ARA-DAC Weekly Analysis Result: 2059 (GFA)

Technical Report

GPS Week: 2059 (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

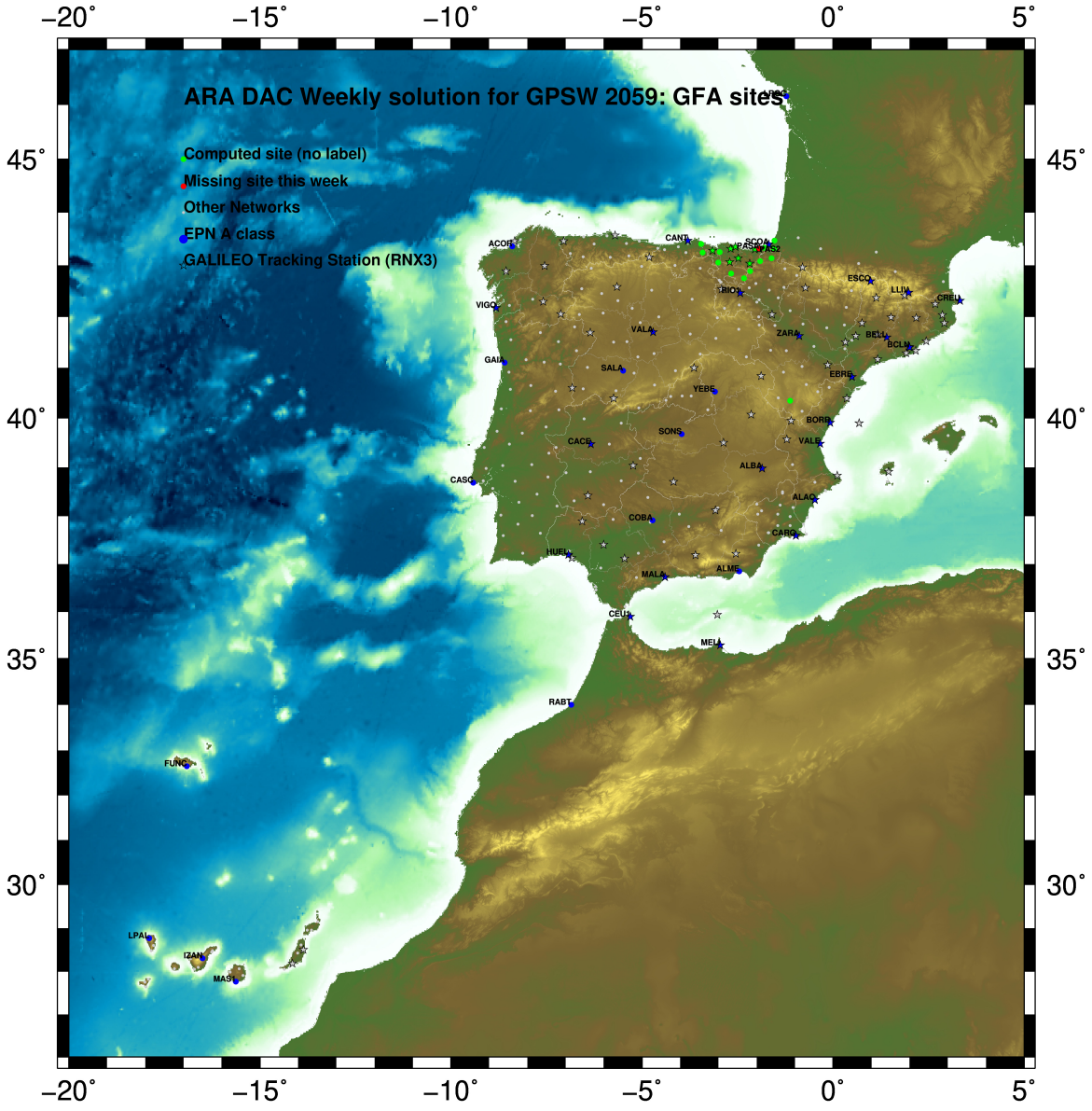

Fig.1: Computed Sites for GPS Week2059 (GFA)

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 C2010.

ARA LAC 2059 WEEK FINAL COMBINATION: PRECISE ORBITS 13-JUL-19 23:35

LOCAL GEODETIC DATUM: IGS14 EPOCH: 2019-06-26 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.55621	-678367.44471	4357066.28339	W
33	ALDA 19383M001	4687280.15406	-190876.56423	4308106.95697	A
42	ALSA 19419M001	4677250.82694	-176770.39282	4319079.87490	A
44	AMUR 19388M001	4661499.44475	-244591.25837	4332269.88541	A
78	BIAZ 10074M002	4634456.05120	-124344.97667	4365785.46239	A
79	BIDA 00000M000	4644177.81912	-145778.32305	4354832.48490	A
89	BRZR 19387M001	4662220.98937	-220769.90024	4333309.44388	A
9	CACE 13447M001	4899866.50388	-544567.03717	4033770.20724	W
10	CANT 13438M001	4625924.31166	-307096.23462	4365771.55951	W
114	CHER 00000M000	4645880.32056	-125721.92582	4353624.37755	A
15	CREU 13432M001	4715420.12697	273178.06011	4271946.84157	W
16	EBRE 13410M001	4833519.98493	41537.39085	4147461.71431	W
135	ELGE 19353S001	4657557.40425	-202241.47421	4338991.87492	A
137	EMAZ 17001M001	4645924.20216	-276949.86524	4347759.57885	A
157	GERN 19389M001	4642811.31608	-217222.92543	4353278.88454	A
177	IGEL 19352S001	4645951.42922	-165574.50309	4352550.42328	A
182	ISPS 19484M001	4640596.47627	-206963.77659	4356391.91538	A
187	KAST 19499M001	4646949.07804	-240747.27540	4348014.99459	A
192	LARE 19440M001	4632831.94933	-279026.13824	4360314.42885	A
193	LAZK 19354S001	4666098.33991	-178186.19080	4330463.67467	A
197	LEIT 19428M001	4663520.93208	-155858.71839	4334519.88641	A
253	ORON 19427M001	4659695.77238	-130864.73382	4338948.88218	A
30	PASA 19351S001	4644909.05854	-156645.06827	4353623.08154	W
33	RIO1 13448M002	4708446.82523	-199490.28444	4284089.74075	W
34	SALA 13469M001	4803054.48229	-462131.06961	4158379.08095	W
35	SCOA 10088M002	4639940.49767	-136224.94021	4359552.41894	W
313	SOPU 19386M001	4643997.90674	-255913.90637	4350063.14797	A
333	TERU 13487M001	4867391.31840	-95523.35193	4108341.68235	A
366	VITO 19385M001	4679397.69765	-218436.50763	4314898.36911	A
43	YEBE 13420M001	4848724.56599	-261631.93016	4123094.33128	W
44	ZARA 13462M001	4773803.16426	-73505.98247	4215454.09692	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).

ETRF2000 FINAL COORD. wk 2059 13-JUL-19 23:35

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2019-06-26 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.86344	-678367.98374	4357065.86586	W
33	ALDA 19383M001	4687280.51512	-190877.11187	4308106.53838	A
42	ALSA 19419M001	4677251.19041	-176770.93937	4319079.45725	A
44	AMUR 19388M001	4661499.80119	-244591.80346	4332269.46813	A
78	BIAZ 10074M002	4634456.42405	-124345.51859	4365785.04862	A
79	BIDA 00000M000	4644178.18870	-145778.86605	4354832.07014	A
89	BRZR 19387M001	4662221.34867	-220770.44535	4333309.02684	A
9	CACE 13447M001	4899866.80440	-544567.60762	4033769.76808	W
10	CANT 13438M001	4625924.66308	-307096.77616	4365771.14417	W
114	CHER 00000M000	4645880.69240	-125722.46893	4353623.96290	A
15	CREU 13432M001	4715420.53983	273177.51120	4271946.42638	W
16	EBRE 13410M001	4833520.36207	41536.82882	4147461.28736	W
135	ELGE 19353S001	4657557.76612	-202242.01878	4338991.45846	A
137	EMAZ 17001M001	4645924.55588	-276950.40881	4347759.16236	A
157	GERN 19389M001	4642811.67718	-217223.46849	4353278.46901	A
177	IGEL 19352S001	4645951.79632	-165575.04633	4352550.00814	A
182	ISPS 19484M001	4640596.83879	-206964.31940	4356391.50015	A
187	KAST 19499M001	4646949.43602	-240747.81897	4348014.57846	A
192	LARE 19440M001	4632832.30367	-279026.68043	4360314.01333	A
193	LAZK 19354S001	4666098.70400	-178186.73618	4330463.25785	A
197	LEIT 19428M001	4663521.29907	-155859.26344	4334519.47005	A
253	ORON 19427M001	4659696.14261	-130865.27839	4338948.46642	A
30	PASA 19351S001	4644909.42676	-156645.61138	4353622.66659	W
33	RIO1 13448M002	4708447.18362	-199490.83430	4284089.32045	W
34	SALA 13469M001	4803054.80116	-462131.62994	4158378.65022	W
35	SCOA 10088M002	4639940.86869	-136225.48273	4359552.00461	W
313	SOPU 19386M001	4643998.26308	-255914.44967	4350062.73188	A
333	TERU 13487M001	4867391.67678	-95523.91793	4108341.25118	A
366	VITO 19385M001	4679398.05595	-218437.05452	4314897.95079	A
43	YEBE 13420M001	4848724.90593	-261632.49472	4123093.89952	W
44	ZARA 13462M001	4773803.53265	-73506.53872	4215453.67316	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 2059 13-JUL-19 23:35

LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2019-06-26 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACOR 13434M001	4594489.82095	-678368.02230	4357065.91430	W
33	ALDA 19383M001	4687280.47043	-190877.15177	4308106.58672	A
42	ALSA 19419M001	4677251.14578	-176770.97935	4319079.50562	A
44	AMUR 19388M001	4661499.75690	-244591.84328	4332269.51651	A
78	BIAZ 10074M002	4634456.37967	-124345.55892	4365785.09712	A
79	BIDA 00000M000	4644178.14429	-145778.90627	4354832.11860	A
89	BRZR 19387M001	4662221.30432	-220770.48524	4333309.07522	A
9	CACE 13447M001	4899866.75847	-544567.64545	4033769.81587	W
10	CANT 13438M001	4625924.61933	-307096.81590	4365771.19262	W
114	CHER 00000M000	4645880.64792	-125722.50922	4353624.01137	A
15	CREU 13432M001	4715420.49331	273177.46982	4271946.47494	W
16	EBRE 13410M001	4833520.31514	41536.78869	4147461.33551	W
135	ELGE 19353S001	4657557.72175	-202242.05875	4338991.50686	A
137	EMAZ 17001M001	4645924.51185	-276950.44857	4347759.21077	A
157	GERN 19389M001	4642811.63300	-217223.50847	4353278.51745	A
177	IGEL 19352S001	4645951.75196	-165575.08648	4352550.05659	A
182	ISPS 19484M001	4640596.79460	-206964.35942	4356391.54859	A
187	KAST 19499M001	4646949.39187	-240747.85885	4348014.62688	A
192	LARE 19440M001	4632832.25977	-279026.72024	4360314.06177	A
193	LAZK 19354S001	4666098.65948	-178186.77621	4330463.30624	A
197	LEIT 19428M001	4663521.25451	-155859.30356	4334519.51847	A
253	ORON 19427M001	4659696.09800	-130865.31861	4338948.51485	A
30	PASA 19351S001	4644909.38238	-156645.65156	4353622.71505	W
33	RIO1 13448M002	4708447.13874	-199490.87408	4284089.36873	W
34	SALA 13469M001	4803054.75604	-462131.66844	4158378.69821	W
35	SCOA 10088M002	4639940.82430	-136225.52301	4359552.05309	W
313	SOPU 19386M001	4643998.21900	-255914.48951	4350062.78030	A
333	TERU 13487M001	4867391.62995	-95523.95745	4108341.29917	A
366	VITO 19385M001	4679398.01142	-218437.09436	4314897.99913	A
43	YEBE 13420M001	4848724.85979	-261632.53375	4123093.94747	W
44	ZARA 13462M001	4773803.48672	-73506.57869	4215453.72136	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).

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ARA LAC 2059 WEEK FINAL COMBINATION: PRECISE ORBITS              13-JUL-19 23:35
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                    Weekday     Repeatability (mm)
Station        #Days 0123456      N      E      U
-----------------------------------------------------
ACOR 13434M001     6  XXXXX X     1.09   1.81   4.93
ALDA 19383M001     7  XXXXXXX     2.48   0.82   3.21
ALSA 19419M001     7  XXXXXXX     2.64   1.06   5.91
AMUR 19388M001     7  XXXXXXX     1.04   1.08   4.05
BIAZ 10074M002     7  XXXXXXX     0.86   1.10   2.77
BIDA 00000M000     7  XXXXXXX     1.23   1.12   3.54
BRZR 19387M001     6  XXX XXX     0.94   1.77   4.02
CACE 13447M001     7  XXXXXXX     0.69   0.59   2.81
CANT 13438M001     7  XXXXXXX     1.26   0.76   3.77
CHER 00000M000     5    XXXXX     1.02   1.43   3.50
CREU 13432M001     7  XXXXXXX     0.68   0.67   2.32
EBRE 13410M001     7  XXXXXXX     0.55   0.45   3.19
ELGE 19353S001     7  XXXXXXX     0.86   1.42   4.62
EMAZ 17001M001     7  XXXXXXX     0.92   1.06   3.55
GERN 19389M001     7  XXXXXXX     0.68   0.92   3.12
IGEL 19352S001     7  XXXXXXX     1.18   1.24   3.25
ISPS 19484M001     7  XXXXXXX     1.07   1.58   4.86
KAST 19499M001     7  XXXXXXX     1.01   0.72   4.45
LARE 19440M001     7  XXXXXXX     0.92   1.45   3.19
LAZK 19354S001     7  XXXXXXX     2.98   0.94   5.64
LEIT 19428M001     7  XXXXXXX     3.38   0.71   4.00
ORON 19427M001     7  XXXXXXX     1.42   1.34   5.60
PASA 19351S001     7  XXXXXXX     0.86   0.62   3.33
RIO1 13448M002     7  XXXXXXX     1.38   1.42   3.65
SALA 13469M001     7  XXXXXXX     1.15   0.88   4.35
SCOA 10088M002     7  XXXXXXX     0.74   0.98   3.63
SOPU 19386M001     7  XXXXXXX     1.00   1.49   2.63
TERU 13487M001     7  XXXXXXX     0.80   1.67   3.55
VITO 19385M001     7  XXXXXXX     1.97   0.88   3.17
YEBE 13420M001     7  XXXXXXX     0.70   0.97   2.60
ZARA 13462M001     7  XXXXXXX     0.89   1.18   3.79

Comparison of individual solutions:
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ACOR 13434M001   N    1.09     -2.31   -0.65    0.26   -0.37    0.12           -0.18
ACOR 13434M001   E    1.81     -0.46    2.59   -0.25    0.12    3.02           -0.47
ACOR 13434M001   U    4.93      6.65   -1.34    3.65   -2.03    4.07            6.42
ALDA 19383M001   N    2.48     -2.51    0.81    0.37    4.23    2.18   -2.61   -0.56
ALDA 19383M001   E    0.82      0.55    0.87   -0.05    1.32    0.52    0.15   -0.95
ALDA 19383M001   U    3.21      0.77   -2.26    3.56   -2.82   -4.79   -2.45   -2.54
ALSA 19419M001   N    2.64     -4.52    0.03    1.36    3.52    2.28   -1.40   -0.28
ALSA 19419M001   E    1.06      1.65    0.28   -0.87    1.44    0.34   -0.05   -1.03
ALSA 19419M001   U    5.91      2.19   -4.35    3.69  -11.77    0.93    3.31   -4.71
AMUR 19388M001   N    1.04      0.49    0.72    1.27   -0.59   -1.45    0.41    1.24
AMUR 19388M001   E    1.08      0.56    0.12    0.19   -0.98    2.28    0.29   -0.61
AMUR 19388M001   U    4.05     -3.24   -0.10   -0.01   -0.67   -8.84    0.11   -3.06
BIAZ 10074M002   N    0.86      1.11    0.94   -0.92   -1.11   -0.08   -0.48   -0.02
BIAZ 10074M002   E    1.10      0.30   -1.52    0.65   -0.19    0.59    1.33    1.51
BIAZ 10074M002   U    2.77     -2.75   -1.85    2.63    0.62   -3.42    3.06   -2.62
BIDA 00000M000   N    1.23      0.41    2.39   -0.31   -1.20   -1.24   -0.44   -0.14
BIDA 00000M000   E    1.12     -0.25   -1.31    0.02    0.56    0.54    2.07    0.96
BIDA 00000M000   U    3.54      1.30   -0.93    3.99   -5.62   -4.68    1.81    0.08
BRZR 19387M001   N    0.94     -1.46   -0.07    0.15            0.28    0.75    1.28
BRZR 19387M001   E    1.77      1.35    0.22   -0.03           -2.92    1.08    2.01
BRZR 19387M001   U    4.02     -6.65   -2.18    2.70            1.47   -4.74   -0.24
CACE 13447M001   N    0.69      0.14    0.15    0.14   -1.59   -0.50    0.01    0.17
CACE 13447M001   E    0.59      1.10   -0.04    0.17   -0.40   -0.20    0.34   -0.74
CACE 13447M001   U    2.81     -5.14    0.49    1.40    3.84    1.55   -1.23    0.29
CANT 13438M001   N    1.26      1.62    1.35    0.44   -1.21    1.58   -0.83    0.42
CANT 13438M001   E    0.76      1.09    0.57    1.00   -0.78    0.20    0.03   -0.53
CANT 13438M001   U    3.77     -4.36   -2.86    4.74   -1.24   -5.33    1.17   -2.05
CHER 00000M000   N    1.02                     -0.62    0.18   -0.61   -1.84   -0.05
CHER 00000M000   E    1.43                      0.55   -1.31    0.95    1.77    1.44
CHER 00000M000   U    3.50                      3.86   -1.66   -2.50    2.59   -4.28
CREU 13432M001   N    0.68     -0.20   -0.84   -0.33    0.19    0.71    0.91   -0.73
CREU 13432M001   E    0.67     -0.94    0.94   -0.61    0.53   -0.16   -0.43    0.21
CREU 13432M001   U    2.32      1.87    1.08    1.70   -0.83    2.44   -2.90   -3.12
EBRE 13410M001   N    0.55      0.84   -0.69   -0.36   -0.24   -0.22   -0.07    0.60
EBRE 13410M001   E    0.45     -0.35    0.79   -0.55   -0.24   -0.29    0.13   -0.02
EBRE 13410M001   U    3.19     -0.33   -1.23    3.84    3.51    1.09   -5.14   -2.19
ELGE 19353S001   N    0.86      1.40   -0.23   -1.38   -0.03    0.51   -0.29    0.40
ELGE 19353S001   E    1.42      2.13    0.15    0.34   -2.43   -0.43    0.73    0.86
ELGE 19353S001   U    4.62     -0.99   -4.55   -4.06    7.29   -2.15   -5.40   -1.77
EMAZ 17001M001   N    0.92      0.75    0.89    0.31   -1.56   -0.53    0.27    0.93
EMAZ 17001M001   E    1.06     -0.70   -0.29    0.80   -0.61    0.90    0.29   -2.07
EMAZ 17001M001   U    3.55      3.92   -3.41   -6.14    0.94   -1.56    2.63   -0.85
GERN 19389M001   N    0.68      0.68    0.42   -1.25    0.23   -0.47    0.40    0.39
GERN 19389M001   E    0.92      1.05   -0.66   -0.48   -0.64    1.63    0.13    0.50
GERN 19389M001   U    3.12     -1.34   -1.89    3.97   -2.63   -1.58   -4.14   -3.25
IGEL 19352S001   N    1.18      2.20    1.01   -1.09   -0.93   -0.42   -0.53    0.13
IGEL 19352S001   E    1.24      0.72    0.89   -0.34    1.29   -1.71   -0.83    1.61
IGEL 19352S001   U    3.25     -0.44   -3.76   -4.01    3.61   -0.13   -4.30   -1.11
ISPS 19484M001   N    1.07     -0.43    0.06   -1.21    1.86    0.51    0.77   -0.93
ISPS 19484M001   E    1.58     -1.28    0.59    0.43   -0.84    3.35   -0.83    0.43
ISPS 19484M001   U    4.86      0.85    1.35    2.72   -8.69   -5.07   -5.20    1.85
KAST 19499M001   N    1.01      0.13    0.01   -0.29   -1.96    1.09    0.73    0.70
KAST 19499M001   E    0.72      0.95   -0.42   -0.51   -0.07   -0.28    0.91    0.94
KAST 19499M001   U    4.45     -6.01   -0.25   -1.48    4.90   -0.57   -7.50   -0.06
LARE 19440M001   N    0.92     -0.04   -0.09    1.43   -1.37    0.44    0.72    0.66
LARE 19440M001   E    1.45     -0.15   -0.26    0.07    1.07   -0.09    0.13   -3.37
LARE 19440M001   U    3.19     -0.45   -0.61   -4.89    4.42   -2.01    1.23   -3.40
LAZK 19354S001   N    2.98     -0.58    4.46    1.42   -3.57   -3.90    1.19    1.30
LAZK 19354S001   E    0.94     -0.18   -0.66   -0.81   -0.44    1.35    1.09    0.96
LAZK 19354S001   U    5.64      7.75   -1.75   -3.06   -9.36   -4.90   -1.90    1.74
```

LEIT	19428M001	N	3.38	-2.89	6.67	-1.98	2.56	-0.25	-1.99	-1.18
LEIT	19428M001	E	0.71	-0.93	0.90	0.35	0.61	-0.40	0.31	0.78
LEIT	19428M001	U	4.00	4.42	-4.09	0.31	-4.19	-0.17	0.06	-6.49
ORON	19427M001	N	1.42	-0.97	2.30	0.27	-1.64	-0.92	0.05	1.48
ORON	19427M001	E	1.34	0.41	-0.70	-0.22	0.08	-1.23	2.44	1.63
ORON	19427M001	U	5.60	3.84	-4.00	8.59	-5.85	-4.62	0.55	-5.30
PASA	19351S001	N	0.86	0.36	0.65	-0.29	-1.35	-0.53	1.32	0.17
PASA	19351S001	E	0.62	-0.17	-0.45	-0.09	0.70	0.08	0.31	1.22
PASA	19351S001	U	3.33	-5.13	0.50	-4.38	-0.43	2.67	-3.64	-0.42
RIO1	13448M002	N	1.38	0.60	2.13	-0.12	0.49	-2.36	-0.40	0.75
RIO1	13448M002	E	1.42	1.37	0.43	-1.28	0.92	1.22	1.12	-2.20
RIO1	13448M002	U	3.65	-4.95	-1.13	0.62	-1.96	4.69	-0.57	-5.26
SALA	13469M001	N	1.15	0.44	-0.89	-0.00	2.39	0.53	0.39	-0.87
SALA	13469M001	E	0.88	0.83	-1.03	-1.08	-0.92	0.27	0.46	-0.73
SALA	13469M001	U	4.35	-5.01	5.06	5.83	-3.65	2.73	2.82	-0.58
SCOA	10088M002	N	0.74	1.08	0.38	0.18	-1.06	-0.03	-0.88	-0.12
SCOA	10088M002	E	0.98	0.79	-1.39	-0.12	-0.28	0.79	1.25	0.97
SCOA	10088M002	U	3.63	-0.86	0.67	5.84	-4.89	-2.80	0.50	-3.43
SOPU	19386M001	N	1.00	-1.47	0.62	0.51	1.24	0.38	-0.62	-1.05
SOPU	19386M001	E	1.49	1.52	-1.94	-1.07	1.25	1.65	1.31	0.11
SOPU	19386M001	U	2.63	-0.73	-1.70	-2.54	-0.76	-0.82	-5.43	-0.97
TERU	13487M001	N	0.80	-0.65	-0.74	0.21	0.37	1.58	-0.03	-0.45
TERU	13487M001	E	1.67	0.81	0.86	1.52	-1.76	-3.15	0.13	0.09
TERU	13487M001	U	3.55	4.31	-3.05	3.78	-0.66	-3.81	-2.99	3.13
VITO	19385M001	N	1.97	1.50	0.53	1.51	-4.03	-0.26	1.12	0.98
VITO	19385M001	E	0.88	1.23	-0.07	0.88	-0.05	-1.33	0.64	0.33
VITO	19385M001	U	3.17	-1.19	-0.05	-6.80	-2.42	-1.73	-1.16	-1.61
YEBE	13420M001	N	0.70	-0.22	-0.82	-0.93	1.01	-0.21	0.54	0.14
YEBE	13420M001	E	0.97	-0.46	0.46	-0.05	-1.81	0.61	-1.08	0.65
YEBE	13420M001	U	2.60	-1.27	-3.76	3.18	-3.75	-0.68	-0.37	0.01
ZARA	13462M001	N	0.89	0.45	-0.26	0.73	-0.96	-1.48	0.56	0.73
ZARA	13462M001	E	1.18	0.06	-1.52	0.46	-1.46	0.65	1.75	0.48
ZARA	13462M001	U	3.79	-3.14	-3.20	-1.34	-3.71	3.42	-2.37	-5.77

6.2 Datum verification

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

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

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-1.51	-0.66	2.10
2	ALAC 13433M001	I W	1.22	-0.28	0.47
3	ALBA 13452M001	I W	-0.05	0.00	-0.46
4	ALME 13437M001	I W	-1.08	0.24	2.02
5	BCLN 13412M001	I W	-0.36	0.31	2.15
6	BELL 13431M001	I W	-0.40	0.48	0.76
7	BORR 13480M001	I W	-0.11	-1.59	1.62
8	BRST 10004M004	I W	-1.90	-0.38	-1.21
9	CACE 13447M001	I W	0.72	1.70	-2.23
10	CANT 13438M001	I W	-1.68	0.98	-1.61
11	CARG 19412M001	I W	0.61	0.68	-1.35
12	CASC 13909S001	I W	1.33	-1.07	1.86
13	CEU1 13449M002	I W	0.58	0.00	0.36
14	COBA 13453M001	I W	2.27	0.22	-3.44
15	CREU 13432M001	I W	-0.73	0.49	1.54
16	EBRE 13410M001	I W	-0.17	0.69	2.53
17	ESCO 13435M001	I W	0.40	0.77	-0.28
18	FUNC 13911S001	I W	4.29	1.18	-4.36
19	GAIA 13902M001	I W	-0.52	-0.90	3.78
21	HUEL 13451M001	I W	1.48	-0.18	-1.08
22	IZAN 31309M002	I W	1.16	0.01	-1.99
23	LLIV 13436M001	I W	-1.22	0.31	3.13
24	LPAL 81701M001	I W	-0.84	-0.01	-0.61
25	LROC 10023M001	I W	0.72	-0.58	2.03
26	MALA 13443M001	I W	1.14	-2.42	-0.13
27	MAS1 31303M002	I W	0.85	0.57	4.21
29	MELI 19379M001	I W	1.91	-1.36	-1.64
30	PASA 19351S001	I W	-1.08	0.35	-3.00
31	PDEL 31906M004	I W	-0.19	0.95	-0.05
32	RABT 35001M002	I W	0.79	-0.47	-6.19
33	RIO1 13448M002	I W	-1.88	0.83	-4.33
34	SALA 13469M001	I W	-0.25	0.39	-3.73
35	SCOA 10088M002	I W	-4.06	-0.96	-4.71
38	SONS 13446M001	I W	-2.05	-0.31	-4.93
40	VALA 13463M002	I W	-0.49	-0.67	-1.37
41	VALE 13439M001	I W	-0.54	0.20	1.29
42	VIGO 13450M001	I W	0.18	0.31	7.47
43	YEBE 13420M001	I W	0.98	-0.19	2.11
44	ZARA 13462M001	I W	-0.11	-0.58	1.19
45	ZIMM 14001M004	I W	0.56	1.00	8.05
	RMS / COMPONENT		1.42	0.82	3.13
	MEAN		-0.00	-0.00	-0.00
	MIN		-4.06	-2.42	-6.19
	MAX		4.29	1.70	8.05

```
NUMBER OF PARAMETERS  :     3
NUMBER OF COORDINATES :   120
RMS OF TRANSFORMATION :    2.04 MM

BARYCENTER COORDINATES:

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


PARAMETERS:

TRANSLATION IN  N     :          -0.00     +-  0.32    MM
TRANSLATION IN  E     :          -0.00     +-  0.32    MM
TRANSLATION IN  U     :           0.00     +-  0.32    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                       17869593
 NUMBER OF UNKNOWNS                             211226
 NUMBER OF DEGREES OF FREEDOM                 17658367
 PHASE MEASUREMENTS SIGMA                      0.00100
 SAMPLING INTERVAL (SECONDS)                       180
 VARIANCE FACTOR                    2.221638566553546


 Helmert Transformation Parameters With Respect to Combined Solution:
 --------------------------------------------------------------------

                     Translation (m)             Rotation (")
 Sol   Rms (m)      X       Y       Z         X       Y       Z     Scale (ppm)
 ------------------------------------------------------------------------------
   1    0.00256    0.0094  0.0098 -0.0066   -0.0001  0.0004  0.0003   -0.00044
   2    0.00280   -0.0047  0.0182  0.0058   -0.0003 -0.0002  0.0005    0.00004
   3    0.00227   -0.0032  0.0032  0.0045   -0.0001 -0.0002  0.0001   -0.00001
   4    0.00243   -0.0030 -0.0094 -0.0012    0.0002 -0.0000 -0.0002    0.00037
 #PR_SBS    5  CRD   CRTG 13483M001           1   301     1     1     0     0     0  2019-06-27 00:00:00  2019-06-27 23:59:30
 #PR_SBS    5  CRD   CRTG 13483M001           1   302     2     1     0     0     0  2019-06-27 00:00:00  2019-06-27 23:59:30
 #PR_SBS    5  CRD   CRTG 13483M001           1   303     3     1     0     0     0  2019-06-27 00:00:00  2019-06-27 23:59:30
   5    0.00231    0.0054 -0.0099 -0.0076    0.0002  0.0003 -0.0003    0.00011
 #PR_SBS    6  CRD   CRTG 13483M001           1   295     1     1     0     0     0  2019-06-28 00:00:00  2019-06-28 23:59:30
 #PR_SBS    6  CRD   CRTG 13483M001           1   296     2     1     0     0     0  2019-06-28 00:00:00  2019-06-28 23:59:30
 #PR_SBS    6  CRD   CRTG 13483M001           1   297     3     1     0     0     0  2019-06-28 00:00:00  2019-06-28 23:59:30
   6    0.00226    0.0025 -0.0064  0.0002    0.0001  0.0001 -0.0002   -0.00034
   7    0.00245   -0.0100  0.0108  0.0129   -0.0002 -0.0005  0.0003    0.00006


 Statistics of individual solutions:
 -----------------------------------

 File     RMS (m)         DOF  Chi**2/DOF  #Observations authentic  / pseudo  #Parameters explicit  / implicit / singular
 ------------------------------------------------------------------------------------------------------------------------
    1     0.00152     2482153        2.30                 2512238         3                  978       29110          0
    2     0.00149     2515072        2.21                 2546096         3                  993       30034          0
    3     0.00148     2513295        2.21                 2544373         3                 1014       30067          0
    4     0.00154     2546634        2.37                 2579107         3                 1020       31456          0
    5     0.00150     2553930        2.25                 2585008         3                 1014       30067          0
    6     0.00144     2510638        2.09                 2541310         3                 1005       29670          0
    7     0.00143     2530663        2.05                 2561461         3                 1005       29796          0
```

7 Equipment

7.1 Receiver List

Serial numbers not shown.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_________ S/N__ FIRMWARE___
 ACOR  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 ALDA  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 ALSA  A    1 P 19:174:00000 19:180:86370 LEICA GR50           ----- -----------
 AMUR  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 BIAZ  A    1 P 19:174:00000 19:180:86370 TRI SP90M            ----- -----------
 BIDA  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 BRZR  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 CACE  A    1 P 19:174:00000 19:180:86370 TRIMBLE NETR9        ----- -----------
 CANT  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 CHER  A    1 P 19:176:00000 19:180:86370 LEICA GRX1200+GNSS   ----- -----------
 CREU  A    1 P 19:174:00000 19:180:86370 LEICA GR50           ----- -----------
 EBRE  A    1 P 19:174:00000 19:180:86370 LEICA GR50           ----- -----------
 ELGE  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 EMAZ  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 GERN  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 IGEL  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 ISPS  A    1 P 19:174:00000 19:180:86370 TRIMBLE NETR9        ----- -----------
 KAST  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 LARE  A    1 P 19:174:00000 19:180:86370 LEICA GRX1200GGPRO   ----- -----------
 LAZK  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 LEIT  A    1 P 19:174:00000 19:180:86370 LEICA GR50           ----- -----------
 ORON  A    1 P 19:174:00000 19:180:86370 LEICA GR50           ----- -----------
 PASA  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 RIO1  A    1 P 19:174:00000 19:180:86370 LEICA GR25           ----- -----------
 SALA  A    1 P 19:174:00000 19:180:86370 LEICA GRX1200+GNSS   ----- -----------
 SCOA  A    1 P 19:174:00000 19:180:86370 LEICA GR25           ----- -----------
 SOPU  A    1 P 19:174:00000 19:180:86370 LEICA GR30           ----- -----------
 TERU  A    1 P 19:174:00000 19:180:86370 LEICA GRX1200GGPRO   ----- -----------
 VITO  A    1 P 19:174:00000 19:180:86370 LEICA GR10           ----- -----------
 YEBE  A    1 P 19:174:00000 19:180:86370 TRIMBLE NETR9        ----- -----------
 ZARA  A    1 P 19:174:00000 19:180:86370 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 19:174:00000 19:180:86370 LEIAT504        LEIS -----
 ALDA  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 ALSA  A    1 P 19:174:00000 19:180:86370 LEIAR10         NONE -----
 AMUR  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 BIAZ  A    1 P 19:174:00000 19:180:86370 LEIAR25         LEIT -----
 BIDA  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 BRZR  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 CACE  A    1 P 19:174:00000 19:180:86370 TRM29659.00     NONE -----
 CANT  A    1 P 19:174:00000 19:180:86370 LEIAR25.R4      LEIT 25066
 CHER  A    1 P 19:176:00000 19:180:86370 LEIAX1203+GNSS  NONE -----
 CREU  A    1 P 19:174:00000 19:180:86370 LEIAR25.R4      NONE 26357
 EBRE  A    1 P 19:174:00000 19:180:86370 LEIAR25.R4      NONE 26359
 ELGE  A    1 P 19:174:00000 19:180:86370 LEIAR25.R4      LEIT -----
 EMAZ  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 GERN  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 IGEL  A    1 P 19:174:00000 19:180:86370 LEIAR20         LEIM -----
 ISPS  A    1 P 19:174:00000 19:180:86370 TRM59900.00     SCIS -----
 KAST  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 LARE  A    1 P 19:174:00000 19:180:86370 LEIAT504        NONE -----
 LAZK  A    1 P 19:174:00000 19:180:86370 LEIAR25.R4      LEIT -----
 LEIT  A    1 P 19:174:00000 19:180:86370 LEIAR10         NONE -----
 ORON  A    1 P 19:174:00000 19:180:86370 LEIAR10         NONE -----
 PASA  A    1 P 19:174:00000 19:180:86370 LEIAR20         LEIM 73034
 RIO1  A    1 P 19:174:00000 19:180:86370 LEIAR25.R4      LEIT 25138
 SALA  A    1 P 19:174:00000 19:180:86370 LEIAR25         NONE -----
 SCOA  A    1 P 19:174:00000 19:180:86370 TRM55971.00     NONE -----
 SOPU  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 TERU  A    1 P 19:174:00000 19:180:86370 LEIAT504GG      LEIS -----
 VITO  A    1 P 19:174:00000 19:180:86370 LEIAS10         NONE -----
 YEBE  A    1 P 19:174:00000 19:180:86370 TRM29659.00     NONE -----
 ZARA  A    1 P 19:174:00000 19:180:86370 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 19:174:00000 19:180:86370 UNE   3.0460   0.0000   0.0000
 ALDA  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 ALSA  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 AMUR  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 BIAZ  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 BIDA  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 BRZR  A    1 P 19:174:00000 19:180:86370 UNE   0.0771   0.0000   0.0000
 CACE  A    1 P 19:174:00000 19:180:86370 UNE   0.0600   0.0000   0.0000
 CANT  A    1 P 19:174:00000 19:180:86370 UNE   3.0490   0.0000   0.0000
 CHER  A    1 P 19:176:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 CREU  A    1 P 19:174:00000 19:180:86370 UNE   0.0770   0.0000   0.0000
 EBRE  A    1 P 19:174:00000 19:180:86370 UNE   0.0770   0.0000   0.0000
 ELGE  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 EMAZ  A    1 P 19:174:00000 19:180:86370 UNE   0.0350   0.0000   0.0000
 GERN  A    1 P 19:174:00000 19:180:86370 UNE   0.0771   0.0000   0.0000
 IGEL  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 ISPS  A    1 P 19:174:00000 19:180:86370 UNE   0.0350   0.0000   0.0000
 KAST  A    1 P 19:174:00000 19:180:86370 UNE   0.0350   0.0000   0.0000
 LARE  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 LAZK  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 LEIT  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 ORON  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 PASA  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 RIO1  A    1 P 19:174:00000 19:180:86370 UNE   0.0606   0.0000   0.0000
 SALA  A    1 P 19:174:00000 19:180:86370 UNE   0.0600   0.0000   0.0000
 SCOA  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 SOPU  A    1 P 19:174:00000 19:180:86370 UNE   0.0771   0.0000   0.0000
 TERU  A    1 P 19:174:00000 19:180:86370 UNE   0.0600   0.0000   0.0000
 VITO  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 YEBE  A    1 P 19:174:00000 19:180:86370 UNE   0.0000   0.0000   0.0000
 ZARA  A    1 P 19:174:00000 19:180:86370 UNE   3.2590   0.0000   0.0000
```

8 References

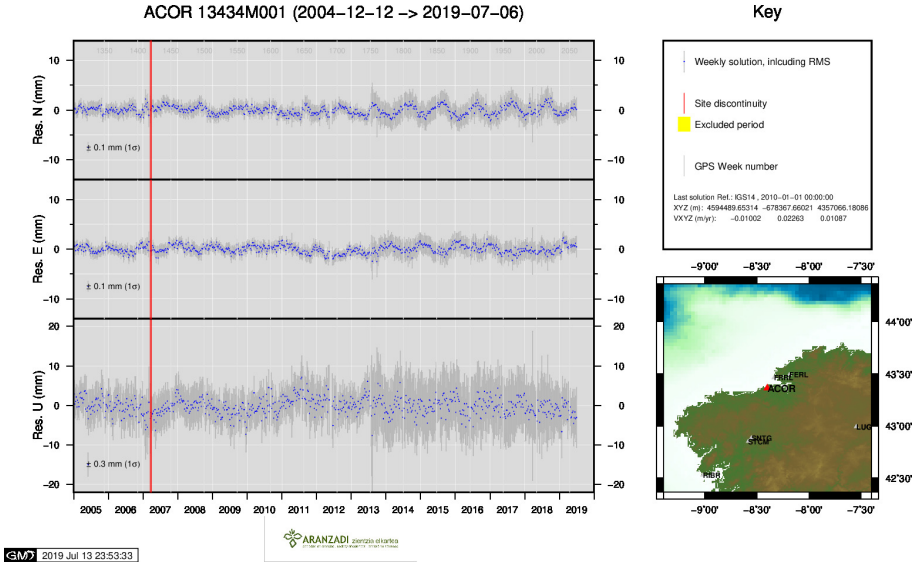
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign.* etrs89.ensg.ign.fr/memo-V8.pdf

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*

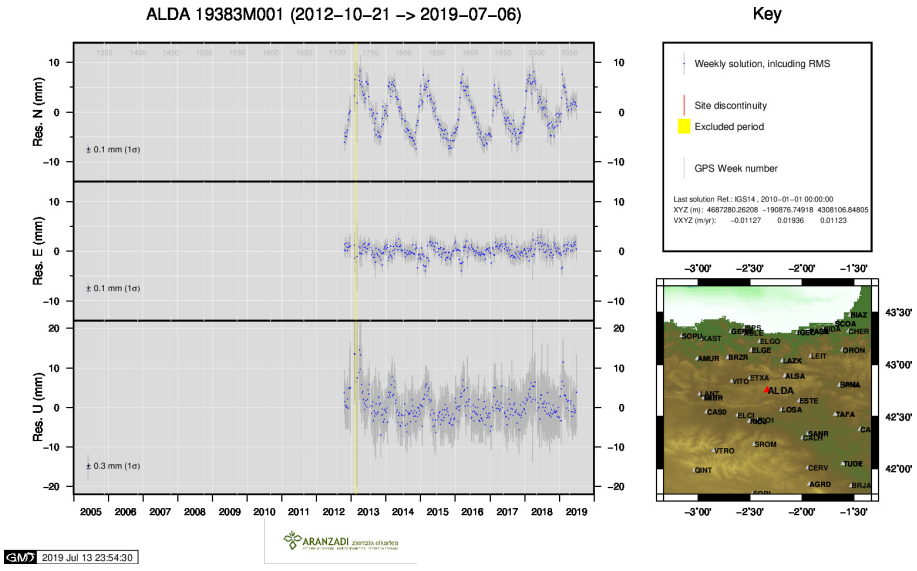
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems.* etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf

9 Cumulative Time Series

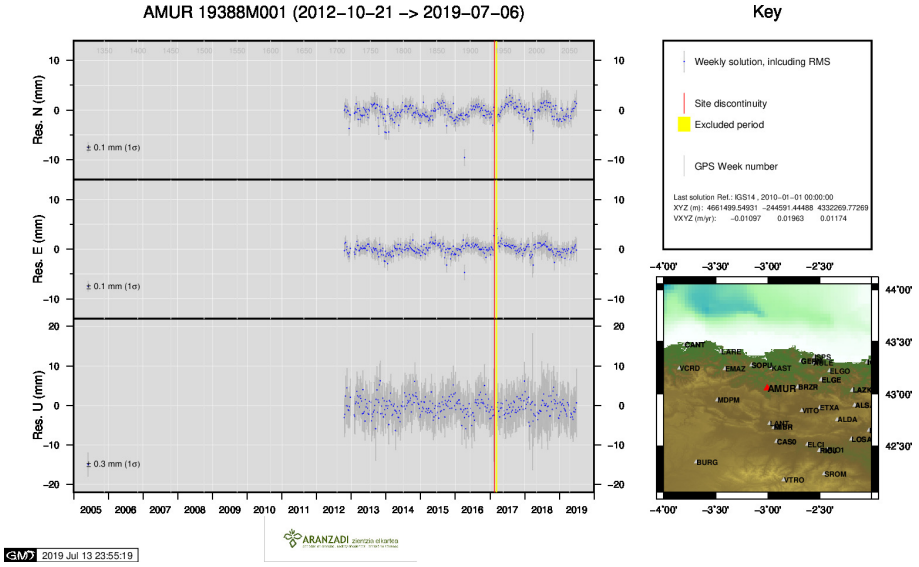
Time series of stations. Latest plots at: http://geolabpasaia.org/gnss/ARA-net/TSeries/, or click on the caption of each image.



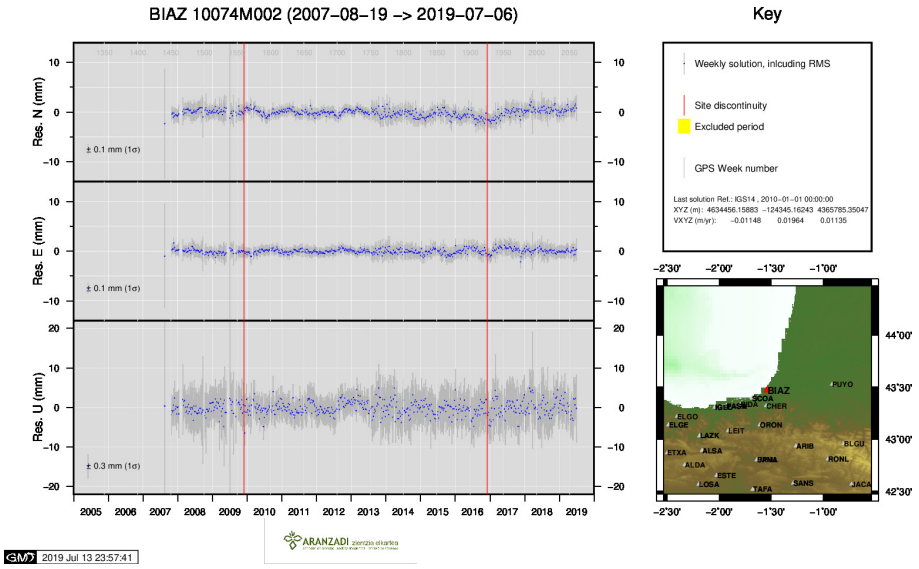
1) ACOR



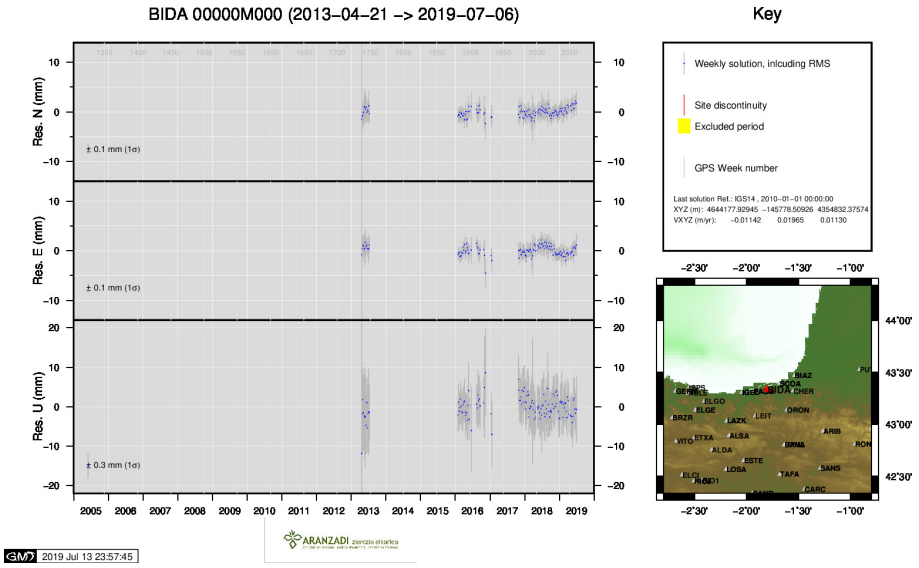
2) ALDA



3) AMUR



4) BIAZ



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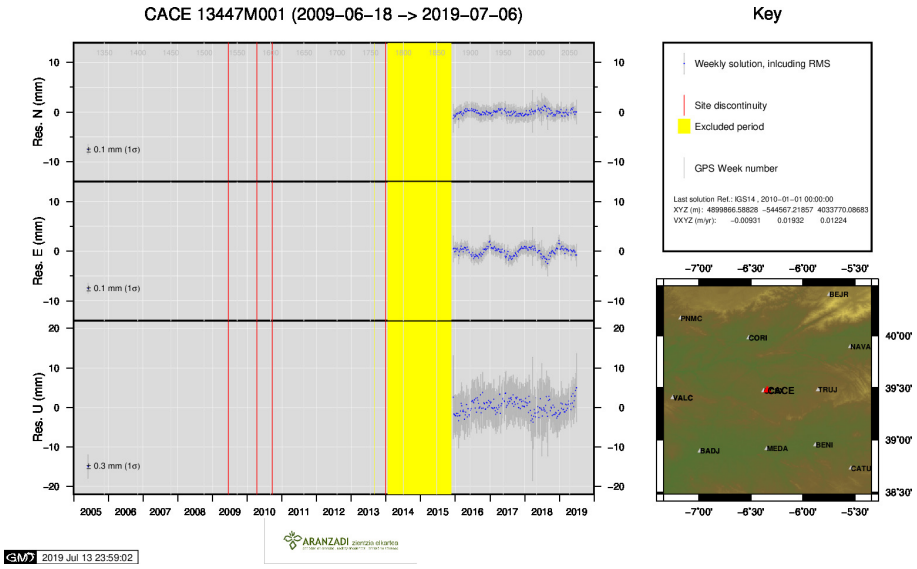

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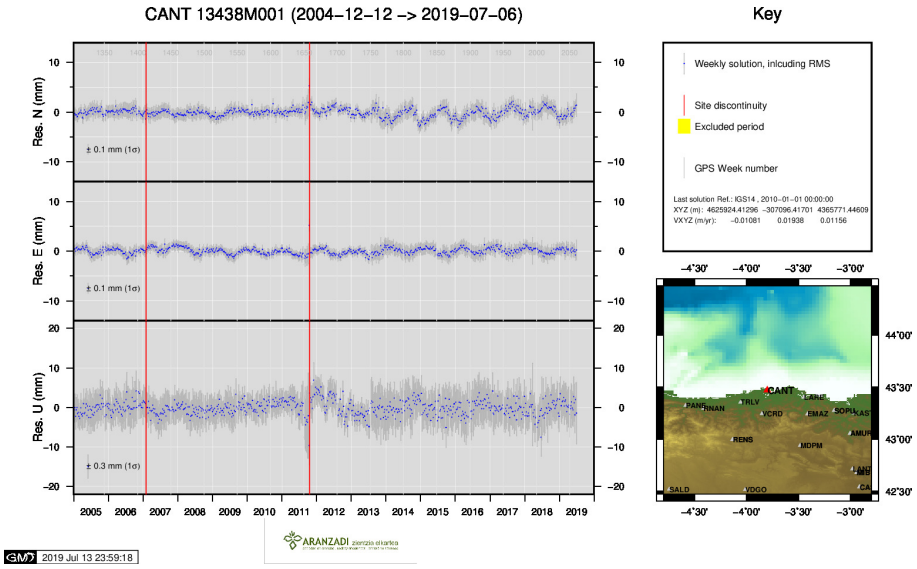

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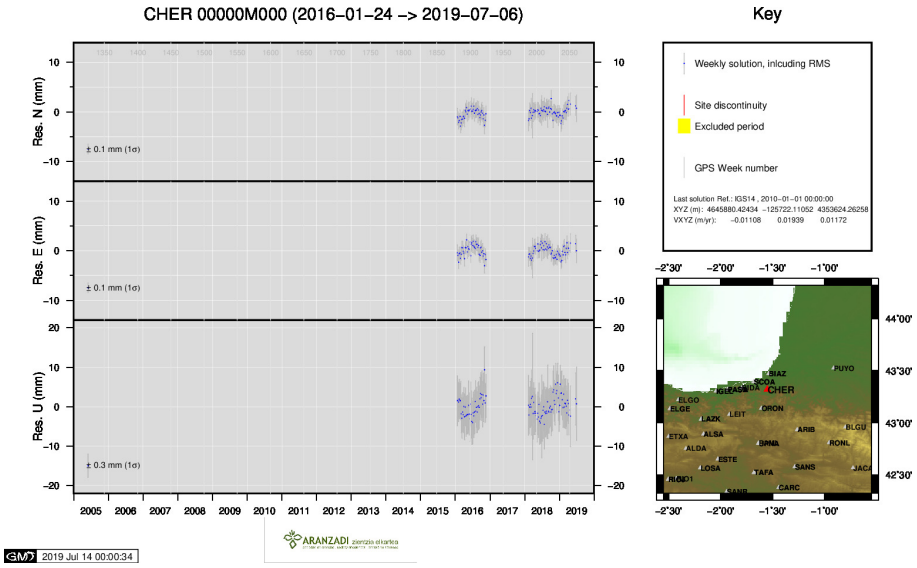

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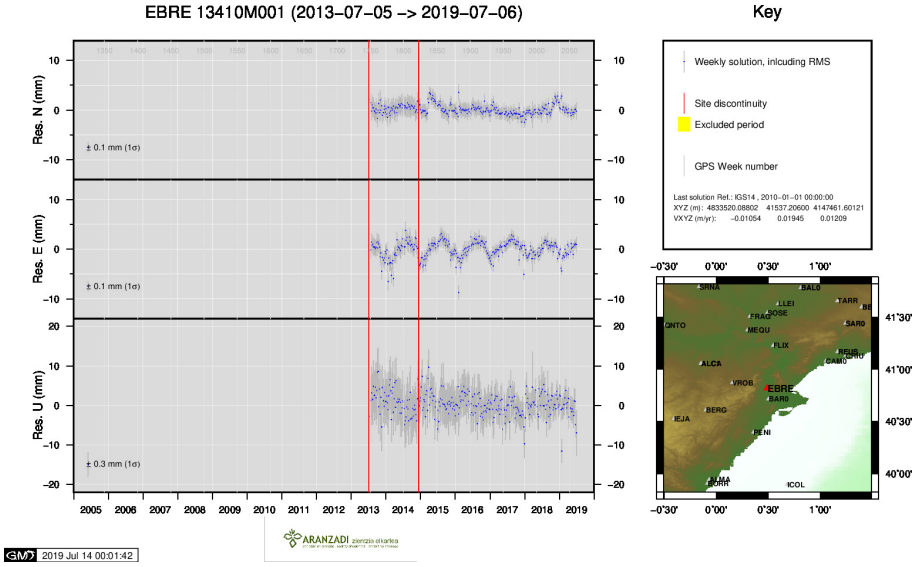

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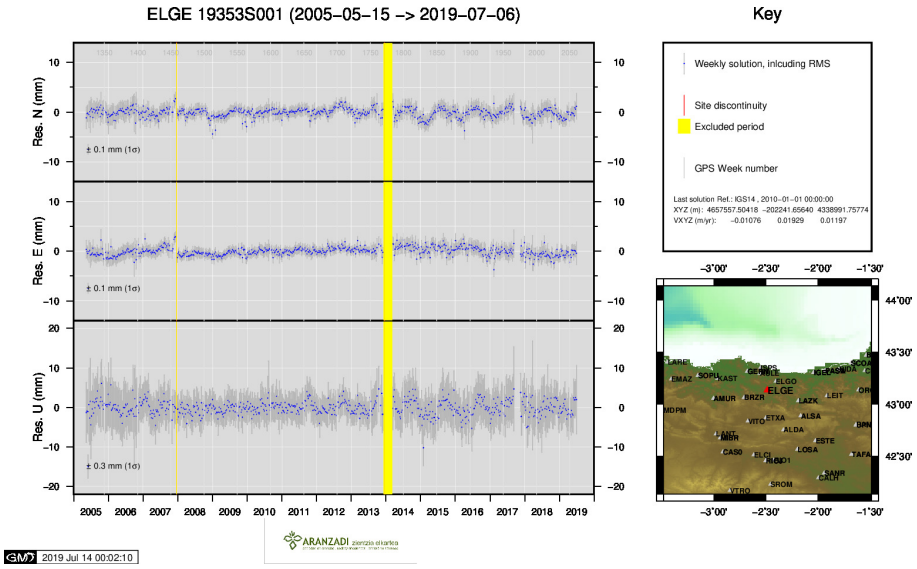

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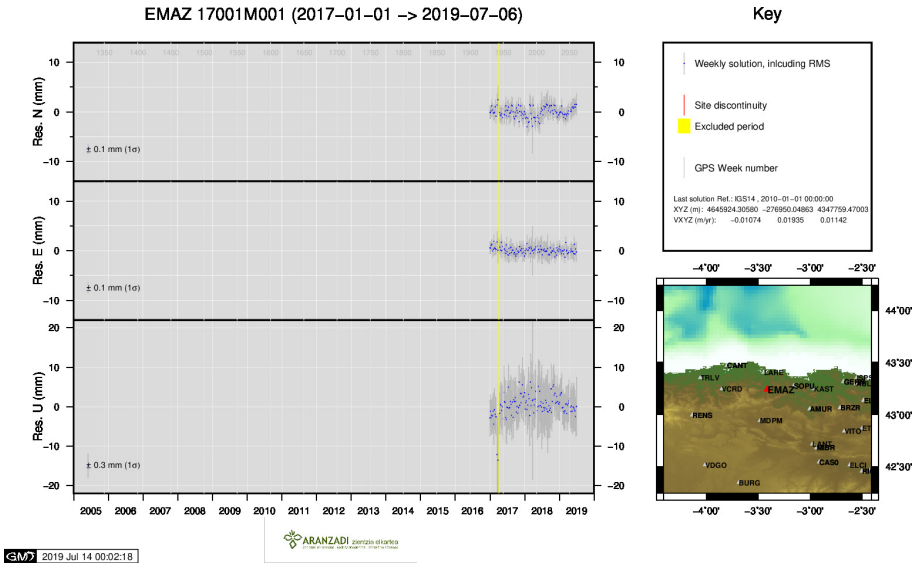

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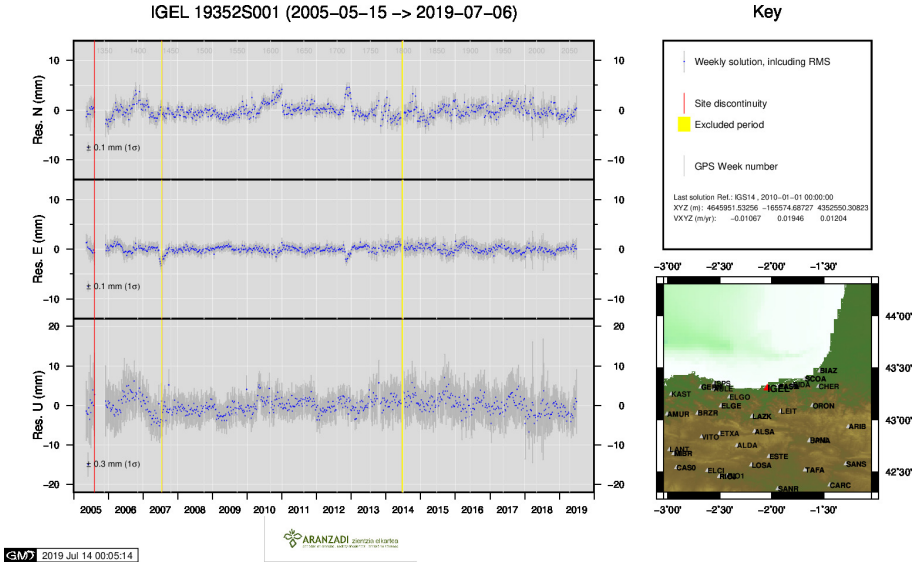

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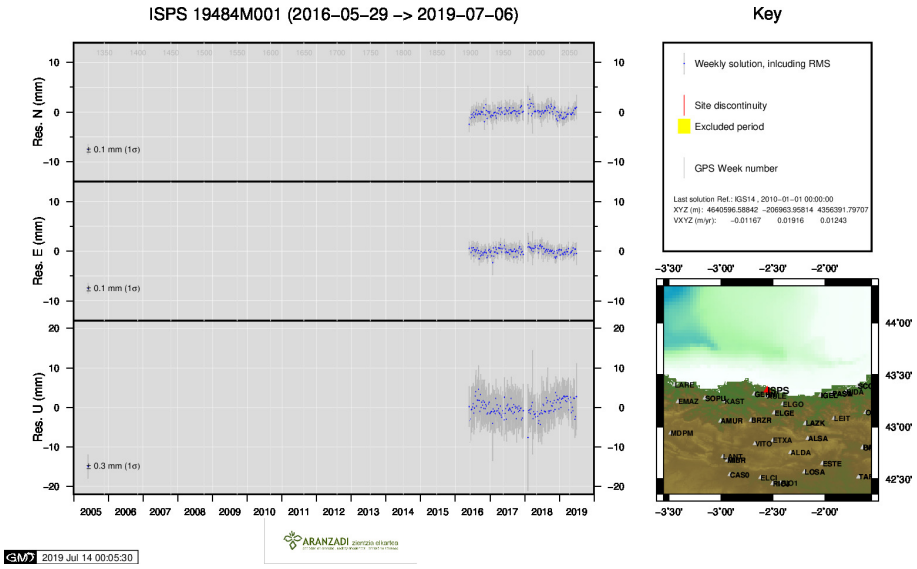

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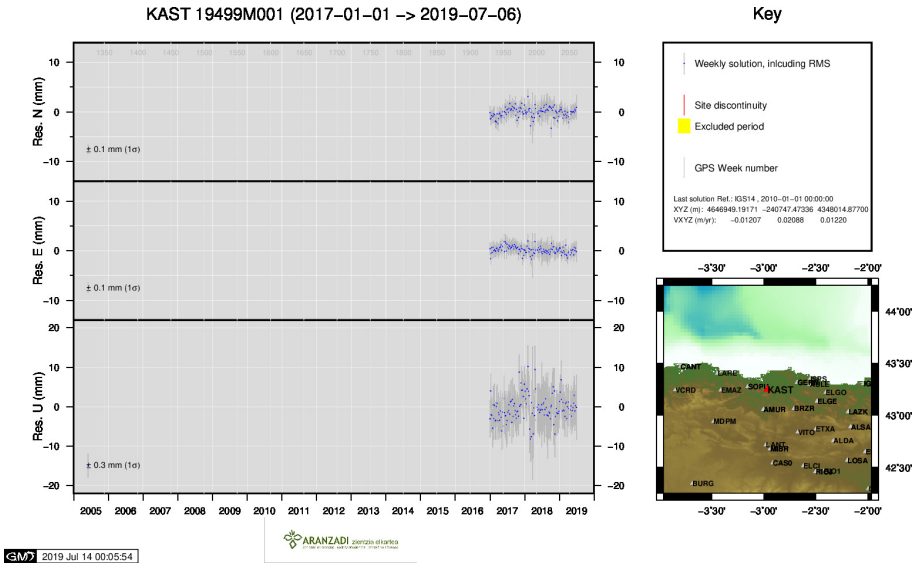

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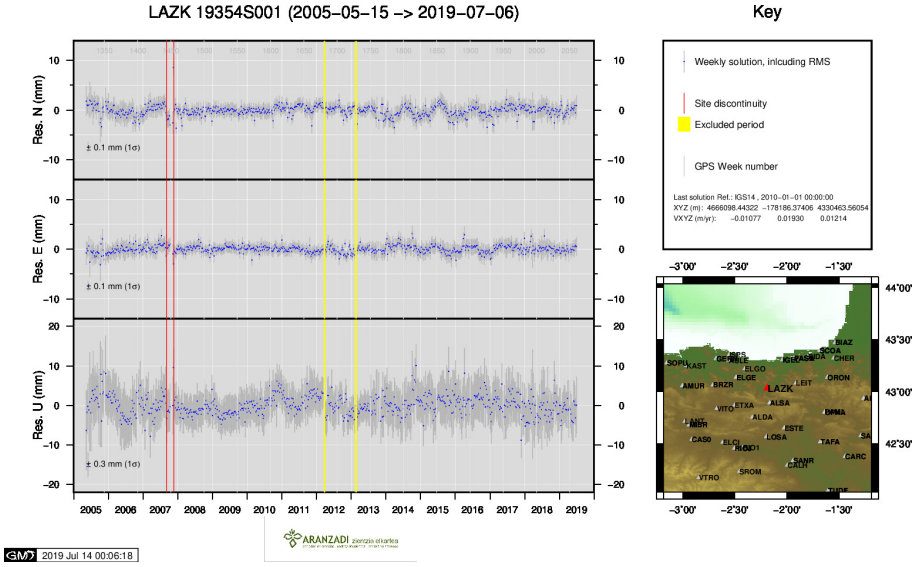

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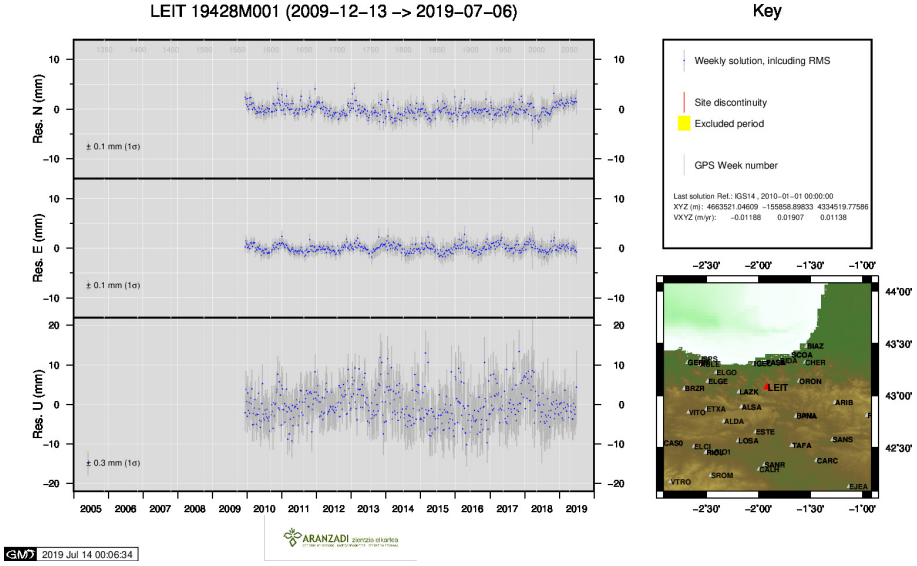

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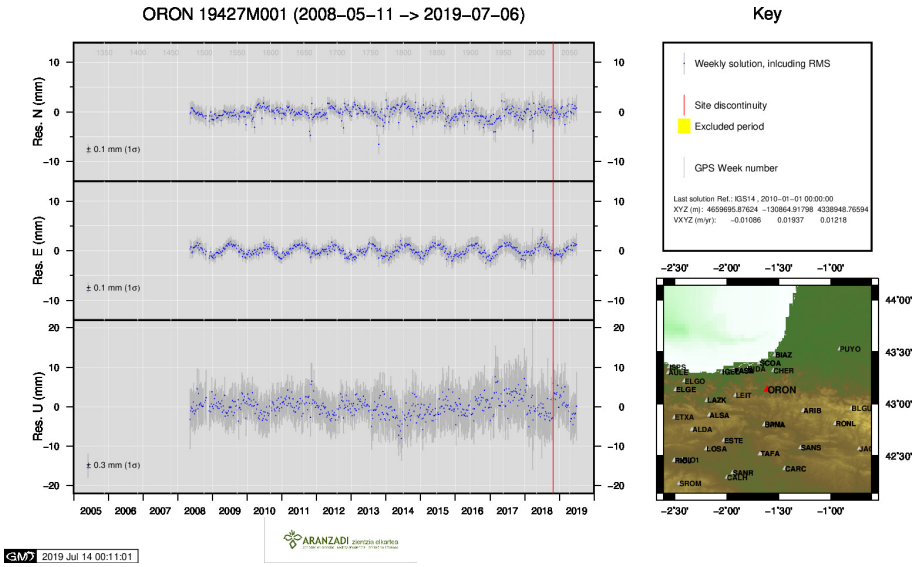

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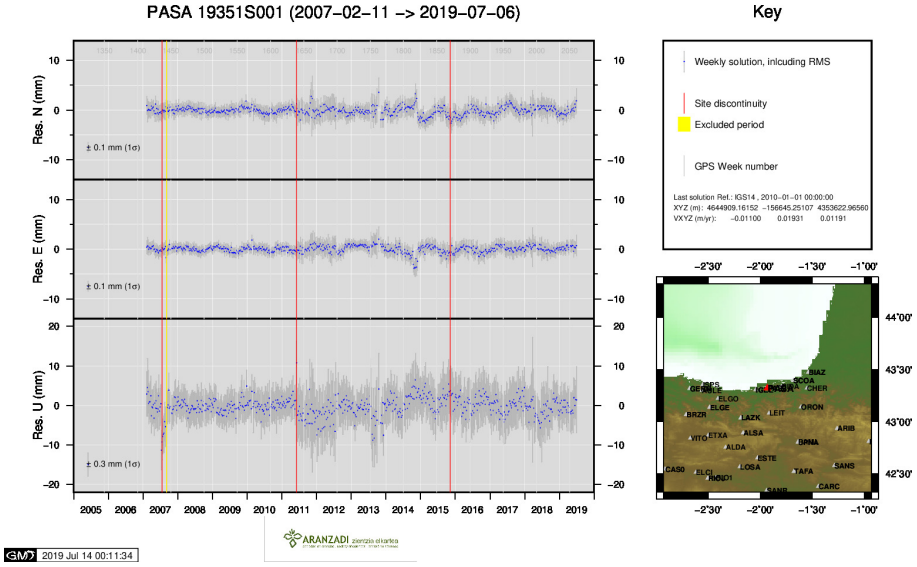

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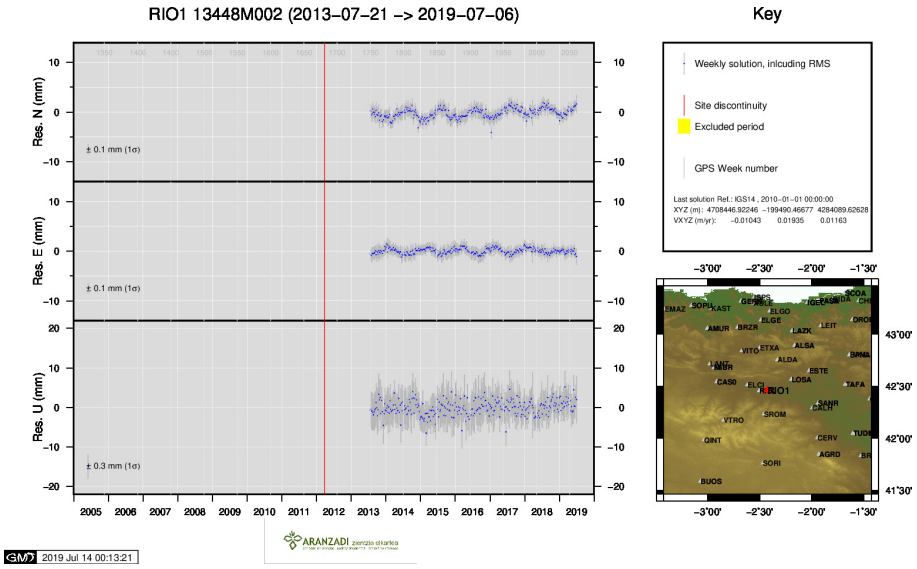

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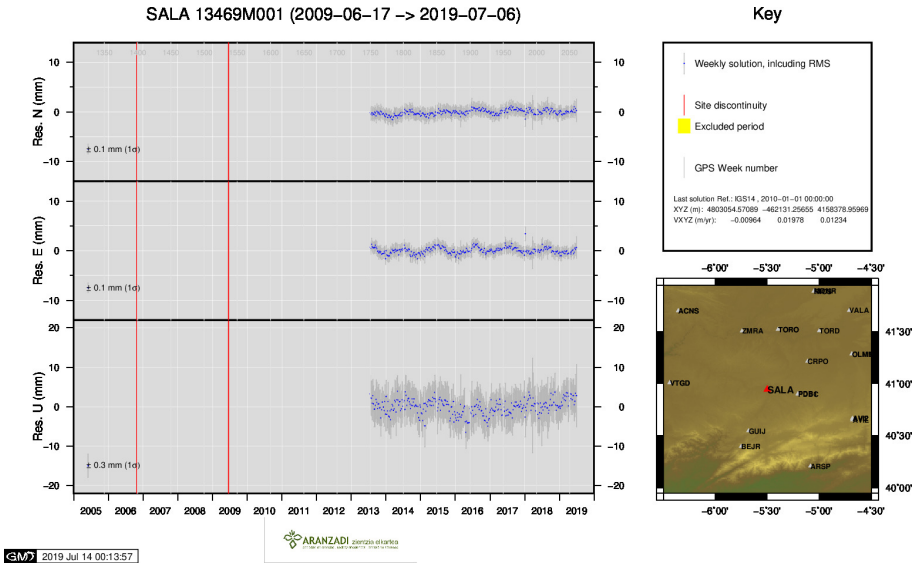

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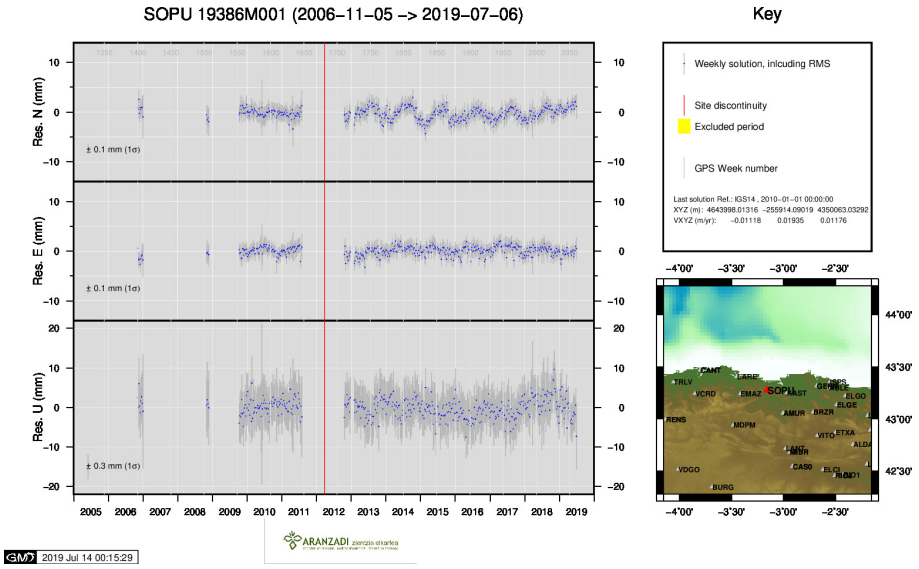

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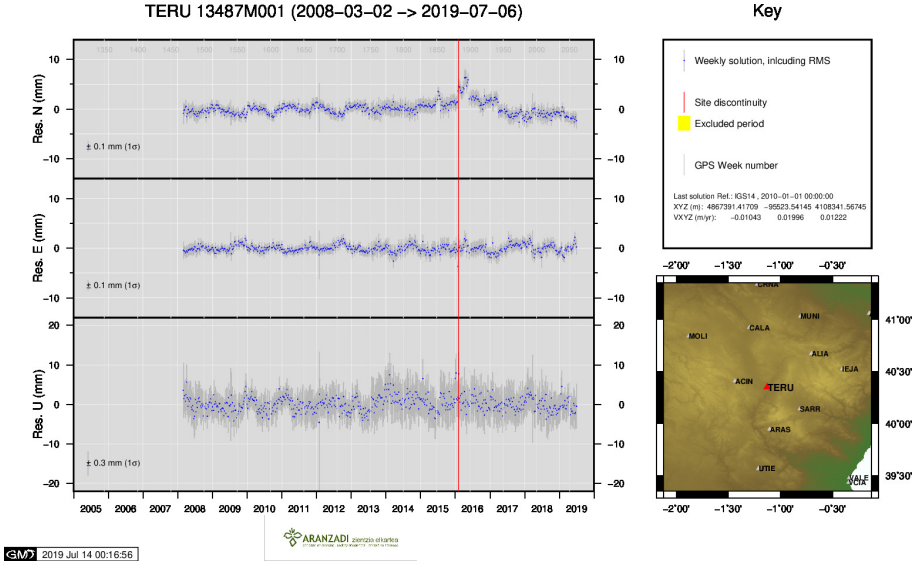

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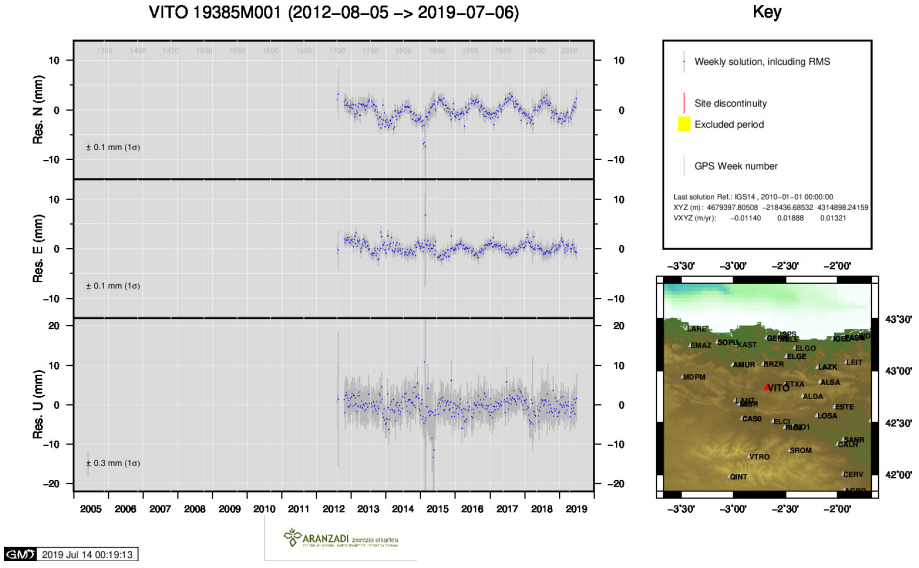

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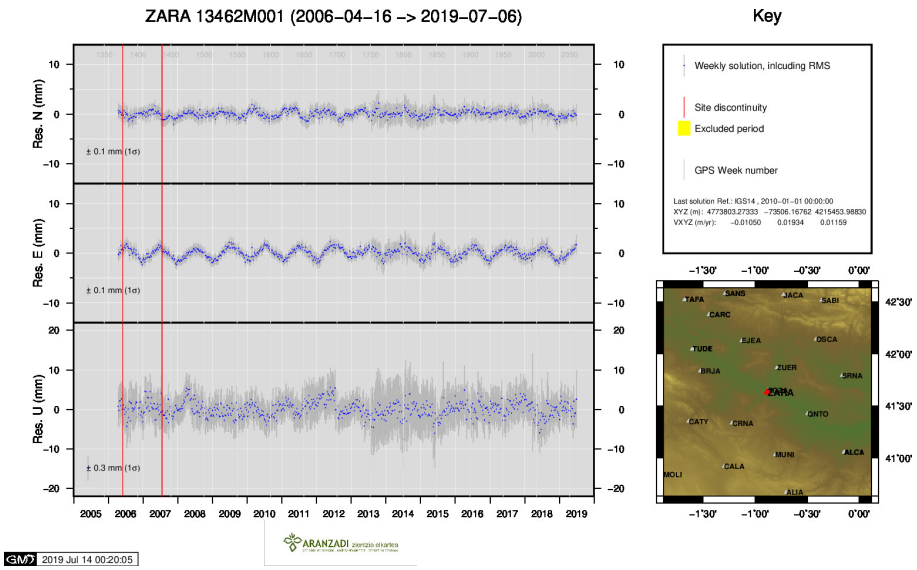
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± 0.1 mm (1σ)
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± 0.3 mm (1σ)
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Key
Weekly solution, inlcuding RMS
Site discontinuity
Excluded period
GPS Week number
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2019 Jul 14 00:20:05
ARANZADI zientzia eta kultura

24) ZARA