weekly solution, inlcuding RMS
Site discontinuity
Antenna Changed – No EPN
Excluded period
Rec. changed/FW upgrade – No EPN
GPS Week number
Last solution Ref.: IGS14 , 2010–01–01 00:00:00
XYZ (m): 4773803.27437 −73506.16629 4215453.98862
VXYZ (m/yr): −0.01107 0.01930 0.01128
−1°30' −1°00' −0°30' 0°00'
42°30'
42°00'
41°30'
41°00'
TAFA
SANS
JACA
SABI
CARC
EJEA
OSCA
TUDE
BRJA
ZUER
SRNA
ZARA
QNTO
CATY
CRNA
MUNI
ALCA
CALA
MOLI
AUA
2020 Jul 07 11:51:06
ARANZADI