

ARA-DAC Weekly Analysis Result: 2330 (GFA)

Technical Report

GPS Week: 2330 (GFA)

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

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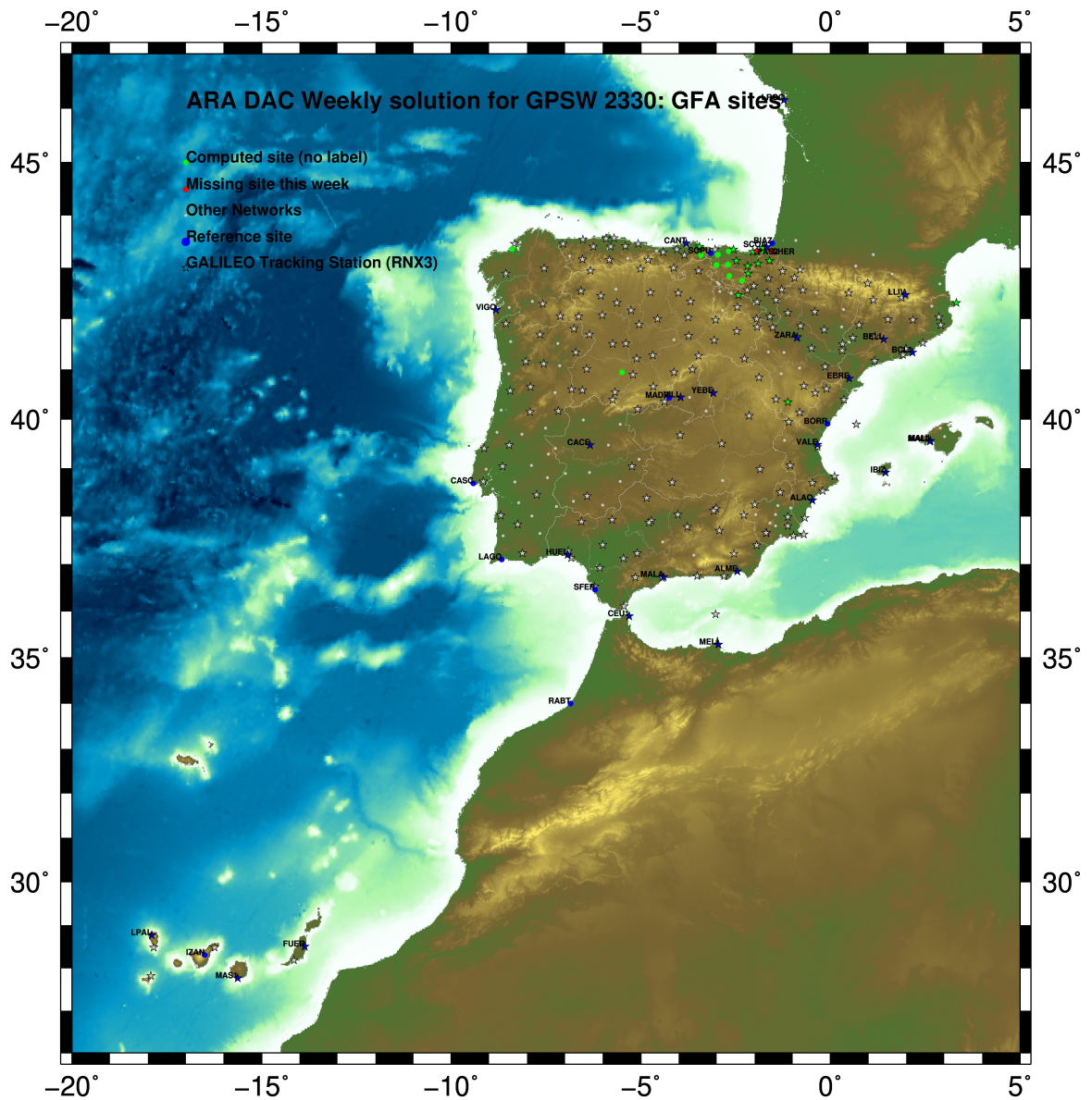


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1 Introduction

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



GM 2024 Sep 23 04:15:34

Fig.1: Computed Sites for GPS Week2330 (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 is used if available starting GPS week 1986)
- 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.I20 file and individual calibrations from EPNC_20.ATX. In case no calibration values of an antenna/radome pairs are not available for a certain GNSS system at some station, the observation of this/these GNSS/GNSSs are excluded from the analysis of that station.
- Reference sites: the latest IGS cumulative solution is used to align our solution to the latest IGS20 release, regularly updated and available at: IGS0OPSSNX_1994002_00U_00U_CRD.SNX.gz. Following the EUREF guidelines, no other individual calibrations are included in the analysis starting GPSW 2238 (IGS20); also applies to repro3 solutions, which are based on IGS20 standards.
- Troposphere:
 - minimum elevation is 3 deg.; elevation dependent weighting.
 - VMF3 mapping function. ZPD parameters are estimated using the VMF3 mapping function.
 - CHENHER gradient estimation model.
- Ionosphere: no a priori model, ionospheric effect almost removed by iono free combination.
- Ocean Loading: FES2014b (Scherneck).
- Atmospheric loading: not corrected, following the latest recommendations for IGS20 products.
- Tidal displacements:
 - Mean pole model : IERS2010_v1.2.0
 - Subdaily pole model: DESAI2016
 - Nutation model : IAU2000R06

4 Estimated Parameters

- Adjustment: Least Squares
- Rejection Criteria: 3σ rms of single differences, in the weekly combination of daily normal equations (ADDNEQ)
- Station coordinates: minimum constraints (MC) to IGS 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. DE421 planetary ephemeris and JGM3 Earth geopotential model is used.
- Ambiguity: an advanced ambiguity resolution (AR) scheme is included:
 - Code-Based Widelane (WL) and Narrow Line (NR) 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 (IGS cumulative solution) are the ones used in the Minimal Constraints condition.

5.1 IGS20

The Reference Frame considered in this section is the IGS20 (IGS cumulative solution), mapped from 2015.0 to the observation epoch.

ARA FINAL WEEKLY COMBINATION: FINAL ORBITS 23-SEP-24 03:02

LOCAL GEODETIC DATUM: IGS20 EPOCH: 2024-09-04 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.48425	-678367.28109	4357066.32713	A	G
39	ALDA 19383M001	4687280.10963	-190876.46677	4308107.01703	A	GR
50	ALSA 19419M001	4677250.77689	-176770.29466	4319079.93940	A	GRE
53	AMUR 19388M001	4661499.39368	-244591.15529	4332269.94525	A	GR
384	BIAZ 10074M002	4634455.99135	-124344.87432	4365785.51803	W	GR
101	BIDA 00000M000	4644177.76153	-145778.22288	4354832.54202	A	GR
113	BRZR 19387M001	4662220.93457	-220769.79834	4333309.49805	A	GR
573	CACE 13447M001	4899866.45694	-544566.93584	4033770.26919	W	GRE
592	CANT 13438M001	4625924.26188	-307096.13667	4365771.62296	W	GRE
908	CREU 13432M001	4715420.06898	273178.16210	4271946.90528	A	GRE
135	EBRE 13410M001	4833519.93588	41537.49495	4147461.78263	W	GRE
180	ELGE 19353S001	4657557.33951	-202241.36913	4338991.95022	A	GRE
182	EMAZ 17001M001	4645924.16181	-276949.77007	4347759.63737	A	GR
209	GERN 19389M001	4642811.26785	-217222.82681	4353278.94471	A	GR
257	HOND 15012M002	4640529.25992	-145675.88505	4358781.81747	A	GRE
235	IGEL 19352S001	4645951.37202	-165574.40351	4352550.48533	A	GRE
240	ISPS 19484M001	4640596.42360	-206963.67675	4356391.97754	A	GRE
245	KAST 19499M001	4646949.02160	-240747.16810	4348015.05747	A	GR
252	LARE 19440M001	4632831.90256	-279026.04591	4360314.49098	A	GRE
256	LAZK 19354S001	4666098.28423	-178186.09020	4330463.73250	A	GRE
261	LEIT 19428M001	4663520.89059	-155858.61963	4334519.95062	A	GRE
334	ORON 19427M001	4659695.72266	-130864.63467	4338948.94714	A	GRE
493	PASA 19351S001	4644909.00319	-156644.97007	4353623.13924	A	GRE
553	RID1 13448M002	4708446.77134	-199490.18209	4284089.79834	A	GRE
558	SALA 13469M001	4803054.43516	-462130.96856	4158379.14179	A	GR
526	SCDA 10088M002	4639940.44727	-136224.84291	4359552.48533	W	GRE
715	SOPU 19386M001	4643997.85153	-255913.80756	4350063.20280	W	GR
443	TERU 13487M001	4867391.26906	-95523.24263	4108341.74911	A	GRE
493	VITO 19385M001	4679397.64493	-218436.40420	4314898.43157	A	GR
616	YEBE 13420M001	4848724.51781	-261631.82591	4123094.39456	W	GRE
655	ZARA 13462M001	4773803.11216	-73505.88411	4215454.15842	W	GRE

5.2 ETRF2000 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2000 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

CONVERT TO ETRF2000 23-SEP-24 03:02

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2024-09-04 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.83061	-678367.92201	4357065.84400	A	
39	ALDA 19383M001	4687280.51893	-190877.11810	4308106.53270	A	
50	ALSA 19419M001	4677251.18902	-176770.94472	4319079.45616	A	
53	AMUR 19388M001	4661499.79758	-244591.80360	4332269.46243	A	
384	BIAZ 10074M002	4634456.41448	-124345.51900	4365785.03930	W	
101	BIDA 00000M000	4644178.18082	-145778.86881	4354832.06213	A	
113	BRZR 19387M001	4662221.34183	-220770.44669	4333309.01551	A	
573	CACE 13447M001	4899866.79524	-544567.61362	4033769.76098	W	
592	CANT 13438M001	4625924.65994	-307096.78078	4365771.14239	W	
908	CREU 13432M001	4715420.53888	273177.50896	4271946.42495	A	
135	EBRE 13410M001	4833520.36389	41536.82661	4147461.28863	W	
180	ELGE 19353S001	4657557.74977	-202242.01685	4338991.46835	A	
182	EMAZ 17001M001	4645924.56234	-276950.41657	4347759.15547	A	
209	GERN 19389M001	4642811.67722	-217223.47276	4353278.46393	A	
257	HOND 15012M002	4640529.67955	-145676.53053	4358781.33790	A	
235	IGEL 19352S001	4645951.78841	-165575.04971	4352550.00501	A	
240	ISPS 19484M001	4640596.83463	-206964.32241	4356391.49710	A	
245	KAST 19499M001	4646949.42731	-240747.81463	4348014.57599	A	
252	LARE 19440M001	4632832.30403	-279026.69080	4360314.01020	A	
256	LAZK 19354S001	4666098.69709	-178186.73890	4330463.25022	A	
261	LEIT 19428M001	4663521.29685	-155859.26796	4334519.46888	A	
334	ORON 19427M001	4659696.14270	-130865.28245	4338948.46609	A	
493	PASA 19351S001	4644909.42089	-156645.61612	4353622.65913	A	
553	RID1 13448M002	4708447.17749	-199490.83601	4284089.31202	A	
558	SALA 13469M001	4803054.79499	-462131.63457	4158378.64335	A	
526	SCDA 10088M002	4639940.86826	-136225.48829	4359552.00595	W	
715	SOPU 19386M001	4643998.25533	-255914.45376	4350062.72137	W	
443	TERU 13487M001	4867391.67409	-95523.91552	4108341.25019	A	
493	VITO 19385M001	4679398.05100	-218437.05463	4314897.94755	A	
616	YEBE 13420M001	4848724.90227	-261632.49700	4123093.89494	W	
655	ZARA 13462M001	4773803.52997	-73506.54560	4215453.66810	W	

5.3 ETRF2014 (ETRS89) Coordinates

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

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CONVERT TO ETRF2014                                     23-SEP-24 03:02
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LOCAL GEODETIC DATUM: ETRF2014                       EPOCH: 2024-09-04 11:59:45
NUM STATION NAME      X (M)      Y (M)      Z (M)      FLAG      SYSTEM
111 ACRD 13434M001     4594489.79076 -678367.95867 4357065.89666 A
 39 ALDA 19383M001     4687280.47653 -190877.15619 4308106.58523 A
 50 ALSA 19419M001     4677251.14668 -176770.98292 4319079.50872 A
 53 AMUR 19388M001     4661499.75566 -244591.84161 4332269.51502 A
384 BIAZ 10074M002     4634456.37243 -124345.55759 4365785.09203 W
101 BIDA 00000M000     4644178.13875 -145778.90727 4354832.11482 A
113 BRZR 19387M001     4662221.29982 -220770.48479 4333309.06810 A
 573 CACE 13447M001     4899866.75145 -544567.64940 4033769.81278 W
 592 CANT 13438M001     4625924.61863 -307096.81872 4365771.19506 W
 908 CREU 13432M001     4715420.49436 273177.46926 4271946.47773 A
135 EBRE 13410M001     4833520.31892 41536.78831 4147461.34088 W
180 ELGE 19353S001     4657557.70775 -202242.05505 4338991.52097 A
182 EMAZ 17001M001     4645924.52071 -276950.45453 4347759.20809 A
209 GERN 19389M001     4642811.63541 -217223.51097 4353278.51659 A
257 HOND 15012M002     4640529.63752 -145676.56901 4358781.39061 A
235 IGEL 19352S001     4645951.74639 -165575.08809 4352550.05768 A
240 ISPS 19484M001     4640596.79282 -206964.36066 4356391.54977 A
245 KAST 19499M001     4646949.38554 -240747.85272 4348014.62862 A
252 LARE 19440M001     4632832.26254 -279026.72881 4360314.06286 A
256 LAZK 19354S001     4666098.65489 -178186.77714 4330463.30282 A
261 LEIT 19428M001     4663521.25459 -155859.30629 4334519.52151 A
334 ORDN 19427M001     4659696.10040 -130865.32090 4338948.51874 A
493 PASA 19351S001     4644909.37885 -156645.65454 4353622.71181 A
553 RIO1 13448M002     4708447.13488 -199490.87398 4284089.36448 A
558 SALA 13469M001     4803054.75213 -462131.67111 4158378.69543 A
526 SODA 10088M002     4639940.82620 -136225.52681 4359552.05866 W
715 SOPU 19386M001     4643998.21364 -255914.49181 4350062.77400 W
443 TERU 13487M001     4867391.62924 -95523.95315 4108341.30225 A
493 VITO 19385M001     4679398.00879 -218437.09266 4314898.00008 A
616 YEBE 13420M001     4848724.85823 -261632.53409 4123093.94697 W
655 ZARA 13462M001     4773803.48615 -73506.58375 4215453.72044 W
    
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5.4 ETRF2020 (ETRS89) Coordinates

European Terrestrial Reference System, 1989 (ETRS89) is realized by ETRF2020 (Boucher and Altamimi, 2011) and (Altamimi, 2017).

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CONVERT TO ETRF2020                                     23-SEP-24 03:02
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LOCAL GEODETIC DATUM: ETRF2020                       EPOCH: 2024-09-04 11:59:45
NUM STATION NAME      X (M)      Y (M)      Z (M)      FLAG      SYSTEM
111 ACRD 13434M001     4594489.78704 -678367.94433 4357065.90458 A
 39 ALDA 19383M001     4687280.47152 -190877.14137 4308106.59340 A
 50 ALSA 19419M001     4677251.14160 -176770.96812 4319079.51688 A
 53 AMUR 19388M001     4661499.75074 -244591.82689 4332269.52313 A
384 BIAZ 10074M002     4634456.36708 -124345.54290 4365785.10013 W
101 BIDA 00000M000     4644178.13349 -145778.89256 4354832.12293 A
113 BRZR 19387M001     4662221.29483 -220770.47005 4333309.07622 A
 573 CACE 13447M001     4899866.74813 -544567.63405 4033769.82121 W
 592 CANT 13438M001     4625924.61381 -307096.80414 4365771.20311 W
 908 CREU 13432M001     4715420.48807 273177.48437 4271946.48603 A
135 EBRE 13410M001     4833520.31362 41536.80369 4147461.34933 W
180 ELGE 19353S001     4657557.70269 -202242.04032 4338991.52909 A
182 EMAZ 17001M001     4645924.51585 -276950.43987 4347759.21617 A
209 GERN 19389M001     4642811.63036 -217223.49629 4353278.52468 A
257 HOND 15012M002     4640529.63225 -145676.55431 4358781.39871 A
235 IGEL 19352S001     4645951.74120 -165575.07339 4352550.06579 A
240 ISPS 19484M001     4640596.78773 -206964.34599 4356391.55786 A
245 KAST 19499M001     4646949.38058 -240747.83804 4348014.63672 A
252 LARE 19440M001     4632832.25766 -279026.71419 4360314.07093 A
256 LAZK 19354S001     4666098.64978 -178186.76237 4330463.31096 A
261 LEIT 19428M001     4663521.24941 -155859.29153 4334519.52964 A
334 ORDN 19427M001     4659696.09514 -130865.30614 4338948.52688 A
493 PASA 19351S001     4644909.37363 -156645.63983 4353622.71992 A
553 RIO1 13448M002     4708447.12995 -199490.85909 4284089.37268 A
558 SALA 13469M001     4803054.74828 -462131.65603 4158378.70373 A
526 SODA 10088M002     4639940.82090 -136225.51211 4359552.06676 W
715 SOPU 19386M001     4643998.20872 -255914.47715 4350062.78209 W
443 TERU 13487M001     4867391.62444 -95523.93772 4108341.31073 A
493 VITO 19385M001     4679398.00384 -218437.07787 4314898.00824 A
616 YEBE 13420M001     4848724.85388 -261632.51878 4123093.95538 W
655 ZARA 13462M001     4773803.48102 -73506.56860 4215453.72877 W
    
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6 Quality Control

6.1 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repeatabilities refer to the IGS20 solution and are given with respect to the Local frame (North-East-Up).

GFA FINAL WEEKLY COMBINATION: FINAL ORBITS 23-SEP-24 03:02

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.58	0.97	3.20
ALDA 19383M001	7	XXXXXX	1.16	1.31	4.87
ALSA 19419M001	7	XXXXXX	0.91	0.55	4.68
AMUR 19388M001	7	XXXXXX	1.33	0.96	5.98
BLAZ 10074M002	7	XXXXXX	1.28	1.74	6.45
BIDA 00000M000	7	XXXXXX	1.70	0.90	4.81
BRZR 19387M001	7	XXXXXX	1.21	1.30	4.20
CACE 13447M001	7	XXXXXX	2.17	0.68	6.56
CANT 13438M001	7	XXXXXX	0.67	0.89	2.91
CREU 13432M001	7	XXXXXX	1.13	0.84	5.73
EBRE 13410M001	7	XXXXXX	1.29	1.29	6.74
ELGE 19353S001	7	XXXXXX	0.82	0.62	2.51
EMAZ 17001M001	7	XXXXXX	1.17	1.30	6.52
GERN 19389M001	7	XXXXXX	1.09	1.81	7.23
HOND 15012M002	6	XX XXX	1.13	0.49	3.92
IGEL 19352S001	7	XXXXXX	0.99	1.06	3.63
ISPS 19484M001	7	XXXXXX	0.83	1.18	3.39
KAST 19499M001	7	XXXXXX	1.09	0.79	7.00
LARE 19440M001	7	XXXXXX	1.24	0.40	5.58
LAZK 19354S001	7	XXXXXX	1.40	0.62	4.11
LEIT 19428M001	7	XXXXXX	1.45	1.02	3.56
ORON 19427M001	4	XXXX	1.42	1.02	4.07
PASA 19351S001	7	XXXXXX	0.91	0.64	3.53
RI01 13448M002	6	X XXXXX	0.84	0.61	3.40
SALA 13469M001	7	XXXXXX	0.72	0.72	3.64
SCOA 10088M002	7	XXXXXX	2.64	1.23	3.16
SOPU 19386M001	7	XXXXXX	0.94	0.45	4.04
TERU 13487M001	7	XXXXXX	1.15	0.71	4.57
VITO 19385M001	7	XXXXXX	0.85	0.78	6.67
YEBE 13420M001	7	XXXXXX	0.52	0.78	2.95
ZARA 13462M001	7	XXXXXX	0.55	0.84	5.19

Comparison of individual solutions:

ACOR 13434M001	N	0.58	1.11	-0.35	0.32	-0.36	0.38	-0.47	-0.18
ACOR 13434M001	E	0.97	-1.41	0.37	0.01	0.54	0.74	-1.03	-1.26
ACOR 13434M001	U	3.20	-1.96	-1.53	-2.14	1.17	4.09	-5.69	0.38
ALDA 19383M001	N	1.16	-2.59	-0.78	0.52	0.06	0.01	0.51	0.44
ALDA 19383M001	E	1.31	1.30	-2.52	0.23	0.07	0.12	1.45	0.24
ALDA 19383M001	U	4.87	6.16	5.02	6.06	0.63	1.84	2.53	-5.68
ALSA 19419M001	N	0.91	-0.77	1.32	-0.40	-1.25	0.20	-0.92	-0.07
ALSA 19419M001	E	0.55	0.37	0.08	-0.20	0.35	-0.52	1.06	-0.31
ALSA 19419M001	U	4.68	1.59	-0.38	7.04	4.94	5.56	2.42	-4.26
AMUR 19388M001	N	1.33	0.19	1.71	-2.60	0.26	0.05	0.87	-0.01
AMUR 19388M001	E	0.96	-1.28	0.02	1.10	0.48	0.05	-0.09	1.55
AMUR 19388M001	U	5.98	0.61	-2.11	11.76	3.58	5.88	4.88	-0.46
BLAZ 10074M002	N	1.28	-1.97	0.87	0.08	1.83	0.99	-0.75	-0.51
BLAZ 10074M002	E	1.74	-0.61	-0.55	-0.02	1.27	-0.07	3.78	-1.27
BLAZ 10074M002	U	6.45	-5.23	-6.54	5.80	4.59	9.65	-0.16	5.59
BIDA 00000M000	N	1.70	-2.24	3.25	0.24	-0.39	0.70	-0.04	-1.03
BIDA 00000M000	E	0.90	0.14	0.60	1.88	-0.13	-0.85	0.36	-0.25
BIDA 00000M000	U	4.81	-2.05	-3.20	8.41	5.86	3.47	2.44	-1.04
BRZR 19387M001	N	1.21	0.56	1.81	0.85	-1.02	0.78	0.65	-1.56
BRZR 19387M001	E	1.30	-0.55	1.63	-0.40	0.78	1.29	0.88	-2.02
BRZR 19387M001	U	4.20	0.99	4.83	2.27	5.14	4.56	0.89	-5.30
CACE 13447M001	N	2.17	4.72	-0.06	0.58	-1.14	-1.49	-0.61	1.30
CACE 13447M001	E	0.68	0.41	-0.07	-0.89	-1.08	0.45	0.09	-0.66
CACE 13447M001	U	6.56	-13.49	-5.15	2.73	0.23	-3.57	5.07	2.00
CANT 13438M001	N	0.67	0.93	1.01	0.22	-0.70	-0.04	0.43	-0.24
CANT 13438M001	E	0.89	-0.14	1.04	-1.62	-0.16	0.90	-0.43	0.14
CANT 13438M001	U	2.91	-3.05	-1.07	3.39	-0.50	4.84	-1.93	1.20
CREU 13432M001	N	1.13	-1.29	1.89	-1.04	-0.40	0.60	0.88	0.14
CREU 13432M001	E	0.84	-0.84	0.08	0.44	0.50	-1.12	1.31	-0.34
CREU 13432M001	U	5.73	-7.58	0.83	4.05	3.81	7.19	6.37	-3.95
EBRE 13410M001	N	1.29	-1.25	-0.37	0.19	1.68	1.38	-0.77	-1.73
EBRE 13410M001	E	1.29	-0.74	0.84	-0.34	-0.96	-1.52	2.29	0.38
EBRE 13410M001	U	6.74	0.90	4.32	8.02	8.28	-7.69	-7.64	1.58
ELGE 19353S001	N	0.82	1.12	1.26	-0.07	-0.27	0.69	0.16	-0.81
ELGE 19353S001	E	0.62	-0.06	0.70	0.16	1.27	-0.42	-0.06	-0.05
ELGE 19353S001	U	2.51	0.35	2.69	3.60	-0.46	2.00	3.59	0.74
EMAZ 17001M001	N	1.17	1.80	1.03	0.68	-1.60	0.86	0.10	0.39
EMAZ 17001M001	E	1.30	-0.00	-2.22	0.92	0.52	1.96	-0.47	0.15
EMAZ 17001M001	U	6.52	-13.20	-1.33	0.43	3.43	3.07	-5.46	-5.30
GERN 19389M001	N	1.09	0.40	2.25	0.64	-0.69	-0.64	-0.60	0.51
GERN 19389M001	E	1.81	1.95	1.93	-0.43	0.60	-1.49	-2.57	1.65
GERN 19389M001	U	7.23	-5.46	-0.06	7.57	7.48	11.23	-1.43	-6.48
HOND 15012M002	N	1.13	-1.29	1.87	0.46		0.59	-0.18	-0.77
HOND 15012M002	E	0.49	0.82	0.42	0.44		0.07	-0.33	-0.23
HOND 15012M002	U	3.92	-2.60	-1.22	7.38		1.44	3.31	1.16
IGEL 19352S001	N	0.99	-0.77	2.01	-0.58	0.64	-0.17	-0.72	0.07
IGEL 19352S001	E	1.06	0.16	-0.14	0.06	1.69	-1.57	1.09	0.43
IGEL 19352S001	U	3.63	0.79	1.72	0.98	5.90	4.87	3.04	-2.58
ISPS 19484M001	N	0.83	0.99	1.17	-0.05	-0.52	-0.55	1.07	-0.26
ISPS 19484M001	E	1.18	0.34	2.22	-0.26	1.38	-0.72	-0.67	-0.62
ISPS 19484M001	U	3.39	1.44	6.07	3.94	3.20	0.49	-1.91	-0.51
KAST 19499M001	N	1.09	-0.78	1.05	0.88	1.61	0.40	0.27	-1.34
KAST 19499M001	E	0.79	0.16	1.10	0.35	1.33	-0.40	-0.20	-0.64
KAST 19499M001	U	7.00	-3.62	-3.62	3.32	7.08	11.56	4.88	-7.04
LARE 19440M001	N	1.24	1.45	1.00	-1.39	-0.74	-0.81	1.18	1.29
LARE 19440M001	E	0.40	-0.67	-0.14	0.24	-0.11	0.12	0.63	-0.12
LARE 19440M001	U	5.58	-8.69	-3.93	8.32	-0.53	0.85	-4.68	-1.93
LAZK 19354S001	N	1.40	-0.79	1.55	-1.72	-1.15	-0.67	-0.92	1.76
LAZK 19354S001	E	0.62	0.26	-0.77	-0.36	0.99	0.02	0.74	-0.07
LAZK 19354S001	U	4.11	-0.41	0.34	2.53	2.79	5.27	7.56	-1.37

LEIT 19428M001	N	1.45	-2.25	1.24	-0.18	0.20	-1.04	-0.40	2.16
LEIT 19428M001	E	1.02	-0.39	-1.13	-0.02	-0.21	0.21	1.02	1.93
LEIT 19428M001	U	3.56	-3.15	2.99	5.98	2.62	0.12	1.99	3.24
ORON 19427M001	N	1.42	-0.57	2.34	0.05	0.51			
ORON 19427M001	E	1.02	0.67	0.98	-1.01	-0.85			
ORON 19427M001	U	4.07	-0.54	1.63	5.43	4.15			
PASA 19351S001	N	0.91	-0.86	1.98	-0.02	-0.39	0.14	-0.21	-0.24
PASA 19351S001	E	0.64	0.37	0.54	0.64	0.53	-0.47	0.79	-0.70
PASA 19351S001	U	3.53	-1.19	0.50	2.61	6.73	4.45	0.36	1.07
RIO1 13448M002	N	0.84	-0.98		0.76	-0.45	-0.20	-0.77	-1.07
RIO1 13448M002	E	0.61	-0.51		-0.91	0.05	0.66	0.23	0.54
RIO1 13448M002	U	3.40	0.83		3.86	3.31	4.12	3.73	-0.65
SALA 13469M001	N	0.72	1.32	0.67	-0.17	0.38	-0.38	-0.75	0.19
SALA 13469M001	E	0.72	-0.13	-0.40	-0.26	0.98	0.65	-1.20	-0.24
SALA 13469M001	U	3.64	-5.91	-2.75	-0.42	-5.76	-0.09	-0.28	1.85
SCDA 10088M002	N	2.64	1.30	5.23	-2.62	-0.59	-0.33	-2.34	-0.06
SCDA 10088M002	E	1.23	1.67	0.73	-1.66	0.16	-1.15	0.56	1.12
SCDA 10088M002	U	3.16	4.86	-1.20	2.31	4.19	3.24	-0.09	1.26
SOPU 19386M001	N	0.94	0.26	1.68	-0.14	-0.23	-0.44	-0.68	1.32
SOPU 19386M001	E	0.45	-0.41	0.62	0.64	-0.03	0.25	0.37	0.25
SOPU 19386M001	U	4.04	-2.59	0.49	1.63	1.14	8.91	2.72	0.38
TERU 13487M001	N	1.15	-1.38	1.23	-1.08	-0.51	1.29	-0.81	0.88
TERU 13487M001	E	0.71	1.04	0.49	0.22	-0.43	0.84	0.52	0.72
TERU 13487M001	U	4.57	-0.10	3.44	7.03	-4.58	-5.94	2.50	1.27
VITO 19385M001	N	0.85	-0.97	1.09	-0.61	-0.98	-0.21	0.63	-0.69
VITO 19385M001	E	0.78	-0.48	-0.52	0.03	0.77	0.43	1.07	-1.08
VITO 19385M001	U	6.67	1.76	-9.08	4.90	2.87	9.49	7.27	-2.50
YEBE 13420M001	N	0.52	0.59	0.14	0.57	-0.00	0.39	-0.57	0.66
YEBE 13420M001	E	0.78	0.77	1.00	-0.68	0.61	-0.20	-0.93	-0.54
YEBE 13420M001	U	2.95	-2.93	-4.96	-0.14	-4.18	0.34	-0.87	-0.81
ZARA 13462M001	N	0.55	-0.64	-0.32	-1.05	-0.41	0.18	-0.03	0.13
ZARA 13462M001	E	0.84	0.14	0.02	-1.47	-0.90	-0.51	0.79	0.60
ZARA 13462M001	U	5.19	2.35	5.94	1.29	5.18	0.95	9.57	0.02

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.

TRANSFORMATION IN EQUATORIAL SYSTEM (X, Y, Z):
RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

LIST OF REMOVED STATIONS:

OUTLIER CRITERIA: 15.00 15.00 20.00

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
2	ALAC 13433M001	I W	0.37	-0.53	-1.96
3	ALME 13437M001	I W	0.53	-0.22	0.53
4	BCL1 19482M001	I W	0.08	-2.18	3.40
5	BELL 13431M001	I W	0.44	-0.46	3.70
6	BIAZ 10074M002	I W	0.24	0.10	-4.30
7	BORR 13480M001	I W	-2.65	1.54	-2.06
8	BRST 10004M004	I W	-1.87	0.30	4.97
9	CACE 13447M001	I W	1.44	2.27	2.99
10	CANT 13438M001	I W	-0.34	1.55	-2.75
11	CASC 13909S001	I W	0.21	-0.09	3.66
12	CEU1 13449M002	I W	0.78	-0.66	-5.02
14	EBRE 13410M001	I W	-0.72	0.67	-3.82
16	FLRS 31907M001	I W	-0.97	-1.08	-5.83
17	FUER 31330M001	I W	0.71	-0.46	3.92
19	HUEL 13451M001	I W	2.60	4.30	-11.76
20	IBIZ 13454S001	I W	0.21	1.21	-2.11
21	IZAN 31309M002	I W	-0.22	0.47	0.97
22	LAGO 13903M001	I W	0.91	0.37	3.76
23	LLIV 13436M001	I W	-1.78	0.61	0.58
24	LPAL 81701M001	I W	1.92	1.42	-0.17
25	LROC 10023M001	I W	0.51	0.70	-0.56
26	MADR 13407S012	I W	0.13	1.46	-1.76
27	MAL1 13444M002	I W	4.70	-0.90	-7.71
28	MALA 13443M001	I W	2.15	-1.69	4.46
29	MALL 13444M001	I W	0.05	-0.13	-0.75
30	MAS1 31303M002	I W	0.04	-1.45	7.25
31	MELI 19379M001	I W	0.13	-1.88	1.56
32	PDEL 31906M004	I W	-1.22	2.27	10.59
33	RABT 35001M002	I W	2.75	-2.16	-6.03
34	SCOA 10088M002	I W	-3.00	0.17	-10.50
35	SFER 13402M004	I W	-0.02	-4.92	8.58
36	SOPU 19386M001	I W	-1.26	1.57	0.10
37	VALE 13439M001	I W	-0.60	0.98	-4.52
38	VIGO 13450M001	I W	0.49	2.36	3.93
39	VILL 13406M001	I W	-0.39	-0.38	2.31
40	YEBE 13420M001	I W	-0.42	-0.42	0.59
41	ZARA 13462M001	I W	-0.89	0.66	-1.66
42	ZIMM 14001M004	I W	-2.70	-1.29	3.33
RMS / COMPONENT			1.53	1.62	4.88
IQR			1.25	1.87	6.41
MEAN			0.06	0.11	-0.06
MEDIAN			0.10	0.13	0.32
MIN			-3.00	-4.92	-11.76
MAX			4.70	4.30	10.59
OVERALL RMS/IQR/MAX(3D)			3.10	2.66	12.79
					HUEL 13451M001 #SUM
ALL RMS / COMPONENT			1.53	1.62	4.88
ALL IQR			1.25	1.87	6.41
ALL MEAN			0.06	0.11	-0.06
ALL MEDIAN			0.10	0.13	0.32
ALL MIN			-3.00	-4.92	-11.76
ALL MAX			4.70	4.30	10.59
ALL OVERALL RMS/IQR/MAX(3D)			3.10	2.66	12.79
					HUEL 13451M001 #SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 38
NUMBER OF COORDINATES : 114
RMS OF TRANSFORMATION : 3.10 MM

PARAMETERS:

TRANSLATION IN X : -0.00 +- 0.50 MM
TRANSLATION IN Y : 0.00 +- 0.50 MM
TRANSLATION IN Z : 0.00 +- 0.50 MM

NUMBER OF ITERATIONS : 1

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          18639178
NUMBER OF UNKNOWN(S)            213462
NUMBER OF DEGREES OF FREEDOM    18425716
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  3.949904159221279
```

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 24:245:00000 24:251:86370 LEICA GR50 -----
ALDA A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
ALSA A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
AMUR A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
BIAZ A 1 P 24:245:00000 24:251:86370 SPECTRA SP90M -----
BIDA A 1 P 24:245:00000 24:251:86370 LEICA GR10 -----
BRZR A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
CACE A 1 P 24:245:00000 24:251:86370 TRIMBLE NETR9 -----
CANT A 1 P 24:245:00000 24:251:86370 LEICA GR10 -----
CREU A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
EBRE A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
ELGE A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
EMAZ A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
GERN A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
HOND A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
IGEL A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
ISPS A 1 P 24:245:00000 24:251:86370 TRIMBLE NETR9 -----
KAST A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
LARE A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
LAZK A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
LEIT A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
ORON A 1 P 24:245:00000 24:248:86370 LEICA GR50 -----
PASA A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
RIO1 A 1 P 24:245:00000 24:251:86370 LEICA GR25 -----
SALA A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
SCOA A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
SOPU A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
TERU A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
VITO A 1 P 24:245:00000 24:251:86370 LEICA GR30 -----
YEBE A 1 P 24:245:00000 24:251:86370 LEICA GR50 -----
ZARA A 1 P 24:245:00000 24:251:86370 TRIMBLE NETR9 -----
```

7.2 Antennas

Serial number ONLY provided in case individual calibrations are used.

```
*SITE PT SOLN T DATA_START_ DATA_END_ DESCRIPTION----- S/N_ DAZI
ACOR A 1 P 24:245:00000 24:251:86370 LEIAT504 LEIS -----
ALDA A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
ALSA A 1 P 24:245:00000 24:251:86370 LEIAR10 NONE -----
AMUR A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
BIAZ A 1 P 24:245:00000 24:251:86370 LEIAR25 LEIT -----
BIDA A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
BRZR A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
CACE A 1 P 24:245:00000 24:251:86370 TRM29659.00 NONE -----
CANT A 1 P 24:245:00000 24:251:86370 LEIAR25_R4 LEIT -----
CREU A 1 P 24:245:00000 24:251:86370 LEIAR25_R4 NONE -----
EBRE A 1 P 24:245:00000 24:251:86370 LEIAR25_R4 NONE -----
ELGE A 1 P 24:245:00000 24:251:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
GERN A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
HOND A 1 P 24:245:00000 24:251:86370 LEIAR20 LEIM -----
IGEL A 1 P 24:245:00000 24:251:86370 LEIAR20 LEIM -----
ISPS A 1 P 24:245:00000 24:251:86370 TRM59900.00 SCIS -----
KAST A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
LARE A 1 P 24:245:00000 24:251:86370 LEIAR20 LEIM -----
LAZK A 1 P 24:245:00000 24:251:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 24:245:00000 24:251:86370 LEIAR10 NONE -----
ORON A 1 P 24:245:00000 24:248:86370 LEIAR10 NONE -----
PASA A 1 P 24:245:00000 24:251:86370 LEIAR20 LEIM -----
RIO1 A 1 P 24:245:00000 24:251:86370 LEIAR25_R4 LEIT -----
SALA A 1 P 24:245:00000 24:251:86370 LEIAR25 NONE -----
SCOA A 1 P 24:245:00000 24:251:86370 TRM55971.00 NONE -----
SOPU A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
TERU A 1 P 24:245:00000 24:251:86370 LEIAR20 LEIM -----
VITO A 1 P 24:245:00000 24:251:86370 LEIAS10 NONE -----
YEBE A 1 P 24:245:00000 24:251:86370 LEIAR20 LEIM -----
ZARA A 1 P 24:245:00000 24:251:86370 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 24:245:00000 24:251:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 24:245:00000 24:251:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 24:245:00000 24:251:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 24:245:00000 24:251:86370 UNE 3.0490 0.0000 0.0000
CREU A 1 P 24:245:00000 24:251:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 24:245:00000 24:251:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 24:245:00000 24:251:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 24:245:00000 24:251:86370 UNE 0.0771 0.0000 0.0000
HOND A 1 P 24:245:00000 24:251:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 24:245:00000 24:251:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 24:245:00000 24:251:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 24:245:00000 24:248:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
RI01 A 1 P 24:245:00000 24:251:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 24:245:00000 24:251:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 24:245:00000 24:251:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 24:245:00000 24:251:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 24:245:00000 24:251:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 24:245:00000 24:251:86370 UNE 0.0600 0.0000 0.0000
ZARA A 1 P 24:245:00000 24:251:86370 UNE 3.2590 0.0000 0.0000
    
```

8 References

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

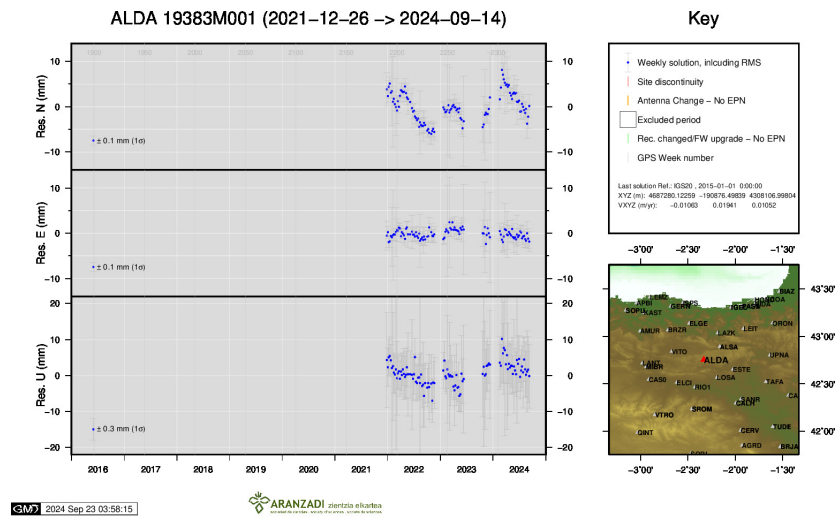
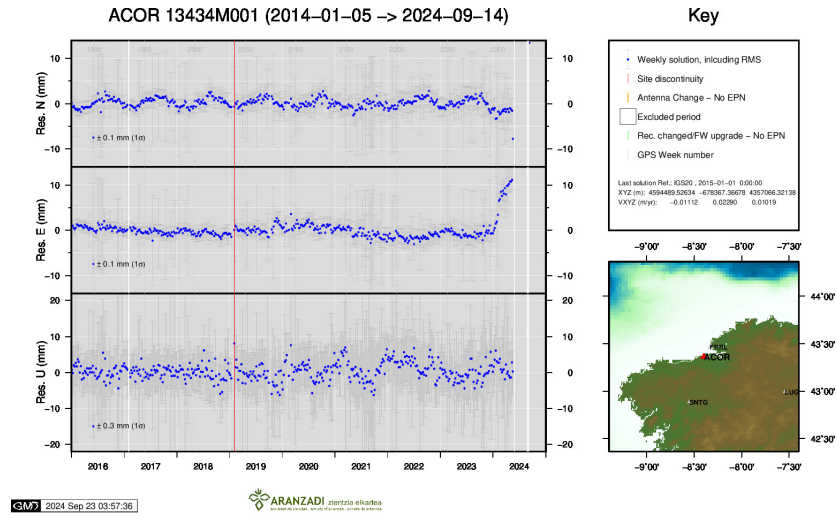
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

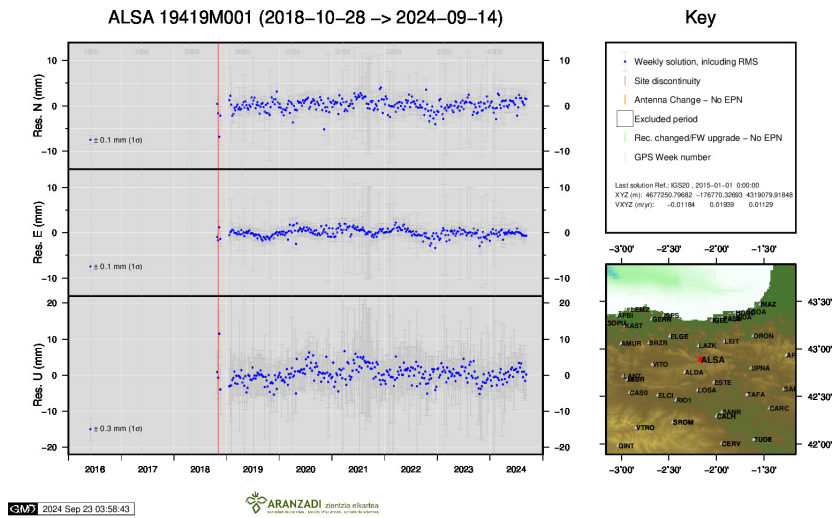
Johnston, G., Riddell, A., Hausler, G. (2017). The International GNSS Service. Teunissen, Peter J.G., Montenbruck, O. (Eds.), Springer Handbook of Global Navigation Satellite Systems (1st ed., pp. 967-982). Cham, Switzerland: Springer International Publishing. DOI: 10.1007/978-3-319-42928-1

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

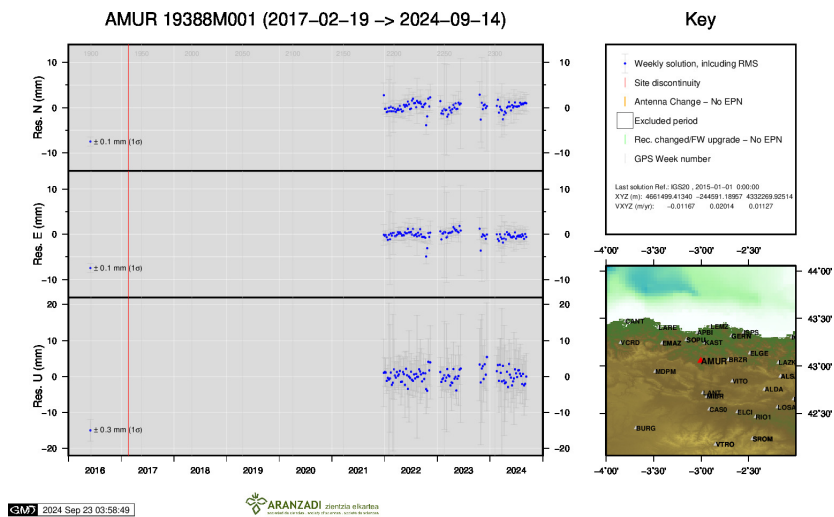
9 Cumulative Time Series

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

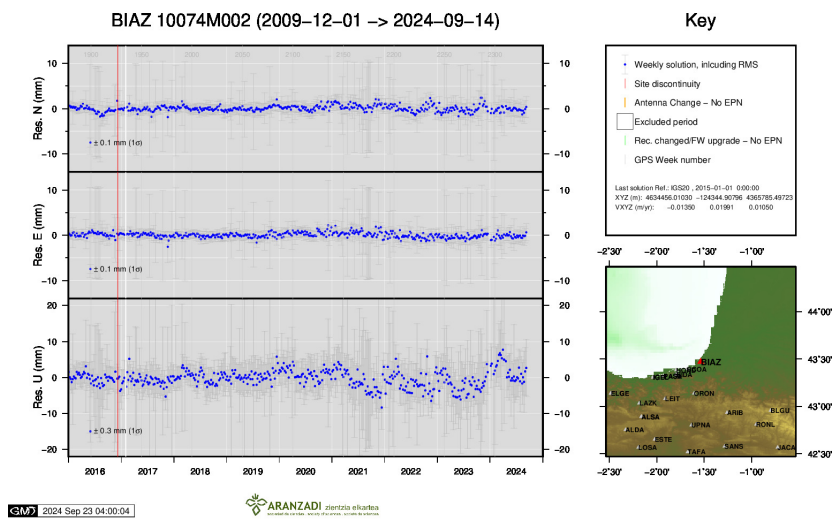




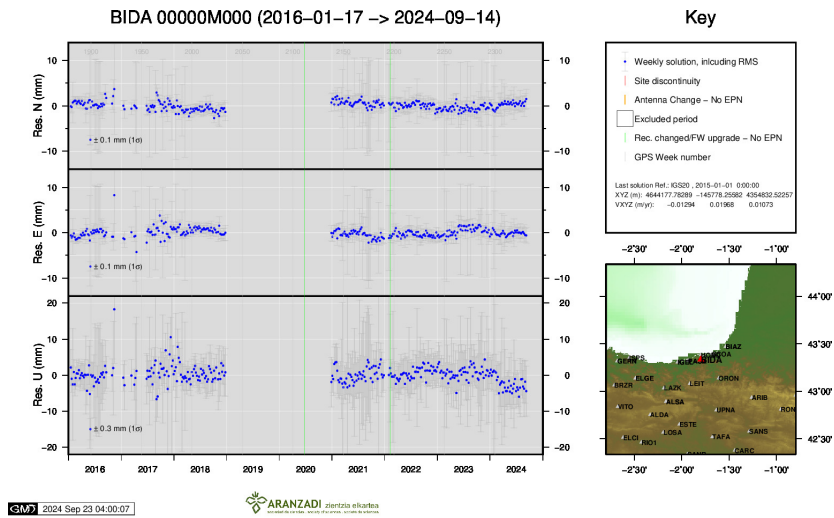
3) ALSA



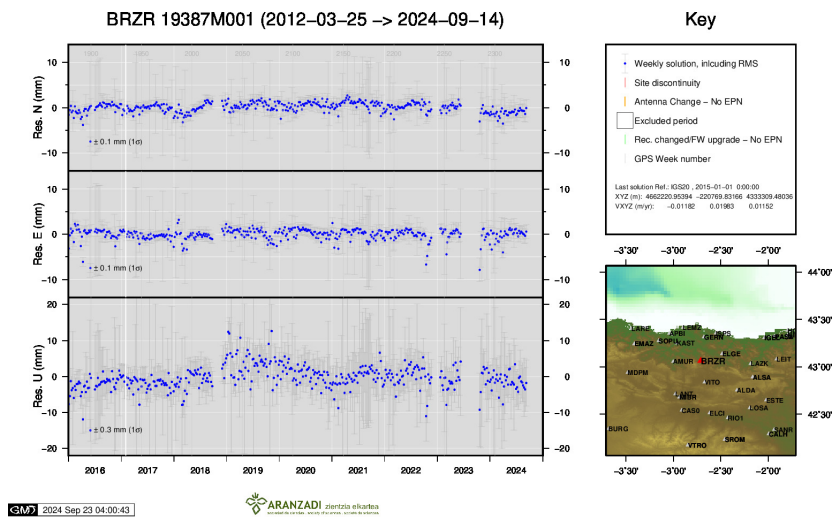
4) AMUR



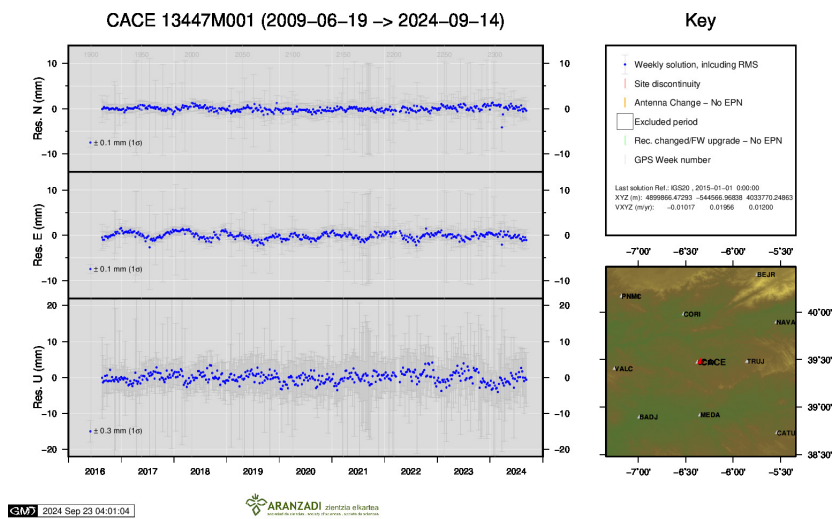
5) BIAZ



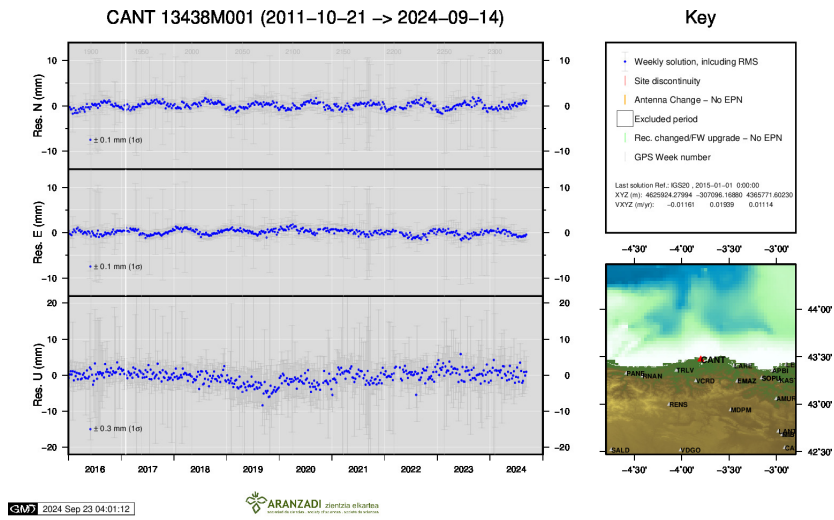
6) BIDA



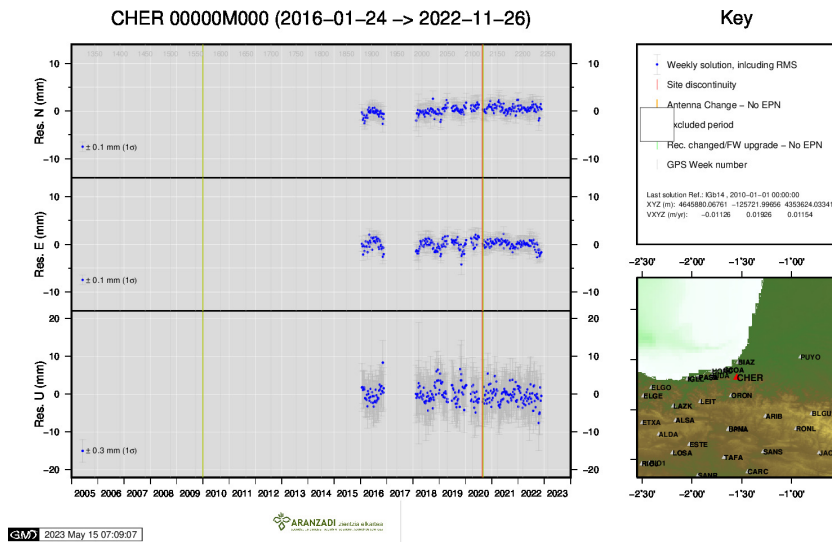
7) BRZR



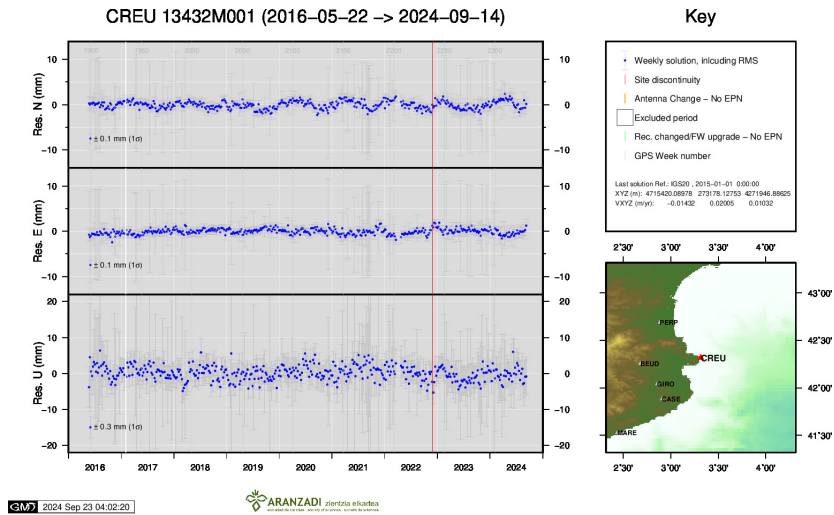
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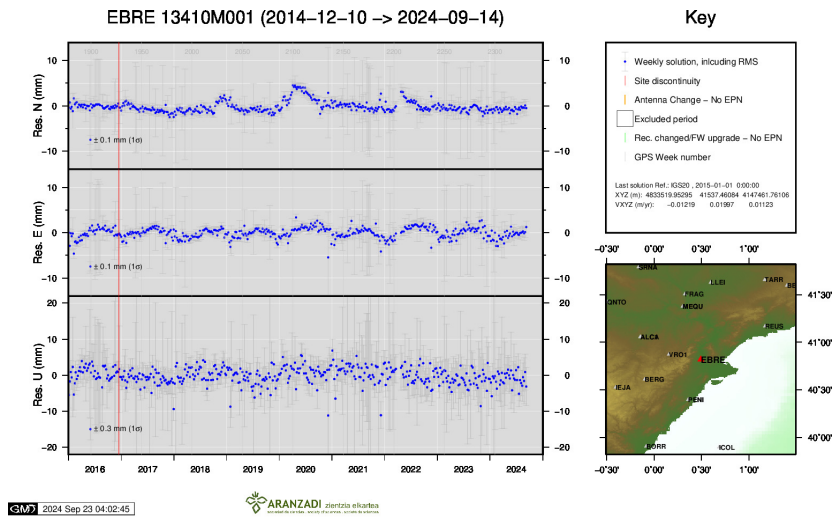
9) CANT



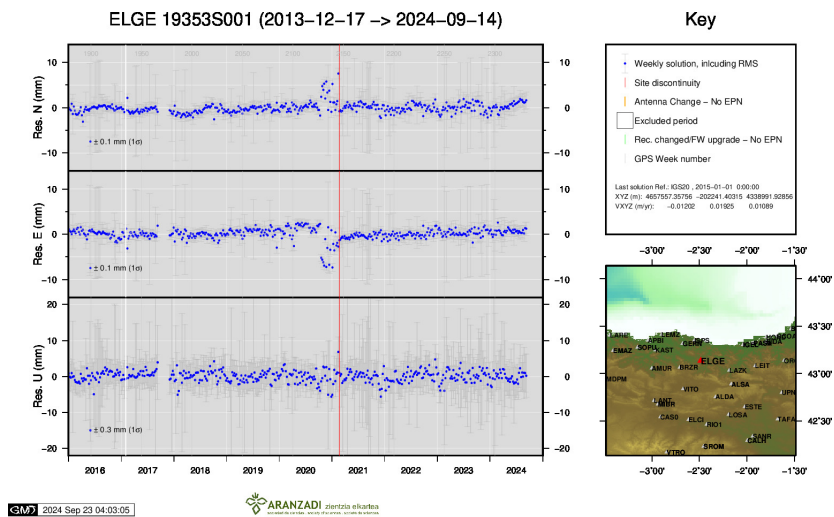
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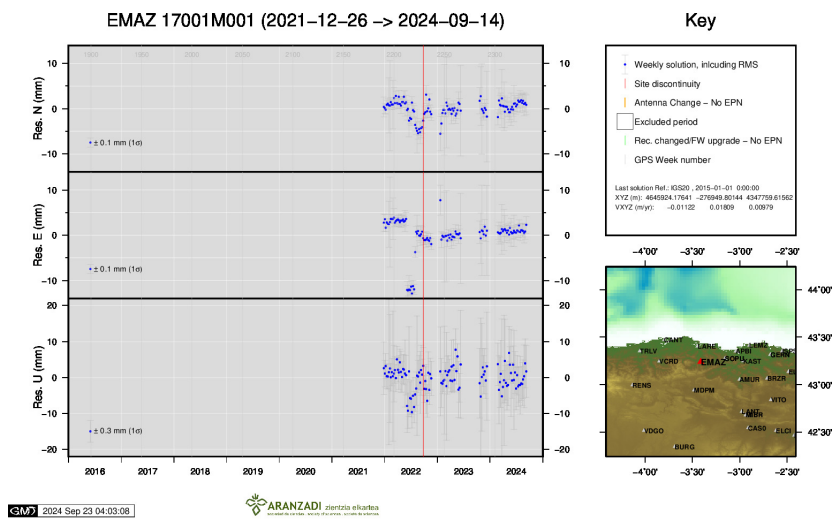
11) CREU



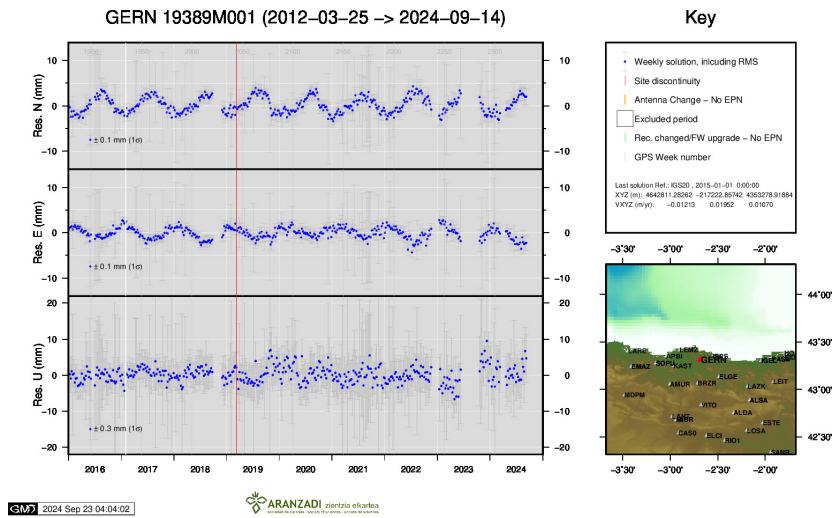
12) EBRE



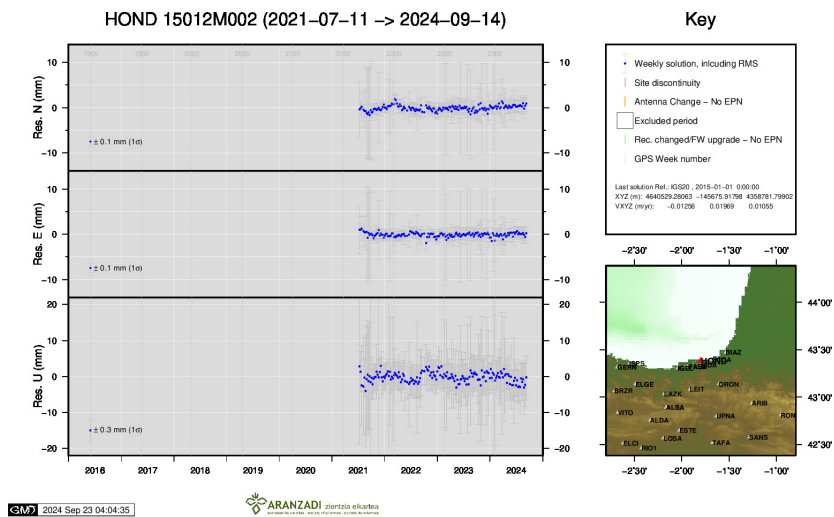
13) ELGE



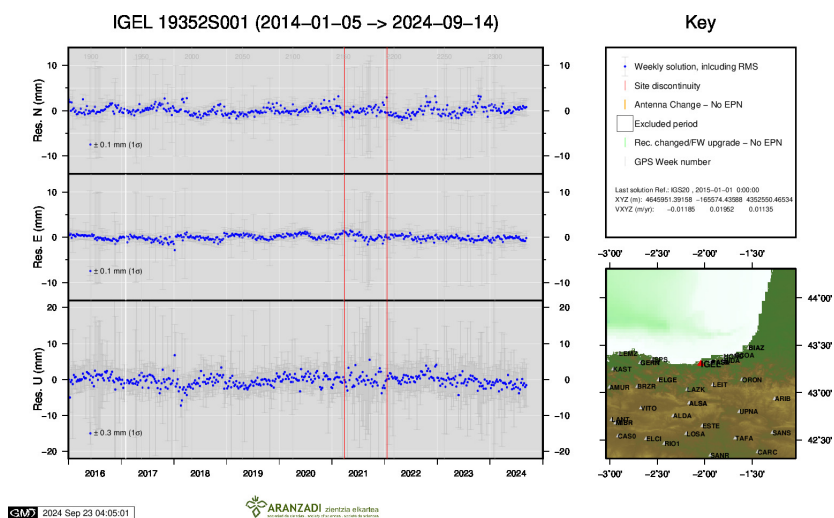
14) EMAZ



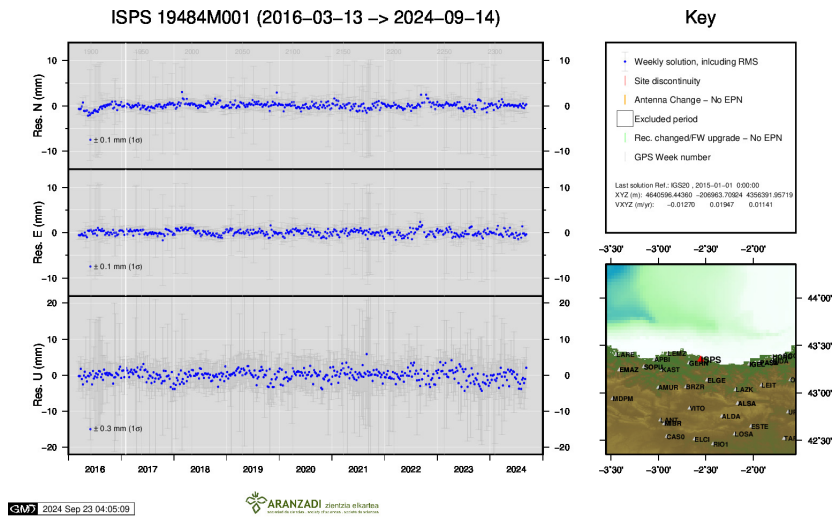
15) GERN



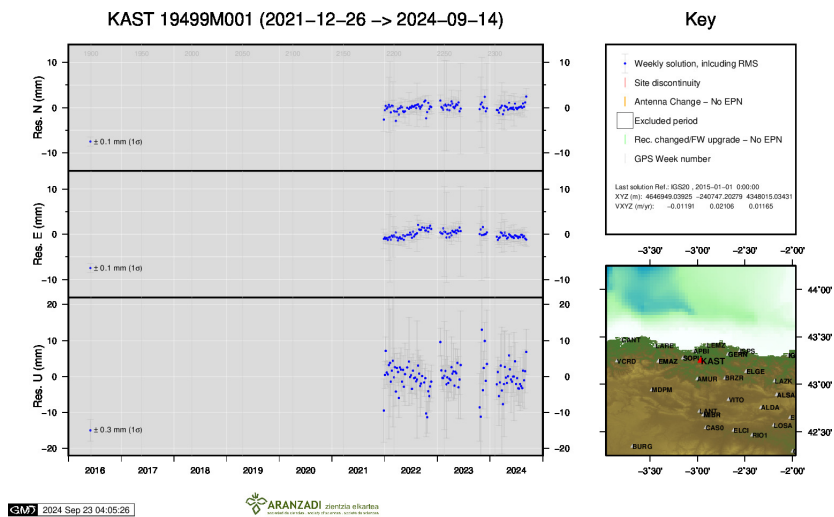
16) HOND



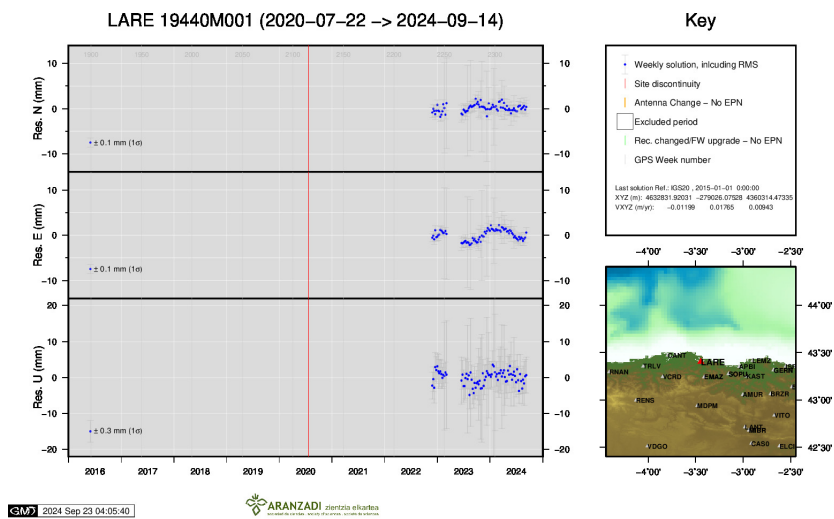
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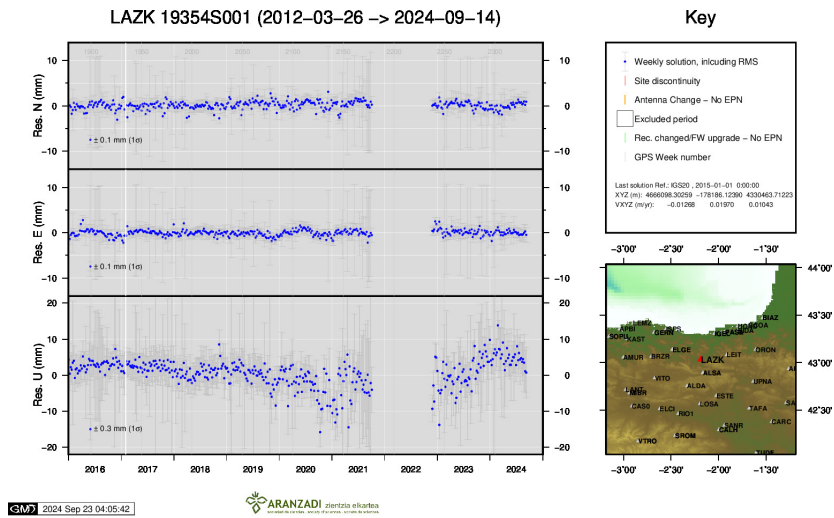
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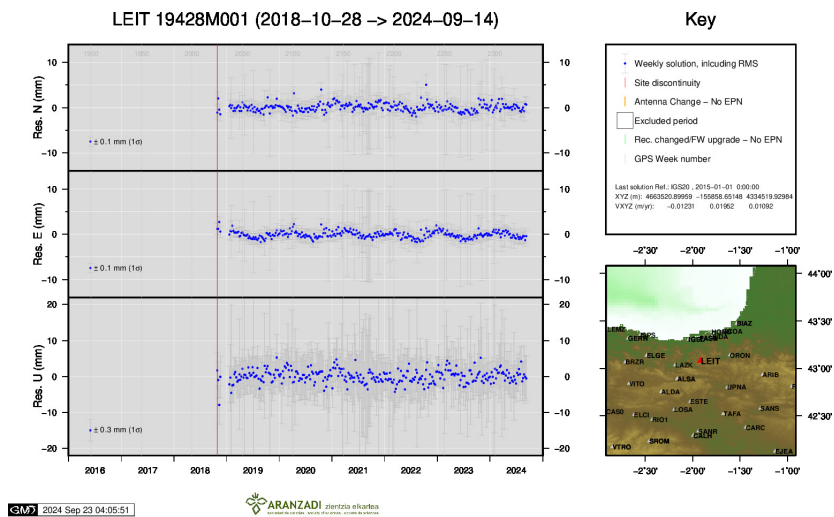
19) KAST



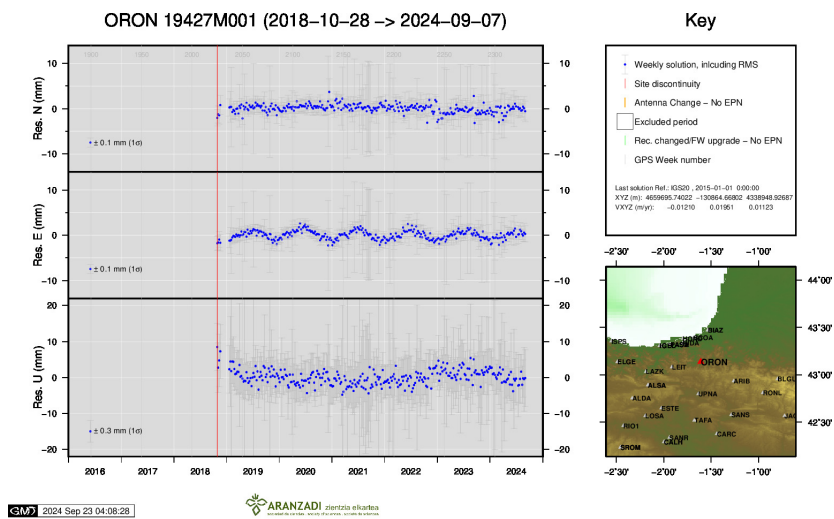
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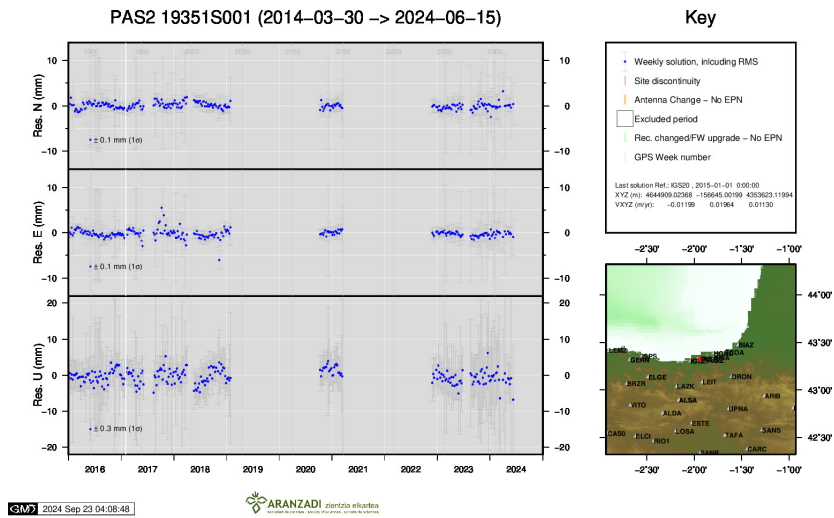
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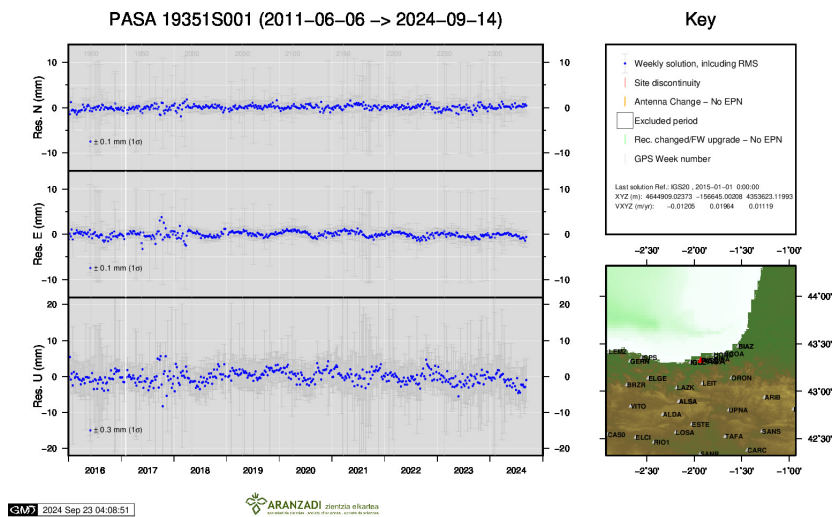
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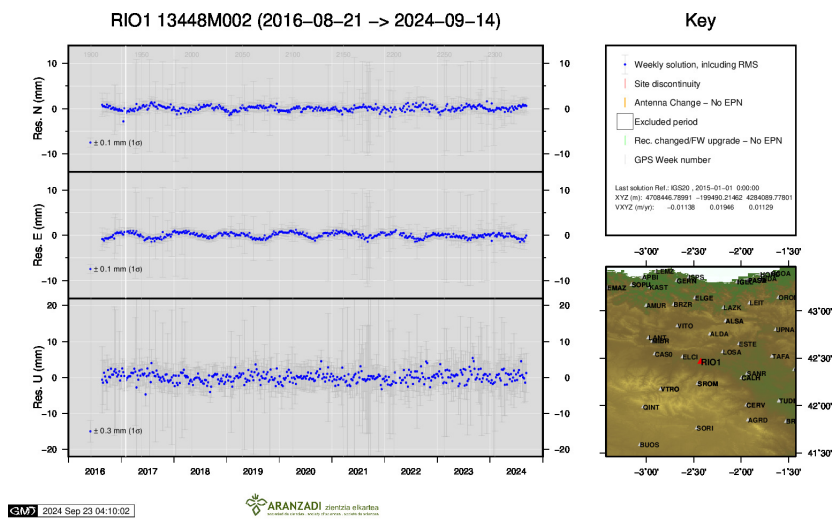
23) ORON



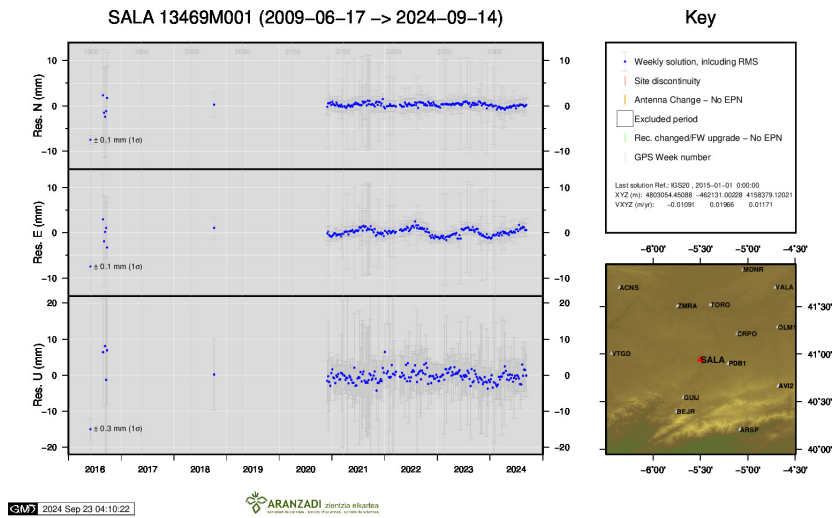
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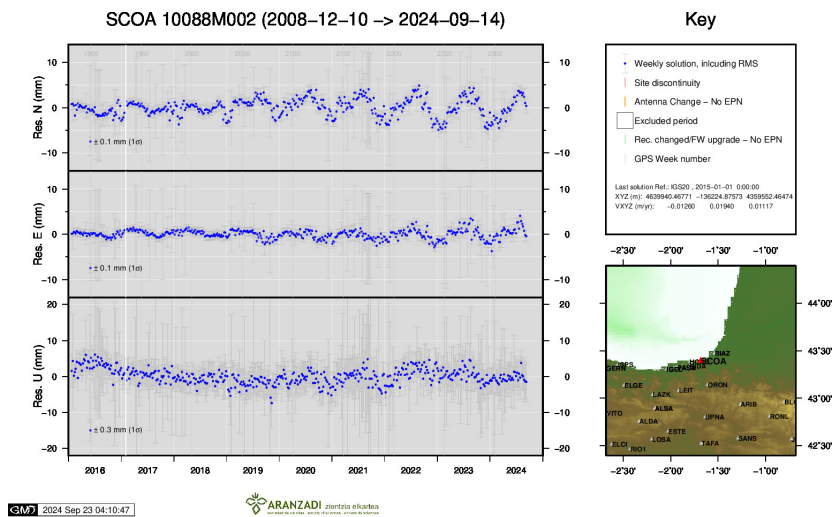
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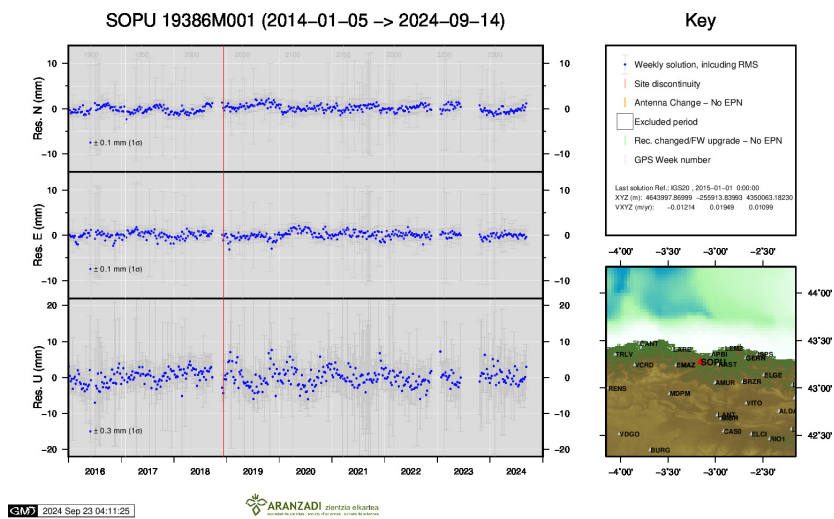
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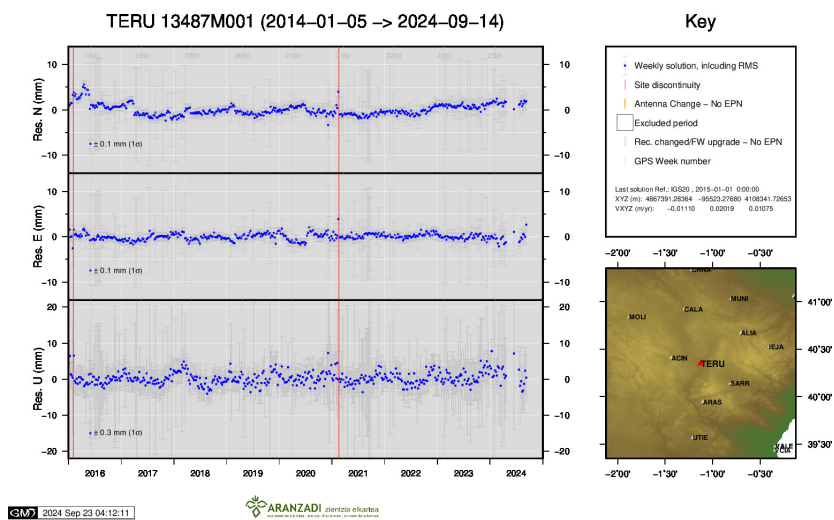
27) SALA



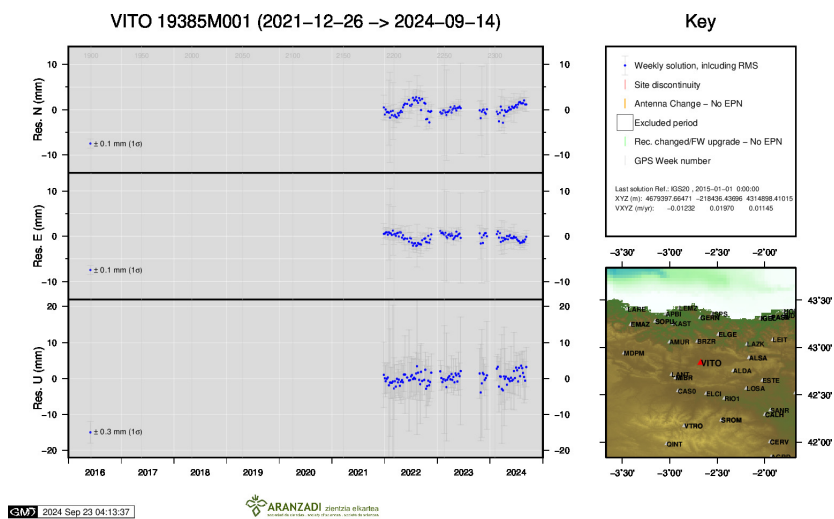
28) SCOA



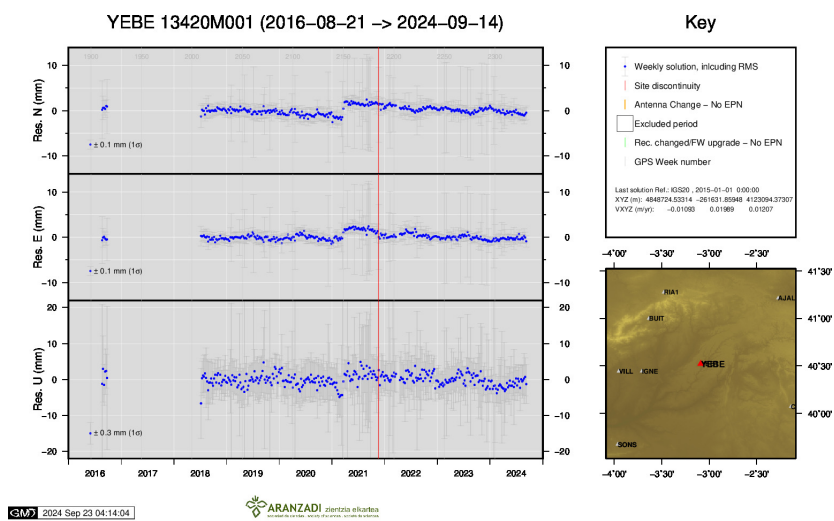
29) SOPU



30) TERU



31) VITO



32) YEBE

