ARA-DAC Weekly Analysis Result: 2143 (GFA)

Technical Report

GPS Week: 2143 (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

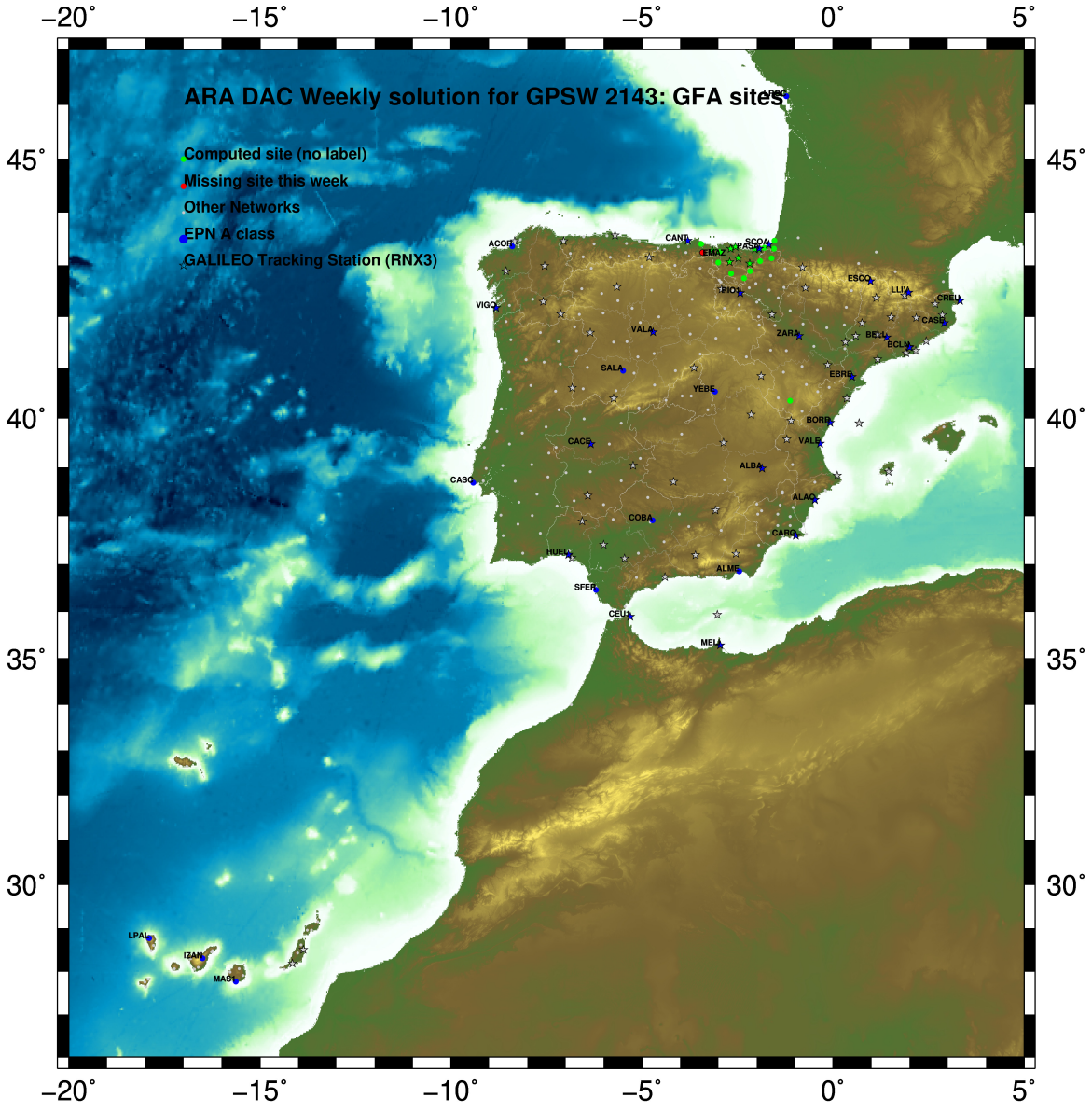

Fig.1: Computed Sites for GPS Week2143 (GFA)

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) IGb14 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 IGb14

The Reference Frame considered in this section is IGb14, release C2130.

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ARA LAC 2143 WEEK FINAL COMBINATION: PRECISE ORBITS             21-FEB-21 13:59
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: IGb14              EPOCH: 2021-02-03 12:00:00

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

  4  ACOR 13434M001    4594489.54135  -678367.40821  4357066.30290    W
 39  ALDA 19383M001    4687280.14274  -190876.53518  4308106.98647    A
 50  ALSA 19419M001    4677250.81171  -176770.36154  4319079.89363    A
 53  AMUR 19388M001    4661499.43255  -244591.22796  4332269.90332    A
100  BIAZ 10074M002    4634456.03065  -124344.94443  4365785.48010    A
101  BIDA 00000M000    4644177.80306  -145778.29211  4354832.50602    A
113  BRZR 19387M001    4662220.96857  -220769.86749  4333309.46070    A
104  CACE 13447M001    4899866.48359  -544567.00452  4033770.22391    W
116  CANT 13438M001    4625924.29215  -307096.20270  4365771.57596    W
154  CHER 00000M000    4645880.00078  -125721.87874  4353624.10576    A
162  CREU 13432M001    4715420.10496   273178.09087  4271946.86031    W
204  EBRE 13410M001    4833519.96566    41537.41905  4147461.73641    W
180  ELGE 19353S001    4657557.38153  -202241.44609  4338991.89048    A
209  GERN 19389M001    4642811.29715  -217222.89285  4353278.89732    A
235  IGEL 19352S001    4645951.40650  -165574.47170  4352550.44016    A
240  ISPS 19484M001    4640596.45448  -206963.74515  4356391.93364    A
245  KAST 19499M001    4646949.05705  -240747.24195  4348015.01516    A
252  LARE 19440M001    4632831.93367  -279026.11123  4360314.45135    A
256  LAZK 19354S001    4666098.30919  -178186.15904  4330463.68202    A
261  LEIT 19428M001    4663520.91589  -155858.68583  4334519.90679    A
334  ORON 19427M001    4659695.75538  -130864.70484  4338948.90318    A
345  PAS2 19351S001    4644909.03692  -156645.03648  4353623.09769    A
493  PASA 19351S001    4644909.03697  -156645.03648  4353623.09776    W
553  RIO1 13448M002    4708446.80614  -199490.25233  4284089.75701    W
558  SALA 13469M001    4803054.46511  -462131.03974  4158379.10023    W
566  SCOA 10088M002    4639940.47863  -136224.91149  4359552.43477    W
418  SOPU 19386M001    4643997.88524  -255913.87561  4350063.16443    A
443  TERU 13487M001    4867391.30011   -95523.32063  4108341.70088    A
493  VITO 19385M001    4679397.68351  -218436.47357  4314898.38660    A
752  YEBE 13420M001    4848724.54611  -261631.89870  4123094.34909    W
755  ZARA 13462M001    4773803.14637   -73505.95290  4215454.11611    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 2143                                   21-FEB-21 13:59
------------------------------------------------------------------------------
LOCAL GEODETIC DATUM: ETRF2000           EPOCH: 2021-02-03 12:00:00

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

  4  ACOR 13434M001    4594489.86111  -678367.97828  4357065.86343    W
 39  ALDA 19383M001    4687280.51915  -190877.11444  4308106.54590    A
 50  ALSA 19419M001    4677251.19066  -176770.93965  4319079.45404    A
 53  AMUR 19388M001    4661499.80410  -244591.80452  4332269.46412    A
100  BIAZ 10074M002    4634456.41948  -124345.51768  4365785.04459    A
101  BIDA 00000M000    4644178.18844  -145778.86649  4354832.06946    A
113  BRZR 19387M001    4662221.34313  -220770.44408  4333309.02175    A
104  CACE 13447M001    4899866.79621  -544567.60770  4033769.76176    W
116  CANT 13438M001    4625924.65843  -307096.77551  4365771.13880    W
154  CHER 00000M000    4645880.38855  -125722.45325  4353623.66932    A
162  CREU 13432M001    4715420.53589   273177.51015  4271946.42332    W
204  EBRE 13410M001    4833520.35895    41536.82457  4147461.28708    W
180  ELGE 19353S001    4657557.75879  -202242.02211  4338991.45214    A
209  GERN 19389M001    4642811.67361  -217223.46728  4353278.45996    A
235  IGEL 19352S001    4645951.78928  -165575.04634  4352550.00321    A
240  ISPS 19484M001    4640596.83243  -206964.31932  4356391.49659    A
245  KAST 19499M001    4646949.43022  -240747.81691  4348014.57717    A
252  LARE 19440M001    4632832.30301  -279026.68473  4360314.01400    A
256  LAZK 19354S001    4666098.68880  -178186.73593  4330463.24330    A
261  LEIT 19428M001    4663521.29855  -155859.26237  4334519.46856    A
334  ORON 19427M001    4659696.14144  -130865.28089  4338948.46557    A
345  PAS2 19351S001    4644909.42088  -156645.61097  4353622.66094    A
493  PASA 19351S001    4644909.42093  -156645.61097  4353622.66101    W
553  RIO1 13448M002    4708447.17973  -199490.83392  4284089.31464    W
558  SALA 13469M001    4803054.79706  -462131.63228  4158378.64692    W
566  SCOA 10088M002    4639940.86554  -136225.48538  4359551.99867    W
418  SOPU 19386M001    4643998.25669  -255914.45028  4350062.72648    A
443  TERU 13487M001    4867391.67364   -95523.91925  4108341.24711    A
493  VITO 19385M001    4679398.05701  -218437.05203  4314897.94631    A
752  YEBE 13420M001    4848724.90023  -261632.49576  4123093.89470    W
755  ZARA 13462M001    4773803.53047   -73506.54126  4215453.67011    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 2143 21-FEB-21 13:59

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2021-02-03 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
4	ACOR 13434M001	4594489.82007	-678368.01630	4357065.91432	W
39	ALDA 19383M001	4687280.47582	-190877.15374	4308106.59667	A
50	ALSA 19419M001	4677251.14739	-176770.97905	4319079.50484	A
53	AMUR 19388M001	4661499.76119	-244591.84376	4332269.51494	A
100	BIAZ 10074M002	4634456.37647	-124345.55743	4365785.09554	A
101	BIDA 00000M000	4644178.14540	-145778.90613	4354832.12038	A
113	BRZR 19387M001	4662221.30015	-220770.48339	4333309.07257	A
104	CACE 13447M001	4899866.75163	-544567.64493	4033769.81187	W
116	CANT 13438M001	4625924.61607	-307096.81468	4365771.18969	W
154	CHER 00000M000	4645880.34543	-125722.49295	4353623.72024	A
162	CREU 13432M001	4715420.49065	273177.46941	4271946.47432	W
204	EBRE 13410M001	4833520.31331	41536.78509	4147461.33760	W
180	ELGE 19353S001	4657557.71580	-202242.06150	4338991.50299	A
209	GERN 19389M001	4642811.63080	-217223.50668	4353278.51085	A
235	IGEL 19352S001	4645951.74628	-165575.08590	4352550.05411	A
240	ISPS 19484M001	4640596.78962	-206964.35876	4356391.54748	A
245	KAST 19499M001	4646949.38745	-240747.85621	4348014.62803	A
252	LARE 19440M001	4632832.26050	-279026.72396	4360314.06488	A
256	LAZK 19354S001	4666098.64564	-178186.77536	4330463.29414	A
261	LEIT 19428M001	4663521.25535	-155859.30190	4334519.51942	A
334	ORON 19427M001	4659696.09820	-130865.32051	4338948.51645	A
345	PAS2 19351S001	4644909.37786	-156645.65057	4353622.71184	A
493	PASA 19351S001	4644909.37791	-156645.65057	4353622.71191	W
553	RIO1 13448M002	4708447.13620	-199490.87311	4284089.36535	W
558	SALA 13469M001	4803054.75332	-462131.67020	4158378.69728	W
566	SCOA 10088M002	4639940.82251	-136225.52506	4359552.04960	W
418	SOPU 19386M001	4643998.21399	-255914.48954	4350062.77735	A
443	TERU 13487M001	4867391.62811	-95523.95813	4108341.29746	A
493	VITO 19385M001	4679398.01385	-218437.09128	4314897.99709	A
752	YEBE 13420M001	4848724.85542	-261632.53416	4123093.94501	W
755	ZARA 13462M001	4773803.48586	-73506.58061	4215453.72071	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 IGb14 solution and are given with respect to the Local frame (North-East-Up).

ARA LAC 2143 WEEK FINAL COMBINATION: PRECISE ORBITS 21-FEB-21 13:59

Station	#Days	Weekday 0123456	Repeatability (mm) N	E	U
ACOR 13434M001	7	XXXXXXX	1.19	0.53	2.71
ALDA 19383M001	7	XXXXXXX	0.71	1.29	4.05
ALSA 19419M001	7	XXXXXXX	2.20	1.96	2.87
AMUR 19388M001	7	XXXXXXX	4.31	3.57	5.42
BIAZ 10074M002	7	XXXXXXX	0.68	0.82	2.20
BIDA 00000M000	7	XXXXXXX	1.55	1.81	4.04
BRZR 19387M001	7	XXXXXXX	2.71	2.00	4.06
CACE 13447M001	7	XXXXXXX	0.63	0.72	2.49
CANT 13438M001	7	XXXXXXX	0.98	0.67	3.41
CHER 00000M000	7	XXXXXXX	1.71	1.01	3.68
CREU 13432M001	7	XXXXXXX	0.60	0.86	4.70
EBRE 13410M001	7	XXXXXXX	3.23	6.90	10.06
ELGE 19353S001	7	XXXXXXX	1.34	3.72	2.22
GERN 19389M001	7	XXXXXXX	1.02	1.25	3.29
IGEL 19352S001	7	XXXXXXX	1.43	0.73	4.07
ISPS 19484M001	7	XXXXXXX	1.78	2.46	3.97
KAST 19499M001	7	XXXXXXX	1.87	1.54	9.85
LARE 19440M001	7	XXXXXXX	1.48	0.69	3.01
LAZK 19354S001	7	XXXXXXX	1.52	1.56	10.58
LEIT 19428M001	7	XXXXXXX	1.83	0.61	3.10
ORON 19427M001	7	XXXXXXX	1.38	0.99	4.01
PAS2 19351S001	7	XXXXXXX	0.89	0.47	2.62
PASA 19351S001	7	XXXXXXX	0.93	0.43	2.37
RIO1 13448M002	7	XXXXXXX	1.23	1.27	2.09
SALA 13469M001	7	XXXXXXX	0.58	0.48	4.34
SCOA 10088M002	7	XXXXXXX	1.90	1.12	3.21
SOPU 19386M001	7	XXXXXXX	2.19	2.17	4.32
TERU 13487M001	4	XXXX	1.33	1.64	1.12
VITO 19385M001	7	XXXXXXX	2.72	1.30	3.73
YEBE 13420M001	7	XXXXXXX	0.35	0.60	2.11
ZARA 13462M001	7	XXXXXXX	1.28	0.52	2.49

Comparison of individual solutions:

ACOR 13434M001	N	1.19	-0.22	-1.52	1.86	1.51	0.35	-0.50	0.20
ACOR 13434M001	E	0.53	0.61	-0.48	0.25	0.03	-0.01	-0.79	-0.64
ACOR 13434M001	U	2.71	-1.97	-0.55	0.44	1.50	-5.62	-0.22	-2.39
ALDA 19383M001	N	0.71	0.56	0.82	1.30	-0.34	-0.04	-0.40	-0.27
ALDA 19383M001	E	1.29	1.60	0.54	-2.41	-0.00	-0.26	1.10	0.16
ALDA 19383M001	U	4.05	1.04	-6.40	5.20	1.90	-2.25	-0.80	4.47
ALSA 19419M001	N	2.20	2.02	2.09	-2.97	2.53	-1.09	-1.90	0.80
ALSA 19419M001	E	1.96	0.69	1.32	-3.91	1.95	1.17	0.15	-0.64
ALSA 19419M001	U	2.87	3.92	1.45	-1.67	-2.54	-2.64	3.63	1.57
AMUR 19388M001	N	4.31	1.71	0.96	1.37	-7.38	1.37	3.89	5.86
AMUR 19388M001	E	3.57	1.06	3.66	1.80	-7.23	-1.21	1.44	1.68
AMUR 19388M001	U	5.42	5.52	4.04	-0.00	-9.84	-3.78	0.21	4.26
BIAZ 10074M002	N	0.68	0.20	-0.07	-0.61	-0.15	-0.40	-0.15	1.47
BIAZ 10074M002	E	0.82	1.00	0.46	0.52	-0.79	-1.05	-0.86	-0.23
BIAZ 10074M002	U	2.20	0.09	4.46	-0.32	0.79	-1.08	-2.67	-0.18
BIDA 00000M000	N	1.55	-1.56	-2.38	0.36	1.42	-0.35	1.01	1.74
BIDA 00000M000	E	1.81	1.21	2.46	-0.90	1.24	-1.71	-0.65	-2.51
BIDA 00000M000	U	4.04	4.46	6.77	-3.82	-3.55	-0.07	-2.27	-0.36
BRZR 19387M001	N	2.71	-1.62	-0.87	-3.35	4.79	-2.40	-0.26	-0.84
BRZR 19387M001	E	2.00	-0.15	1.03	-2.43	3.28	-1.87	-0.56	-1.58
BRZR 19387M001	U	4.06	0.62	1.15	1.72	-5.90	-0.68	-2.11	7.39
CACE 13447M001	N	0.63	-0.36	-0.71	-0.63	0.17	0.84	0.65	0.46
CACE 13447M001	E	0.72	0.35	0.90	-0.88	0.17	-0.75	-0.46	-0.75
CACE 13447M001	U	2.49	-2.92	-4.60	-1.07	-0.61	2.06	-1.33	-0.01
CANT 13438M001	N	0.98	-1.42	-1.30	-0.63	1.20	0.18	0.36	-0.16
CANT 13438M001	E	0.67	0.25	1.19	-0.89	-0.17	-0.29	-0.32	-0.48
CANT 13438M001	U	3.41	3.77	4.18	2.86	2.07	-2.55	-2.42	-3.65
CHER 00000M000	N	1.71	-0.16	-0.84	-0.50	-3.31	-0.33	1.92	1.34
CHER 00000M000	E	1.01	0.44	0.64	0.29	-1.63	-1.62	0.34	-0.18
CHER 00000M000	U	3.68	0.75	2.60	1.69	7.99	-1.10	-2.45	-0.04
CREU 13432M001	N	0.60	0.18	-1.01	0.24	-0.48	-0.53	0.13	-0.73
CREU 13432M001	E	0.86	1.05	1.22	-0.17	-0.48	-0.53	-0.39	-1.07
CREU 13432M001	U	4.70	0.83	9.92	1.48	2.57	-2.93	-1.84	-3.56
EBRE 13410M001	N	3.23	5.90	2.51	-3.16	-0.65	-1.51	-1.02	-2.76
EBRE 13410M001	E	6.90	-9.66	-10.81	6.82	2.74	2.83	1.95	3.02
EBRE 13410M001	U	10.06	-16.70	-11.06	8.83	6.01	0.97	2.03	9.34
ELGE 19353S001	N	1.34	-0.65	-1.62	-0.12	-1.65	1.49	-0.91	-1.41
ELGE 19353S001	E	3.72	3.68	2.19	-5.00	-3.49	-4.51	1.72	2.02
ELGE 19353S001	U	2.22	-2.75	1.27	2.53	3.09	1.09	-0.39	-1.75
GERN 19389M001	N	1.02	-0.52	-0.06	-1.28	0.40	-1.12	-0.64	-1.57
GERN 19389M001	E	1.25	-1.08	-1.33	-1.94	1.41	-0.00	0.77	0.33
GERN 19389M001	U	3.29	-0.40	-1.99	-1.33	0.85	-0.84	-1.45	7.46
IGEL 19352S001	N	1.43	-2.39	-0.35	0.97	0.84	-0.48	-1.32	-1.67
IGEL 19352S001	E	0.73	-0.46	0.81	0.11	0.91	-0.06	-0.70	-1.00
IGEL 19352S001	U	4.07	2.32	-3.00	-2.19	8.22	0.32	-1.57	-3.16
ISPS 19484M001	N	1.78	-2.40	-1.20	-1.60	2.27	0.77	-1.03	-1.58
ISPS 19484M001	E	2.46	0.40	0.43	-5.32	2.55	0.71	-0.73	-0.16
ISPS 19484M001	U	3.97	-3.52	2.67	-5.22	5.08	-2.33	1.28	3.84
KAST 19499M001	N	1.87	-2.08	-0.95	-3.66	0.43	-0.21	-0.17	1.42
KAST 19499M001	E	1.54	-1.44	-0.88	-1.85	2.22	-0.96	1.14	-0.88
KAST 19499M001	U	9.85	-6.14	-2.03	-9.50	-6.23	-1.52	15.05	13.51
LARE 19440M001	N	1.48	0.26	-0.75	-1.05	2.77	-0.68	-1.32	-1.21
LARE 19440M001	E	0.69	-0.13	-0.53	-0.04	-1.29	0.89	0.24	0.11
LARE 19440M001	U	3.01	-1.15	0.02	4.48	-1.19	5.19	-1.03	-1.94
LAZK 19354S001	N	1.52	2.06	1.34	1.21	-2.33	-0.81	-0.41	0.10
LAZK 19354S001	E	1.56	1.50	-0.10	2.56	-2.29	-0.11	-0.80	-0.01
LAZK 19354S001	U	10.58	-9.29	-5.39	8.01	15.13	3.95	6.16	-14.47
LEIT 19428M001	N	1.83	-0.11	-0.91	-1.40	-0.38	4.13	0.26	-0.20
LEIT 19428M001	E	0.61	0.44	0.59	0.05	0.49	0.45	-0.91	-0.63
LEIT 19428M001	U	3.10	3.19	2.47	-2.18	4.44	-3.78	0.85	-1.30

ORON	19427M001	N	1.38	-0.99	-0.89	1.69	1.15	1.97	-0.28	-1.22
ORON	19427M001	E	0.99	1.46	-0.76	0.77	-1.33	-0.38	0.02	0.83
ORON	19427M001	U	4.01	0.31	-1.84	6.10	4.26	-6.00	-0.66	1.08
PAS2	19351S001	N	0.89	-1.26	-0.07	-1.47	-0.26	-0.17	-0.67	-0.65
PAS2	19351S001	E	0.47	0.36	0.72	-0.07	-0.61	-0.23	-0.23	-0.47
PAS2	19351S001	U	2.62	4.05	0.17	-2.96	1.79	0.79	-3.50	-0.26
PASA	19351S001	N	0.93	-1.32	-0.06	-1.59	-0.42	0.02	-0.49	-0.67
PASA	19351S001	E	0.43	0.55	0.48	-0.11	-0.46	-0.25	-0.25	-0.47
PASA	19351S001	U	2.37	3.69	0.40	-2.40	2.26	-0.31	-3.00	-0.29
RIO1	13448M002	N	1.23	-1.31	-0.23	0.27	2.39	0.40	1.13	0.17
RIO1	13448M002	E	1.27	1.79	1.61	0.43	-0.37	-1.51	-0.95	-0.57
RIO1	13448M002	U	2.09	0.21	-0.93	-2.88	0.23	1.22	2.74	2.82
SALA	13469M001	N	0.58	0.11	-0.57	0.46	-0.83	0.66	0.57	-0.12
SALA	13469M001	E	0.48	0.32	0.63	-0.41	-0.49	-0.08	-0.33	-0.60
SALA	13469M001	U	4.34	-2.91	1.31	2.54	7.66	-2.22	-5.19	-2.39
SCOA	10088M002	N	1.90	-2.30	-1.59	-0.92	-0.63	0.46	2.74	2.21
SCOA	10088M002	E	1.12	-0.41	0.16	-0.69	-1.41	-1.14	1.42	1.22
SCOA	10088M002	U	3.21	-0.48	6.31	0.81	0.03	0.76	-2.53	-3.78
SOPU	19386M001	N	2.19	-1.90	-2.36	-0.76	3.42	0.32	-2.38	-1.23
SOPU	19386M001	E	2.17	0.16	-1.22	-4.00	3.01	0.47	0.58	-1.02
SOPU	19386M001	U	4.32	1.12	-9.07	3.20	1.68	0.85	0.95	3.68
TERU	13487M001	N	1.33	1.95	-0.15	-1.23	-0.06			
TERU	13487M001	E	1.64	1.22	-2.51	-0.41	0.36			
TERU	13487M001	U	1.12	0.12	1.21	0.06	1.52			
VITO	19385M001	N	2.72	2.02	2.02	1.55	-4.80	1.05	2.04	2.31
VITO	19385M001	E	1.30	1.69	1.00	0.83	-1.68	-0.88	0.20	1.40
VITO	19385M001	U	3.73	1.22	-0.94	-3.08	-5.82	-2.37	1.32	5.52
YEBE	13420M001	N	0.35	-0.58	-0.17	0.46	0.36	0.14	0.05	0.02
YEBE	13420M001	E	0.60	0.43	0.03	-0.54	0.97	-0.59	-0.27	-0.59
YEBE	13420M001	U	2.11	-2.60	-3.53	0.59	1.78	-1.20	1.31	0.90
ZARA	13462M001	N	1.28	-1.86	0.62	0.61	2.33	-0.17	-0.38	-0.21
ZARA	13462M001	E	0.52	0.81	-0.47	0.13	0.37	-0.23	-0.73	0.05
ZARA	13462M001	U	2.49	4.11	-1.50	0.45	0.52	-3.22	0.94	-2.55

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: IGb14
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
4	ACOR 13434M001	I W	-0.80	-1.12	-0.92
12	ALAC 13433M001	I W	-0.64	0.43	1.00
15	ALBA 13452M001	I W	-1.07	-0.75	-1.60
21	ALME 13437M001	I W	-0.42	-1.25	1.47
47	BCLN 13412M001	I W	-0.73	-0.69	-0.35
52	BELL 13431M001	I W	-0.64	-2.32	1.82
71	BORR 13480M001	I W	-1.70	-2.14	-2.07
76	BRST 10004M004	I W	-2.03	-1.82	1.96
104	CACE 13447M001	I W	0.22	-0.02	4.87
116	CANT 13438M001	I W	-1.78	-0.31	-1.26
117	CARG 19412M001	I W	0.56	-1.35	-1.18
122	CASE 13494M001	I W	-0.54	-0.25	-0.22
128	CEU1 13449M002	I W	-0.37	-0.19	-2.59
143	COBA 13453M001	I W	0.05	-0.43	-2.58
162	CREU 13432M001	I W	-1.27	0.64	2.42
204	EBRE 13410M001	I W	-2.31	3.75	0.73
222	ESCO 13435M001	I W	3.09	0.88	5.94
299	HUEL 13451M001	I W	-1.96	4.52	-1.26
316	IZAN 31309M002	I W	5.84	-1.94	-2.67
385	LLIV 13436M001	I W	-1.35	2.41	2.92
390	LPAL 81701M001	I W	-1.36	2.54	-6.92
392	LROC 10023M001	I W	-0.00	0.41	0.15
421	MAS1 31303M002	I W	-1.11	-0.63	1.09
432	MELI 19379M001	I W	0.50	1.50	0.61
493	PASA 19351S001	I W	-0.69	-1.60	-1.55
501	PDEL 31906M004	I W	7.44	8.49	-2.95
553	RIO1 13448M002	I W	-1.34	-0.84	-1.70
558	SALA 13469M001	I W	-0.14	0.92	-4.18
566	SCOA 10088M002	I W	0.30	-0.03	-4.64
574	SFER 13402M004	I W	1.16	-0.94	2.67
700	VALA 13463M002	I W	-0.04	0.90	0.29
704	VALE 13439M001	I W	0.35	0.08	-0.34
715	VIGO 13450M001	I W	-0.52	1.22	1.29
752	YEBE 13420M001	I W	-0.79	0.22	4.94
755	ZARA 13462M001	I W	-0.57	0.02	0.18
764	ZIMM 14001M004	I W	0.75	-2.06	2.94
121	CASC 13909S001	A W	3.91	-8.27	1.70
	RMS / COMPONENT		2.04	2.51	2.71
	MEAN		0.00	-0.00	-0.00
	MIN		-2.31	-8.27	-6.92
	MAX		7.44	8.49	5.94

NUMBER OF PARAMETERS : 3
NUMBER OF COORDINATES : 111
RMS OF TRANSFORMATION : 2.44 MM

BARYCENTER COORDINATES:

LATITUDE : 39 58 52.05
LONGITUDE : - 4 16 55.01
HEIGHT : -43.341 KM

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.40 MM
TRANSLATION IN E : -0.00 +- 0.40 MM
TRANSLATION IN U : -0.00 +- 0.40 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 to the daily solutions are shown.

```
*_STATISTICAL PARAMETER________ __VALUE(S)____________
 NUMBER OF OBSERVATIONS                       18475449
 NUMBER OF UNKNOWNS                             218391
 NUMBER OF DEGREES OF FREEDOM                 18257058
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                     1.858303567134901
```

Helmert Transformation Parameters With Respect to Combined Solution:

		Translation (m)			Rotation (")			
Sol	Rms (m)	X	Y	Z	X	Y	Z	Scale (ppm)
1	0.00327	-0.0078	-0.0256	0.0062	0.0005	-0.0003	-0.0006	0.00002
2	0.00323	-0.0109	-0.0197	0.0143	0.0004	-0.0006	-0.0005	-0.00023
3	0.00286	-0.0038	0.0051	0.0016	-0.0000	-0.0001	0.0002	0.00035
4	0.00232	0.0034	0.0130	-0.0051	-0.0002	0.0002	0.0004	0.00040
5	0.00209	-0.0027	0.0144	0.0058	-0.0003	-0.0002	0.0004	-0.00018
6	0.00251	0.0068	-0.0014	0.0000	-0.0000	0.0001	-0.0001	-0.00082
7	0.00356	0.0084	-0.0051	-0.0023	0.0002	0.0002	-0.0001	-0.00064

Statistics of individual solutions:

File	RMS (m)	DOF	Chi**2/DOF	#Observations authentic	/ pseudo	#Parameters explicit	/ implicit	/ singular
1	0.00149	2597363	2.21	2631099	3	969	32770	0
2	0.00144	2556994	2.08	2590544	3	978	32575	0
3	0.00133	2636767	1.77	2668292	3	984	30544	0
4	0.00130	2616335	1.69	2648012	3	981	30699	0
5	0.00130	2553887	1.68	2584427	3	954	29589	0
6	0.00129	2600637	1.67	2632447	3	969	30844	0
7	0.00132	2689273	1.75	2720628	3	975	30383	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 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 ALDA  A    1 P 21:031:00000 21:037:86370 LEICA GR10           ----- -----------
 ALSA  A    1 P 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 21:031:00000 21:037:86370 LEICA GR10           ----- -----------
 BIAZ  A    1 P 21:031:00000 21:037:86370 SPECTRA SP90M        ----- -----------
 BIDA  A    1 P 21:031:00000 21:037:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 21:031:00000 21:037:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 21:031:00000 21:037:86370 LEICA GR10           ----- -----------
 CHER  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 CREU  A    1 P 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 IGEL  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 21:031:00000 21:037:86370 TRIMBLE NETR9        ----- -----------
 KAST  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 LARE  A    1 P 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 LAZK  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 LEIT  A    1 P 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 21:031:00000 21:037:86370 LEICA GR50           ----- -----------
 PAS2  A    1 P 21:031:00030 21:037:86370 STONEX SC2200        ----- -----------
 PASA  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 21:031:00000 21:037:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 21:031:00000 21:037:86370 LEICA GRX1200+GNSS   ----- -----------
 SCOA  A    1 P 21:031:00000 21:037:86370 LEICA GR25           ----- -----------
 SOPU  A    1 P 21:031:00000 21:037:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 21:031:00000 21:034:86370 LEICA GRX1200GGPRO   ----- -----------
 VITO  A    1 P 21:031:00000 21:037:86370 LEICA GR10           ----- -----------
 YEBE  A    1 P 21:031:00000 21:037:86370 TRIMBLE NETR9        ----- -----------
 ZARA  A    1 P 21:031:00000 21:037:86370 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 21:031:00000 21:037:86370 LEIAT504        LEIS -----
 ALDA  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 ALSA  A    1 P 21:031:00000 21:037:86370 LEIAR10         NONE -----
 AMUR  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 BIAZ  A    1 P 21:031:00000 21:037:86370 LEIAR25         LEIT -----
```

```
 BIDA  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 BRZR  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 CACE  A    1 P 21:031:00000 21:037:86370 TRM29659.00     NONE -----
 CANT  A    1 P 21:031:00000 21:037:86370 LEIAR25.R4      LEIT 25066
 CHER  A    1 P 21:031:00000 21:037:86370 LEIAR10         NONE -----
 CREU  A    1 P 21:031:00000 21:037:86370 LEIAR25.R4      NONE 26357
 EBRE  A    1 P 21:031:00000 21:037:86370 LEIAR25.R4      NONE 26359
 ELGE  A    1 P 21:031:00000 21:037:86370 LEIAR25.R4      LEIT -----
 GERN  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 IGEL  A    1 P 21:031:00000 21:037:86370 LEIAR20         LEIM -----
 ISPS  A    1 P 21:031:00000 21:037:86370 TRM59900.00     SCIS -----
 KAST  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 LARE  A    1 P 21:031:00000 21:037:86370 LEIAR20         LEIM -----
 LAZK  A    1 P 21:031:00000 21:037:86370 LEIAR25.R4      LEIT -----
 LEIT  A    1 P 21:031:00000 21:037:86370 LEIAR10         NONE -----
 ORON  A    1 P 21:031:00000 21:037:86370 LEIAR10         NONE -----
 PAS2  A    1 P 21:031:00030 21:037:86370 LEIAR20         LEIM 73034
 PASA  A    1 P 21:031:00000 21:037:86370 LEIAR20         LEIM 73034
 RIO1  A    1 P 21:031:00000 21:037:86370 LEIAR25.R4      LEIT 25138
 SALA  A    1 P 21:031:00000 21:037:86370 LEIAR25         NONE -----
 SCOA  A    1 P 21:031:00000 21:037:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 TERU  A    1 P 21:031:00000 21:034:86370 LEIAT504GG      LEIS -----
 VITO  A    1 P 21:031:00000 21:037:86370 LEIAS10         NONE -----
 YEBE  A    1 P 21:031:00000 21:037:86370 TRM29659.00     NONE -----
 ZARA  A    1 P 21:031:00000 21:037:86370 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 21:031:00000 21:037:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 21:031:00000 21:037:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 21:031:00000 21:037:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 21:031:00000 21:037:86370 UNE   3.0490   0.0000   0.0000
 CHER  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 CREU  A    1 P 21:031:00000 21:037:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 21:031:00000 21:037:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 GERN  A    1 P 21:031:00000 21:037:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 21:031:00000 21:037:86370 UNE   0.0350   0.0000   0.0000
 KAST  A    1 P 21:031:00000 21:037:86370 UNE   0.0350   0.0000   0.0000
 LARE  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 LAZK  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 LEIT  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 ORON  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 PAS2  A    1 P 21:031:00030 21:037:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 21:031:00000 21:037:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 21:031:00000 21:037:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 21:031:00000 21:037:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 21:031:00000 21:034:86370 UNE   0.0600   0.0000   0.0000
 VITO  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 YEBE  A    1 P 21:031:00000 21:037:86370 UNE   0.0000   0.0000   0.0000
 ZARA  A    1 P 21:031:00000 21:037:86370 UNE   3.2590   0.0000   0.0000
```

8 References

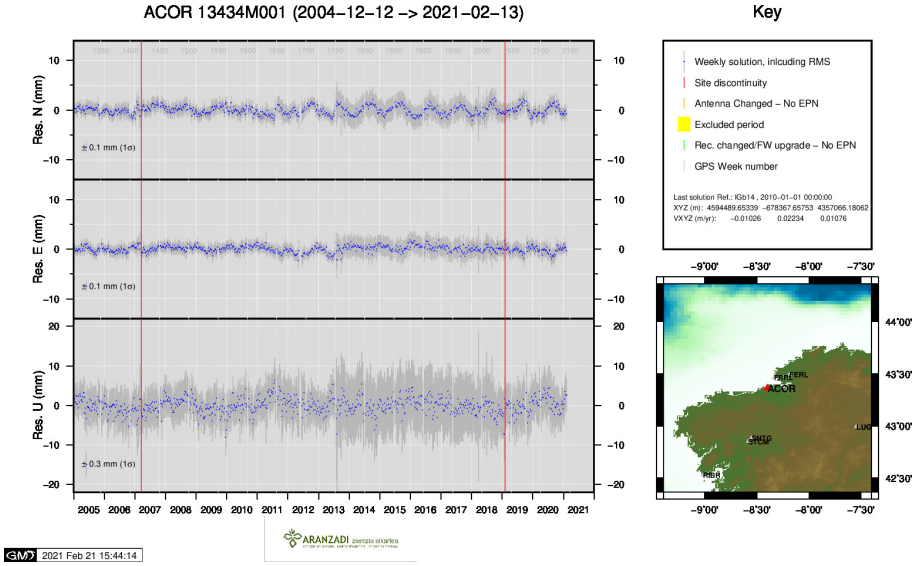
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

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

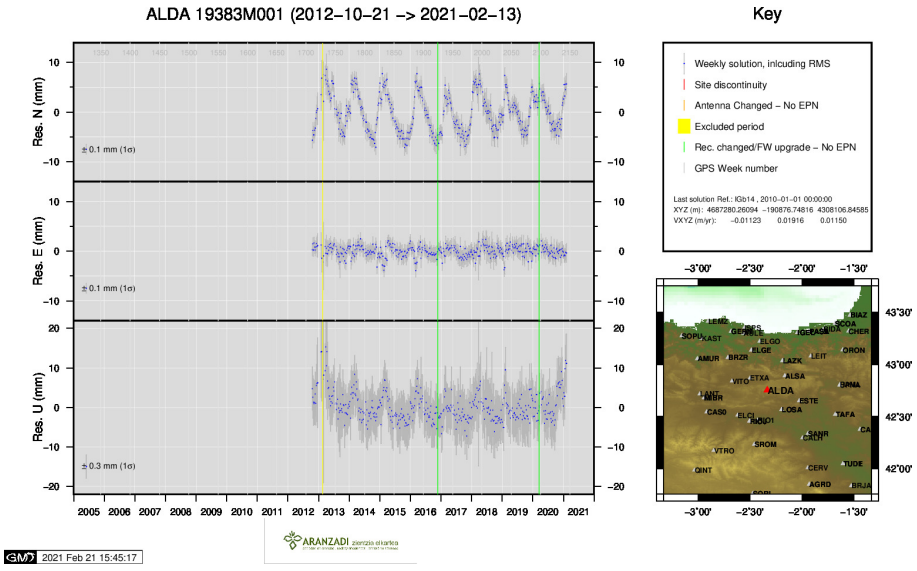
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

9 Cumulative Time Series

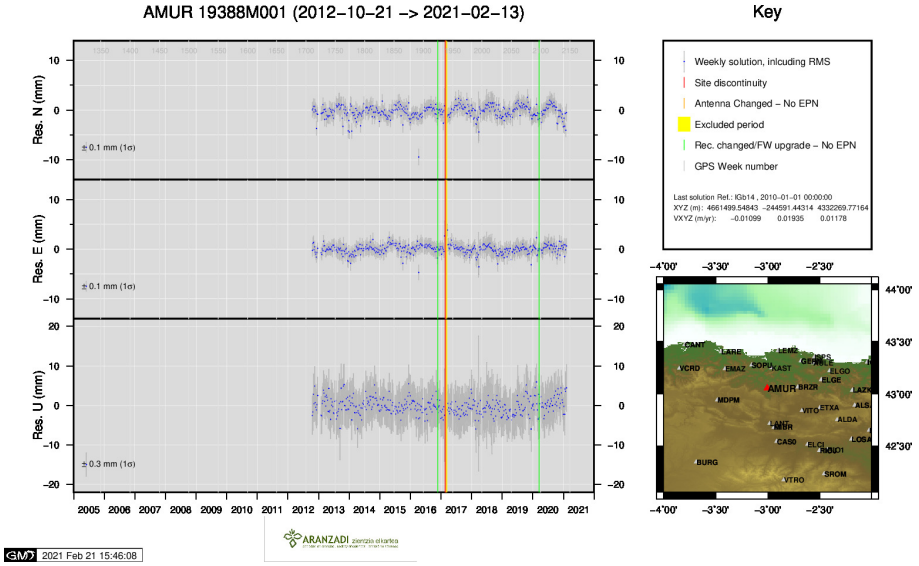
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



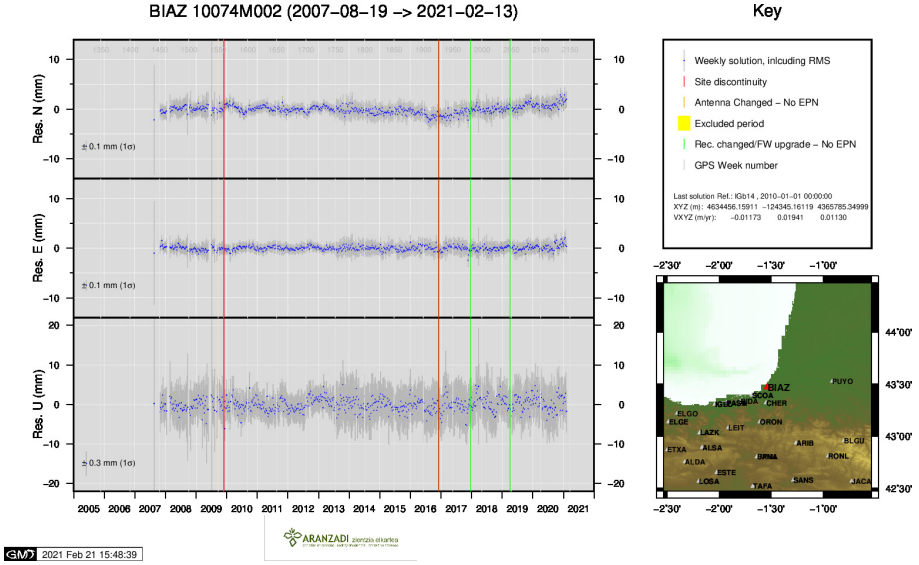
1) ACOR



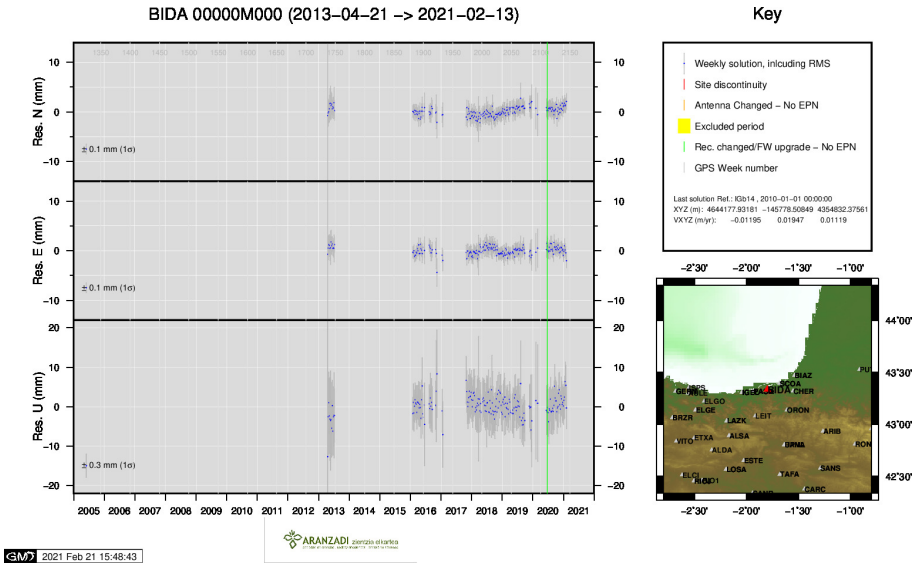
2) ALDA



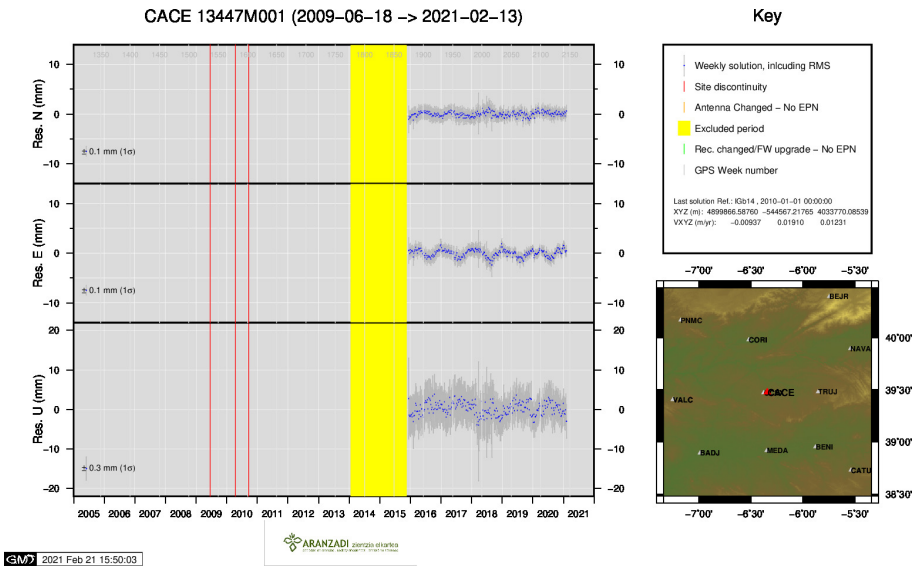
3) AMUR



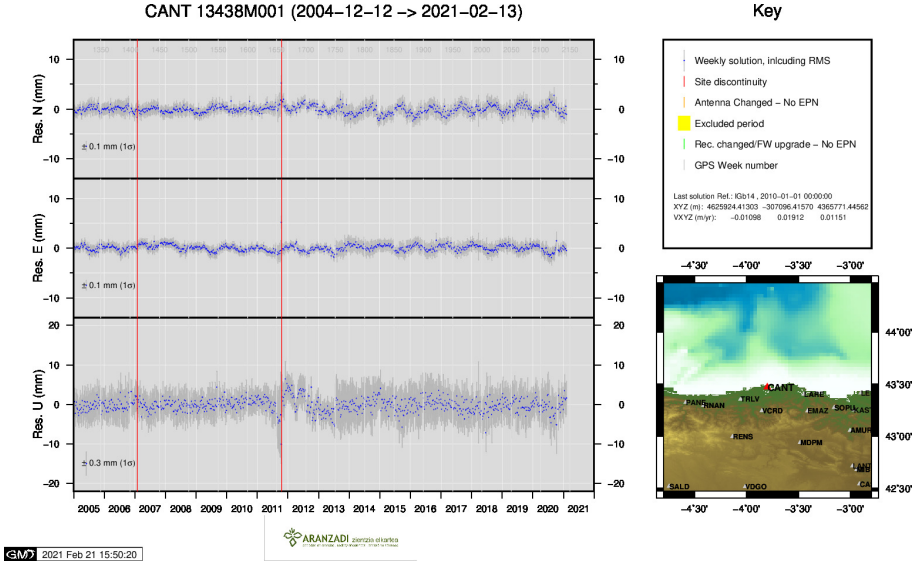
4) BIAZ



5) BIDA



6) CACE



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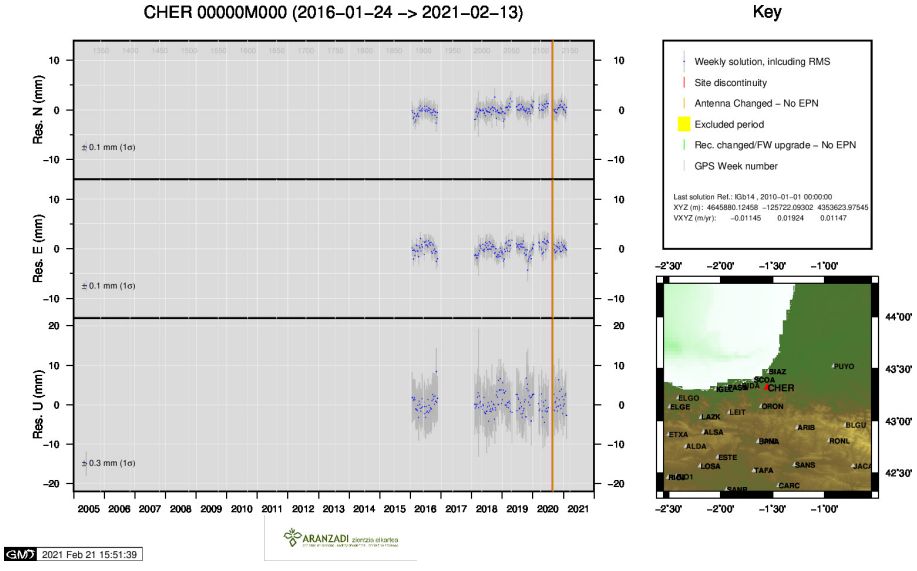

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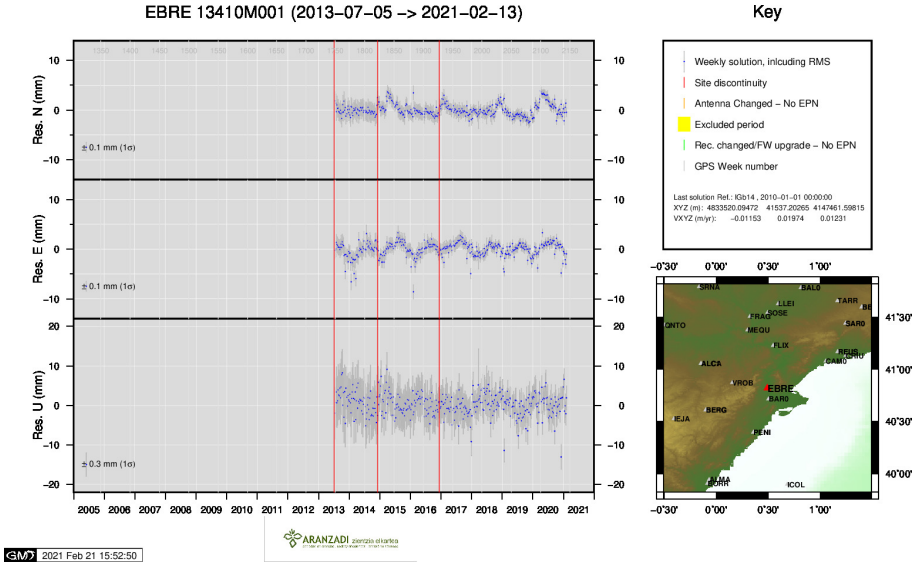

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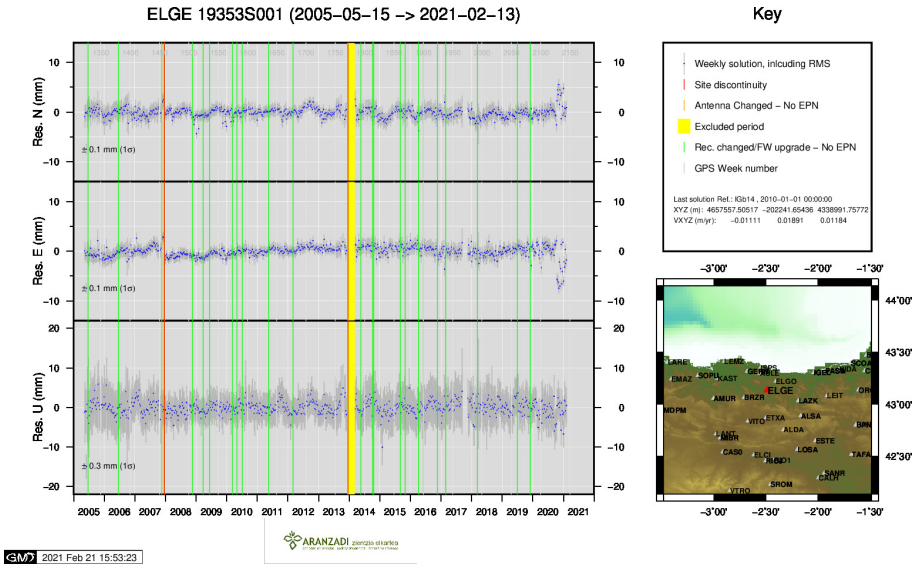

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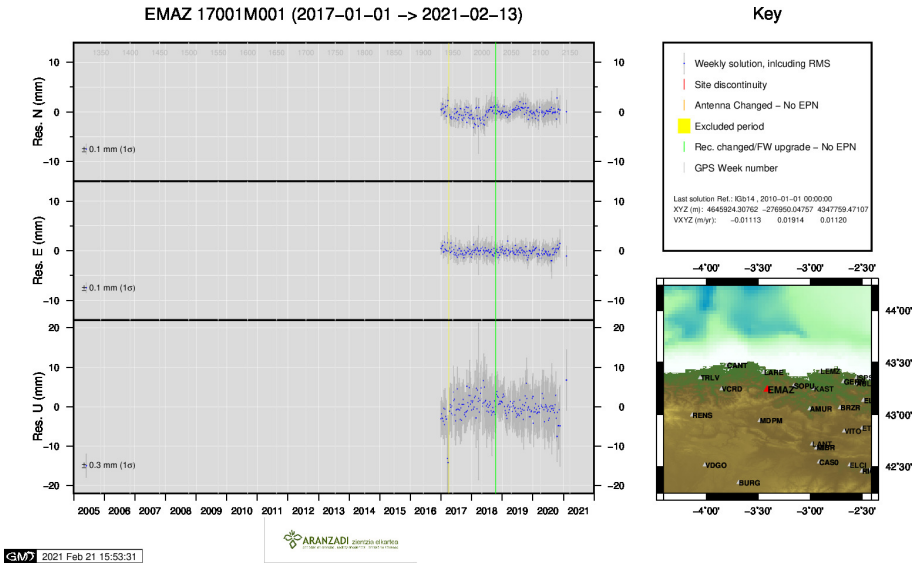

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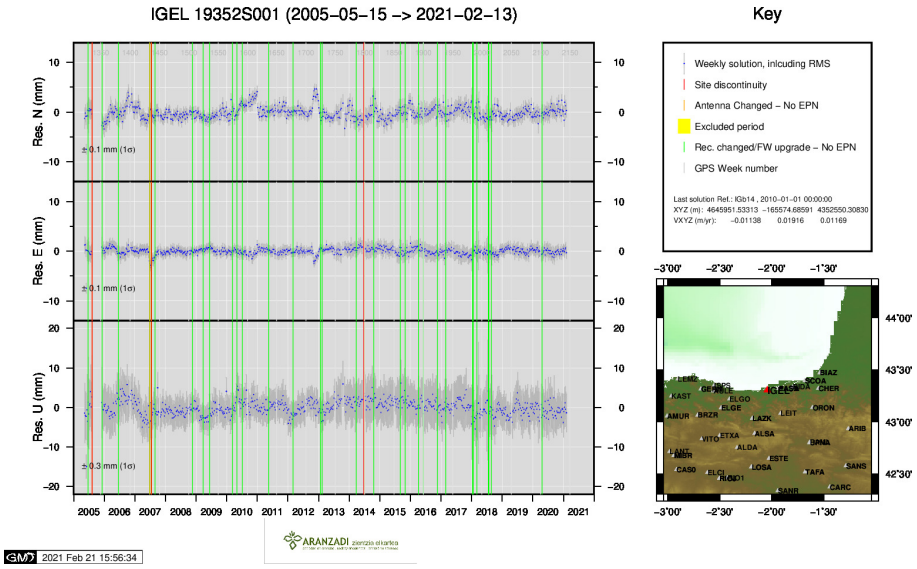

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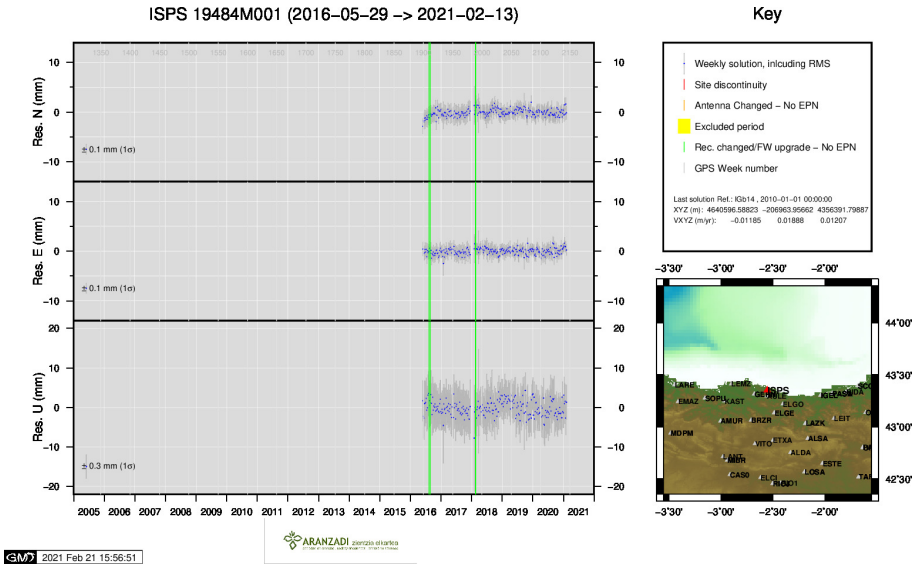

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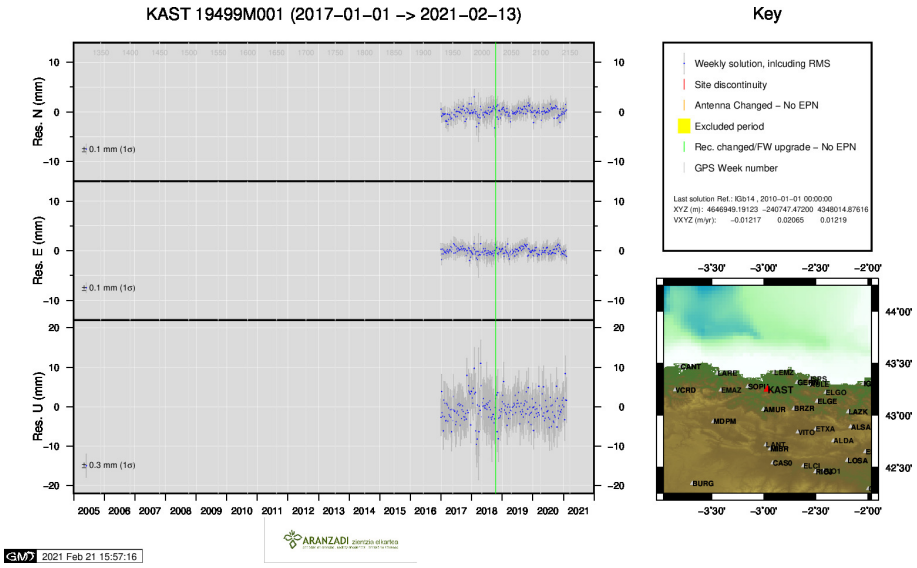

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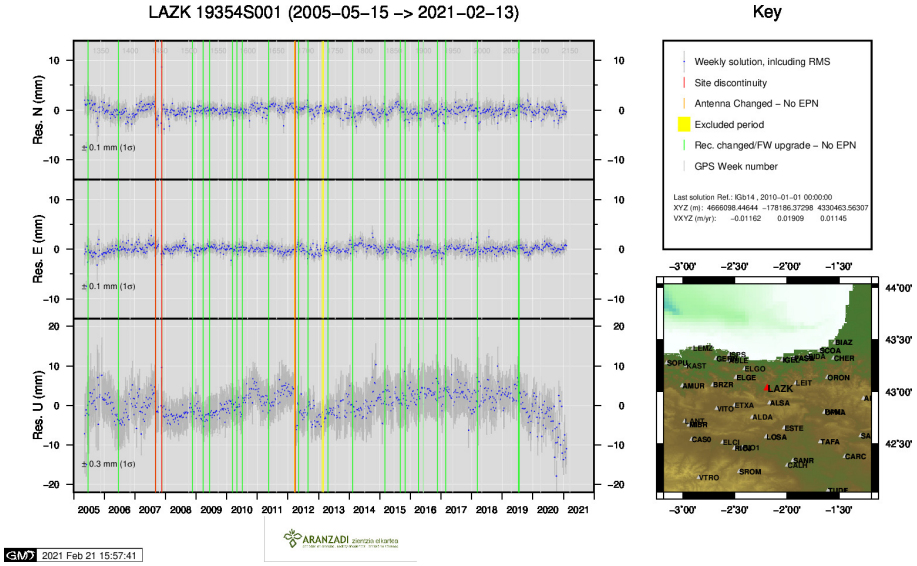

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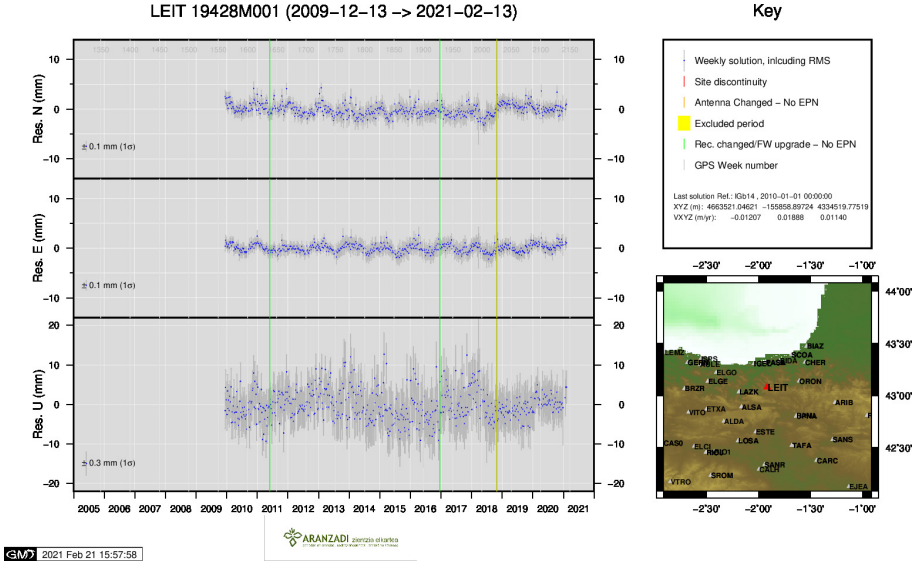

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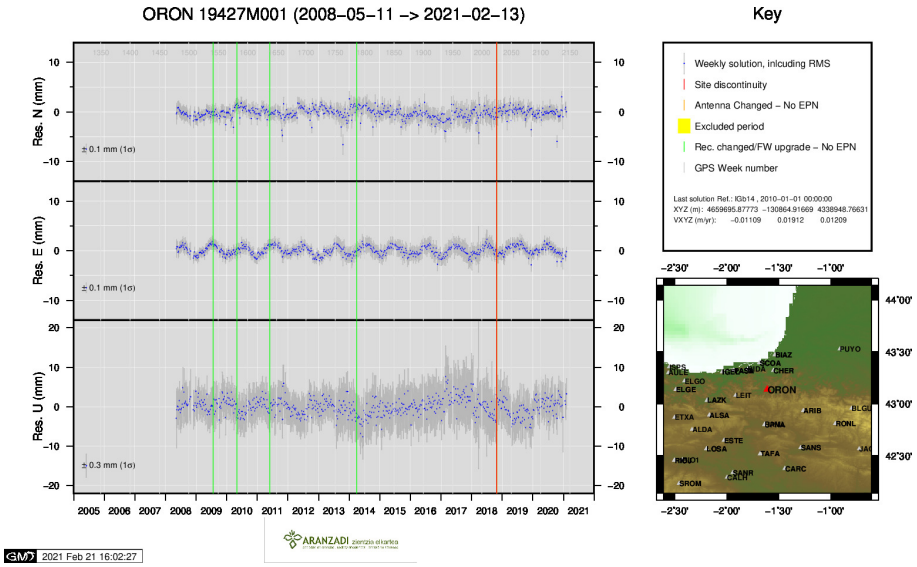

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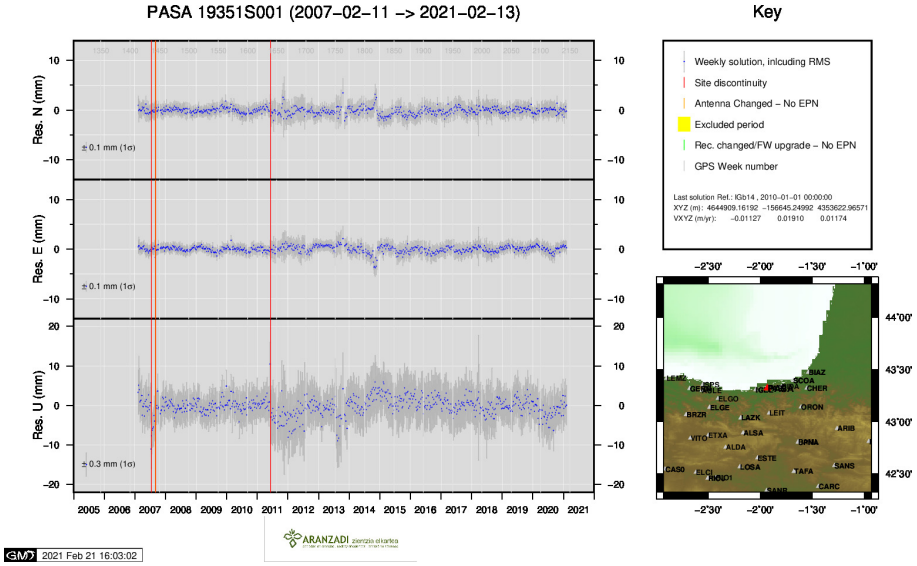

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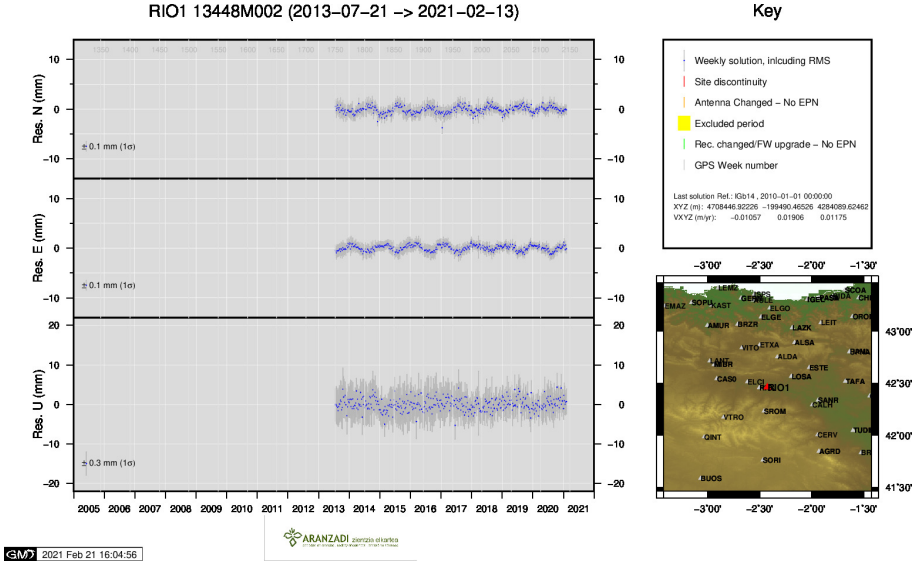

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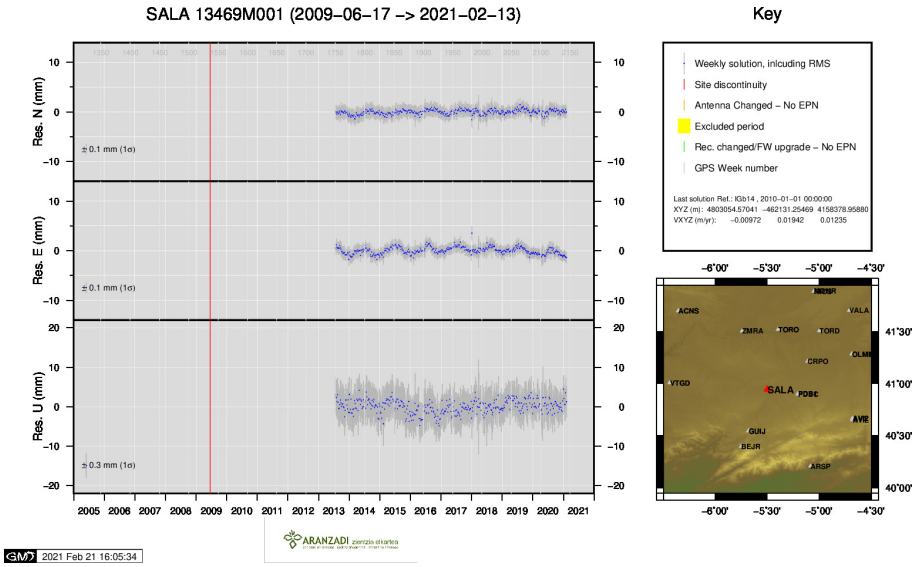

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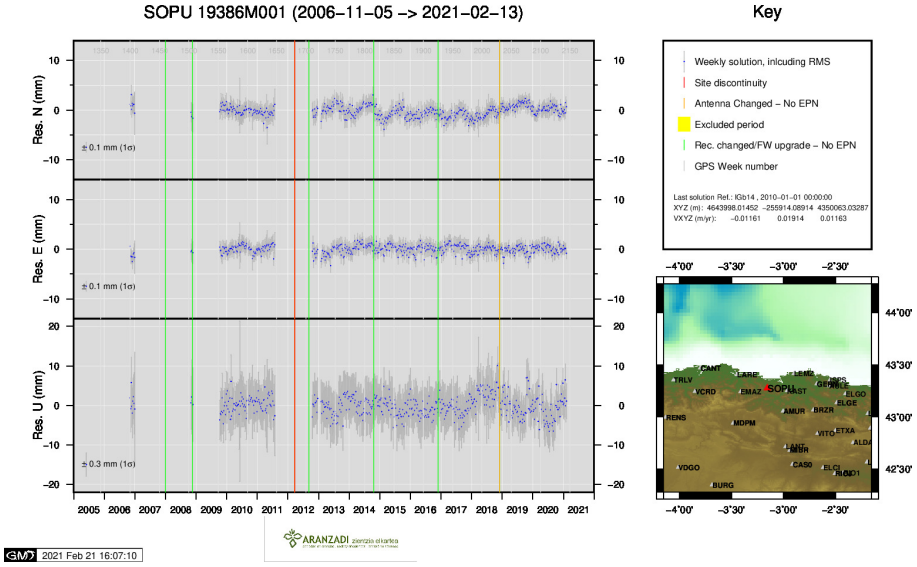

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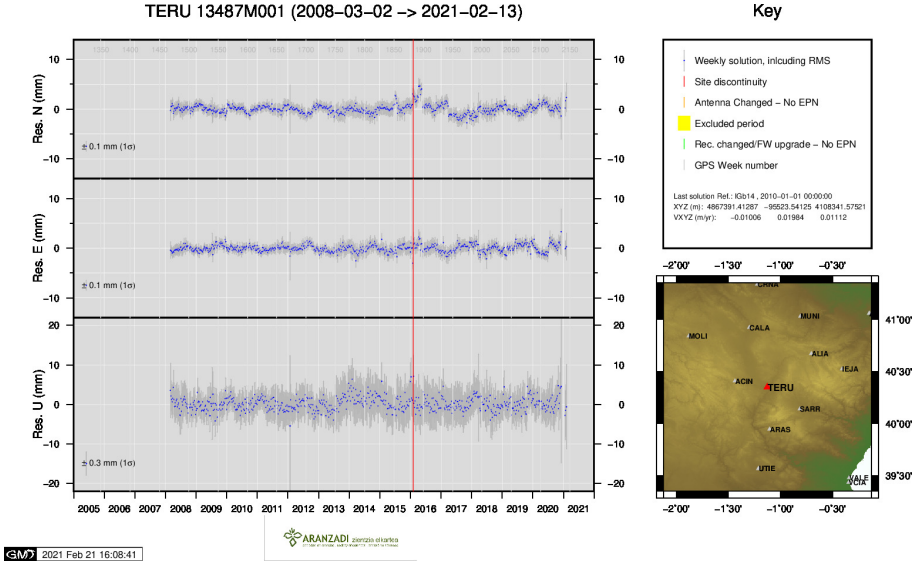

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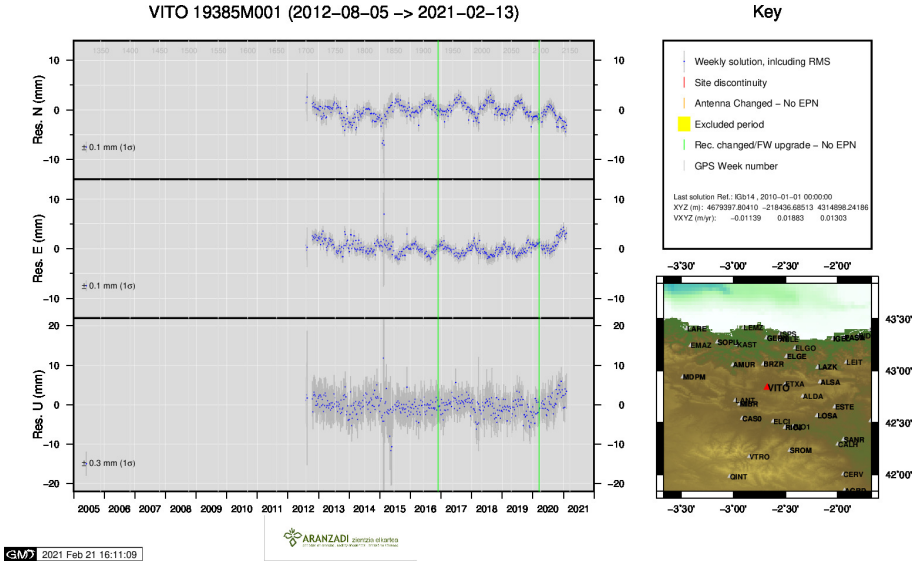

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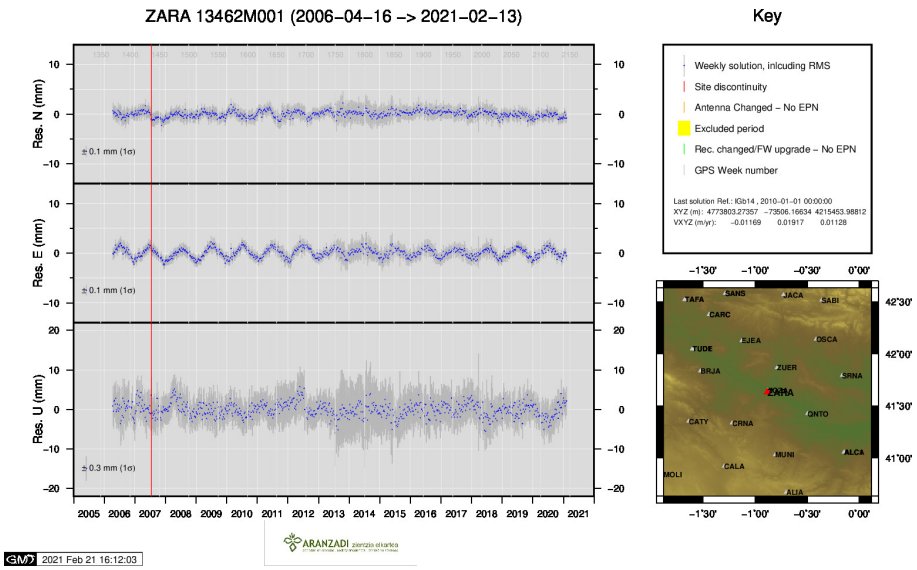
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Key
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Res. E (mm)
Res. U (mm)
±0.1 mm (1σ)
±0.1 mm (1σ)
±0.3 mm (1σ)
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021
Weekly solution, inlcuding RMS
Site discontinuity
Antenna Changed – No EPN
Excluded period
Rec. changed/FW upgrade – No EPN
GPS Week number
Last solution Ref.: IGb14 , 2010-01-01 00:00:00
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VXYZ (m/yr): −0.01169 0.01917 0.01128
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TAFA
SANS
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SABI
CARC
EJEA
OSCA
TUDE
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ZUER
SRNA
ZARA
QNTO
CATY
CRNA
MUNI
ALCA
CALA
MOLI
AUA
2021 Feb 21 16:12:03
ARANZADI

24) ZARA