

ARA-DAC Weekly Analysis Result: 2340 (GFA)

Technical Report

GPS Week: 2340 (GFA)

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

ARA-DAC details:

Contact person: J. Zurutuza

Contact mail: geodesia@aranzadi.eus

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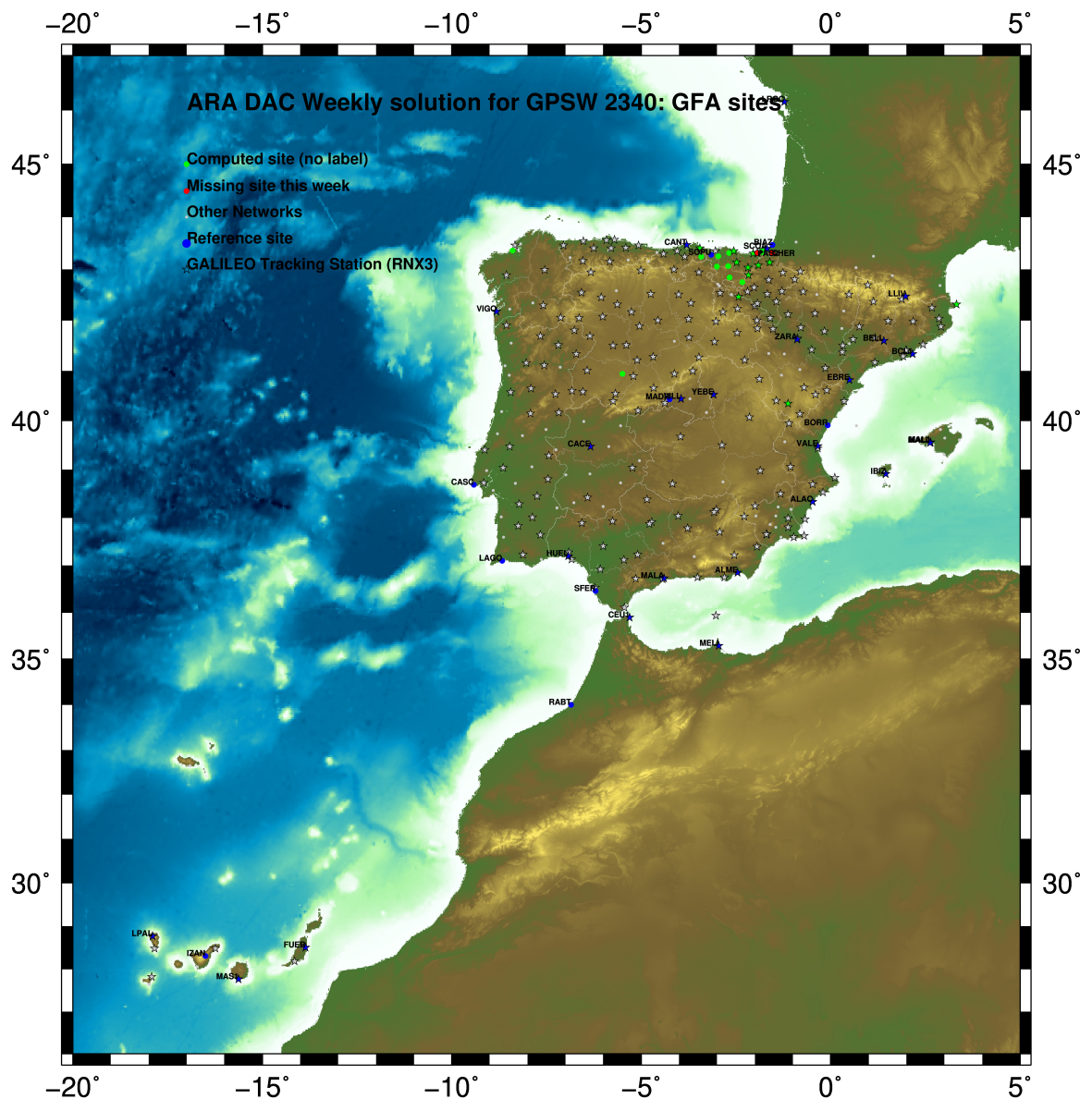


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1 Introduction

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 Dec 02 03:46:08

Fig.1: Computed Sites for GPS Week2340 (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 02-DEC-24 02:31

LOCAL GEODETIC DATUM: IGS20 EPOCH: 2024-11-13 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.48350	-678367.27446	4357066.32622	A	G
39	ALDA 19383M001	4687280.10967	-190876.46332	4308107.02281	A	GR
50	ALSA 19419M001	4677250.77793	-176770.29076	4319079.94024	A	GRE
53	AMUR 19388M001	4661499.39133	-244591.15306	4332269.94467	A	GR
384	BIAZ 10074M002	4634455.98711	-124344.87118	4365785.51748	W	GR
101	BIDA 00000M000	4644177.75798	-145778.21936	4354832.54030	A	GR
113	BRZR 19387M001	4662220.93154	-220769.79413	4333309.49858	A	GR
573	CACE 13447M001	4899866.45540	-544566.93095	4033770.26965	W	GRE
592	CANT 13438M001	4625924.25822	-307096.13191	4365771.62119	W	GRE
908	CREU 13432M001	4715420.06655	273178.16394	4271946.90645	A	GRE
135	EBRE 13410M001	4833519.93038	41537.49830	4147461.78595	W	GRE
180	ELGE 19353S001	4657557.33703	-202241.36565	4338991.95048	A	GRE
182	EMAZ 17001M001	4645924.15655	-276949.76589	4347759.63465	A	GR
209	GERN 19389M001	4642811.26214	-217222.82018	4353278.94047	A	GR
257	HOND 15012M002	4640529.25776	-145675.88127	4358781.81807	A	GRE
235	IGEL 19352S001	4645951.36948	-165574.39951	4352550.48456	A	GRE
240	ISPS 19484M001	4640596.42185	-206963.67217	4356391.97940	A	GRE
245	KAST 19499M001	4646949.01762	-240747.16409	4348015.05700	A	GR
252	LARE 19440M001	4632831.89728	-279026.04076	4360314.48903	A	GRE
256	LAZK 19354S001	4666098.28320	-178186.08782	4330463.73586	A	GRE
261	LEIT 19428M001	4663520.87642	-155858.61419	4334519.94903	A	GRE
334	ORON 19427M001	4659695.71621	-130864.63040	4338948.94755	A	GRE
493	PASA 19351S001	4644909.00074	-156644.96582	4353623.13946	A	GRE
553	RID1 13448M002	4708446.77096	-199490.17854	4284089.80057	A	GRE
558	SALA 13469M001	4803054.43191	-462130.96498	4158379.14223	A	GR
526	SCDA 10088M002	4639940.44601	-136224.84054	4359552.48241	W	GRE
715	SOPU 19386M001	4643997.84878	-255913.80270	4350063.20236	W	GR
443	TERU 13487M001	4867391.26253	-95523.23938	4108341.74922	A	GRE
493	VITO 19385M001	4679397.64349	-218436.39919	4314898.43206	A	GR
616	YEBE 13420M001	4848724.51191	-261631.82220	4123094.39380	W	GRE
655	ZARA 13462M001	4773803.10895	-73505.88146	4215454.15935	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 02-DEC-24 02:31

LOCAL GEODETIC DATUM: ETRF2000 EPOCH: 2024-11-13 11:59:45

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG	SYSTEM
111	ACOR 13434M001	4594489.83146	-678367.91910	4357065.84071	A	
39	ALDA 19383M001	4687280.52091	-190877.11842	4308106.53610	A	
50	ALSA 19419M001	4677251.19201	-176770.94459	4319079.45462	A	
53	AMUR 19388M001	4661499.79714	-244591.80513	4332269.45948	A	
384	BIAZ 10074M002	4634456.41225	-124345.51960	4365785.03640	W	
101	BIDA 00000M000	4644178.17927	-145778.86903	4354832.05805	A	
113	BRZR 19387M001	4662221.34072	-220770.44624	4333309.01367	A	
573	CACE 13447M001	4899866.79526	-544567.61265	4033769.75893	W	
592	CANT 13438M001	4625924.65816	-307096.77976	4365771.13826	W	
908	CREU 13432M001	4715420.53871	273177.50702	4271946.42376	A	
135	EBRE 13410M001	4833520.36043	41536.82609	4147461.28951	W	
180	ELGE 19353S001	4657557.74923	-202242.01713	4338991.46624	A	
182	EMAZ 17001M001	4645924.55917	-276950.41614	4347759.15038	A	
209	GERN 19389M001	4642811.67345	-217223.46988	4353278.45733	A	
257	HOND 15012M002	4640529.67938	-145675.53050	4358781.33615	A	
235	IGEL 19352S001	4645951.78785	-165575.04946	4352550.00187	A	
240	ISPS 19484M001	4640596.83483	-206964.32158	4356391.49660	A	
245	KAST 19499M001	4646949.42525	-240747.81437	4348014.57316	A	
252	LARE 19440M001	4632832.30064	-279026.68939	4360314.00589	A	
256	LAZK 19354S001	4666098.69802	-178186.74028	4330463.25121	A	
261	LEIT 19428M001	4663521.29465	-155859.26628	4334519.46492	A	
334	ORON 19427M001	4659696.13825	-130865.28194	4338948.46414	A	
493	PASA 19351S001	4644909.42043	-156645.61561	4353622.65699	A	
553	RID1 13448M002	4708447.17903	-199490.83625	4284089.31185	A	
558	SALA 13469M001	4803054.79341	-462131.63483	4158378.64133	A	
526	SCDA 10088M002	4639940.86900	-136225.48967	4359552.00067	W	
715	SOPU 19386M001	4643998.25449	-255914.45265	4350062.71856	W	
443	TERU 13487M001	4867391.67048	-95523.91616	4108341.24784	A	
493	VITO 19385M001	4679398.05148	-218437.05340	4314897.94565	A	
616	YEBE 13420M001	4848724.89817	-261632.49717	4123093.89172	W	
655	ZARA 13462M001	4773803.52875	-73506.54678	4215453.66661	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                                02-DEC-24 02:31
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LOCAL GEODETIC DATUM: ETRF2014                    EPOCH: 2024-11-13 11:59:45
NUM STATION NAME      X (M)      Y (M)      Z (M)  FLAG  SYSTEM
111 ACRD 13434M001    4594489.79167 -678367.95569 4357065.89347  A
 39 ALDA 19383M001    4687280.47856 -190877.15646 4308106.58872  A
 50 ALSA 19419M001    4677251.14973 -176770.98272 4319079.50728  A
 53 AMUR 19388M001    4661499.75527 -244591.84308 4332269.51216  A
384 BIAZ 10074M002    4634456.37026 -124345.55812 4365785.08923  W
101 BIDA 00000M000    4644178.13724 -145778.90744 4354832.11084  A
113 BRZR 19387M001    4662221.29877 -220770.48427 4333309.06635  A
573 CACE 13447M001    4899866.75151 -544567.64835 4033769.81082  W
592 CANT 13438M001    4625924.61690 -307096.81764 4365771.19102  W
908 CREU 13432M001    4715420.49423 273177.46737 4271946.47664  A
135 EBRE 13410M001    4833520.31550 41536.78786 4147461.34186  W
180 ELGE 19353S001    4657557.70726 -202242.05526 4338991.51895  A
182 EMAZ 17001M001    4645924.51760 -276950.45404 4347759.20309  A
209 GERN 19389M001    4642811.63169 -217223.50802 4353278.51008  A
257 HOND 15012M002    4640529.63740 -145676.56892 4358781.38894  A
235 IGEL 19352S001    4645951.74588 -165575.08778 4352550.05464  A
240 ISPS 19484M001    4640596.79307 -206964.35976 4356391.54936  A
245 KAST 19499M001    4646949.38354 -240747.85240 4348014.62588  A
252 LARE 19440M001    4632832.25921 -279026.72734 4360314.05864  A
256 LAZK 19354S001    4666098.65886 -178186.77846 4330463.30390  A
261 LEIT 19428M001    4663521.25245 -155859.30455 4334519.51764  A
334 ORDN 19427M001    4659696.09600 -130865.32033 4338948.51688  A
493 PASA 19351S001    4644909.37844 -156645.65397 4353622.70977  A
553 RIO1 13448M002    4708447.13647 -199490.87415 4284089.36441  A
558 SALA 13469M001    4803054.75060 -462131.67129 4158378.69350  A
526 SCOA 10088M002    4639940.82699 -136225.52812 4359552.05348  W
715 SOPU 19386M001    4643998.21286 -255914.49063 4350062.77129  W
443 TERU 13487M001    4867391.62567 -95523.95372 4108341.29999  A
493 VITO 19385M001    4679398.00932 -218437.09136 4314897.99829  A
616 YEBE 13420M001    4848724.85418 -261632.53419 4123093.94383  W
655 ZARA 13462M001    4773803.48497 -73506.58486 4215453.71904  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                                02-DEC-24 02:31
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LOCAL GEODETIC DATUM: ETRF2020                    EPOCH: 2024-11-13 11:59:45
NUM STATION NAME      X (M)      Y (M)      Z (M)  FLAG  SYSTEM
111 ACRD 13434M001    4594489.78792 -678367.94126 4357065.90140  A
 39 ALDA 19383M001    4687280.47350 -190877.14154 4308106.59690  A
 50 ALSA 19419M001    4677251.14460 -176770.96783 4319079.51545  A
 53 AMUR 19388M001    4661499.75031 -244591.82827 4332269.52029  A
384 BIAZ 10074M002    4634456.36486 -124345.54335 4365785.09734  W
101 BIDA 00000M000    4644178.13194 -145778.89264 4354832.11896  A
113 BRZR 19387M001    4662221.29373 -220770.46945 4333309.07449  A
573 CACE 13447M001    4899866.74816 -544567.63291 4033769.81927  W
592 CANT 13438M001    4625924.61204 -307096.80296 4365771.19908  W
908 CREU 13432M001    4715420.48789 273177.48257 4271946.48494  A
135 EBRE 13410M001    4833520.31015 41536.80333 4147461.35032  W
180 ELGE 19353S001    4657557.70216 -202242.04044 4338991.52709  A
182 EMAZ 17001M001    4645924.51269 -276950.43929 4347759.21119  A
209 GERN 19389M001    4642811.62660 -217223.49326 4353278.51818  A
257 HOND 15012M002    4640529.63209 -145676.55413 4358781.39706  A
235 IGEL 19352S001    4645951.74064 -165575.07299 4352550.06276  A
240 ISPS 19484M001    4640596.78794 -206964.34500 4356391.55747  A
245 KAST 19499M001    4646949.37853 -240747.83763 4348014.63399  A
252 LARE 19440M001    4632832.25428 -279026.71263 4360314.06672  A
256 LAZK 19354S001    4666098.65071 -178186.76360 4330463.31205  A
261 LEIT 19428M001    4663521.24722 -155859.28970 4334519.52579  A
334 ORDN 19427M001    4659696.09069 -130865.30547 4338948.52503  A
493 PASA 19351S001    4644909.37317 -156645.63918 4353622.71789  A
553 RIO1 13448M002    4708447.13150 -199490.85918 4284089.37262  A
558 SALA 13469M001    4803054.74671 -462131.65612 4158378.70182  A
526 SCOA 10088M002    4639940.82164 -136225.51333 4359552.06159  W
715 SOPU 19386M001    4643998.20788 -255914.47588 4350062.77939  W
443 TERU 13487M001    4867391.62082 -95523.93820 4108341.30848  A
493 VITO 19385M001    4679398.00433 -218437.07648 4314898.00645  A
616 YEBE 13420M001    4848724.84978 -261632.51880 4123093.95226  W
655 ZARA 13462M001    4773803.47979 -73506.56963 4215453.72739  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 02-DEC-24 02:31

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.97	1.16	5.58
ALDA 19383M001	7	XXXXXX	1.52	1.77	7.59
ALSA 19419M001	7	XXXXXX	3.27	1.36	5.72
AMUR 19388M001	7	XXXXXX	2.04	1.31	3.84
BLAZ 10074M002	7	XXXXXX	1.17	0.78	5.46
BIDA 00000M000	7	XXXXXX	1.03	1.39	3.98
BRZR 19387M001	7	XXXXXX	1.50	1.30	3.35
CACE 13447M001	7	XXXXXX	1.68	1.27	3.94
CANT 13438M001	7	XXXXXX	1.02	1.17	2.97
CREU 13432M001	6	XXX XX	1.97	1.70	3.17
EBRE 13410M001	6	XXX XX	2.06	1.37	2.89
ELGE 19353S001	6	XXXX X	0.63	1.15	4.45
EMAZ 17001M001	7	XXXXXX	1.18	0.73	3.73
GERN 19389M001	7	XXXXXX	0.99	4.29	6.26
HOND 15012M002	7	XXXXXX	1.23	1.10	5.00
IGEL 19352S001	7	XXXXXX	0.78	0.75	5.07
ISPS 19484M001	7	XXXXXX	0.82	2.57	4.59
KAST 19499M001	7	XXXXXX	2.08	1.46	5.75
LARE 19440M001	7	XXXXXX	2.03	0.61	2.39
LAZK 19354S001	7	XXXXXX	2.76	1.01	6.27
LEIT 19428M001	7	XXXXXX	1.63	1.21	5.94
ORON 19427M001	2	X X	3.14	2.09	13.82
PASA 19351S001	7	XXXXXX	0.77	0.79	4.93
RI01 13448M002	6	XXX XX	2.76	1.02	2.48
SALA 13469M001	7	XXXXXX	0.85	0.93	3.53
SCOA 10088M002	7	XXXXXX	2.80	1.61	5.17
SOPU 19386M001	7	XXXXXX	1.25	1.31	4.60
TERU 13487M001	6	XXX XX	2.54	1.53	3.04
VITO 19385M001	6	XXX XX	1.43	1.23	4.32
YEBE 13420M001	7	XXXXXX	1.96	0.98	2.76
ZARA 13462M001	6	XXX XX	1.71	1.03	2.36

Comparison of individual solutions:

Station	Day	Weekday	N	E	U	N	E	U	
ACOR 13434M001	N	0.97	-1.19	-0.35	-1.53	1.01	0.64	0.33	0.41
ACOR 13434M001	E	1.16	-0.39	0.08	-1.75	-0.71	-2.00	0.60	-0.16
ACOR 13434M001	U	5.58	2.43	0.43	-3.61	-0.25	12.48	-2.95	-1.82
ALDA 19383M001	N	1.52	0.51	-0.35	2.64	-0.45	0.47	-1.95	-1.53
ALDA 19383M001	E	1.77	0.10	-2.68	-2.32	0.68	2.10	0.99	0.54
ALDA 19383M001	U	7.59	12.44	-2.07	-3.56	-0.21	13.06	-1.32	-1.09
ALSA 19419M001	N	3.27	-0.59	-0.92	5.78	0.68	1.52	-3.11	-4.15
ALSA 19419M001	E	1.36	1.24	-2.52	-0.86	-0.51	0.55	0.27	1.34
ALSA 19419M001	U	5.72	4.60	1.68	3.87	0.12	12.07	-2.85	-1.95
AMUR 19388M001	N	2.04	-0.17	-2.24	3.96	0.21	0.70	-1.80	-0.68
AMUR 19388M001	E	1.31	1.00	-2.89	0.05	-0.31	0.03	0.04	-0.90
AMUR 19388M001	U	3.84	2.30	2.37	-1.72	0.57	8.13	2.17	1.83
BLAZ 10074M002	N	1.17	0.30	-1.12	1.91	-1.32	0.70	-0.74	-0.68
BLAZ 10074M002	E	0.78	0.56	-1.10	-0.55	-0.12	-0.57	-0.44	-1.13
BLAZ 10074M002	U	5.46	-1.56	5.95	1.30	0.02	11.67	-1.05	-1.41
BIDA 00000M000	N	1.03	0.54	-0.16	1.69	-0.23	-0.70	-1.43	-0.77
BIDA 00000M000	E	1.39	1.06	-3.13	-0.10	-0.10	-0.73	-0.24	-0.08
BIDA 00000M000	U	3.98	-1.74	2.16	2.73	1.76	8.42	-0.99	2.19
BRZR 19387M001	N	1.50	-1.28	-2.17	1.38	0.41	2.22	-0.30	-0.04
BRZR 19387M001	E	1.30	1.59	-2.40	-1.04	0.03	-0.25	0.10	-0.82
BRZR 19387M001	U	3.35	2.99	4.56	1.41	0.47	5.88	-0.40	0.82
CACE 13447M001	N	1.68	0.71	1.38	-3.74	0.12	-0.42	0.42	0.36
CACE 13447M001	E	1.27	-0.01	2.70	-1.06	0.10	0.16	-1.11	-0.29
CACE 13447M001	U	3.94	-0.47	-6.14	-4.42	-0.50	-5.41	-1.52	-2.00
CANT 13438M001	N	1.02	-0.01	-1.37	1.69	0.40	1.11	0.02	0.35
CANT 13438M001	E	1.17	1.21	-1.75	-0.65	0.59	-1.39	-0.27	-0.96
CANT 13438M001	U	2.97	0.05	2.20	5.06	0.11	4.72	0.24	0.44
CREU 13432M001	N	1.97	-0.12	-2.91	2.68	1.22		1.51	0.13
CREU 13432M001	E	1.70	-0.92	-3.51	-0.01	0.69		-0.28	0.82
CREU 13432M001	U	3.17	1.92	0.56	0.41	-0.20		5.60	3.84
EBRE 13410M001	N	2.06	-0.30	-1.83	4.20	0.41		0.13	0.21
EBRE 13410M001	E	1.37	-0.38	-2.86	-0.34	0.94		-0.19	0.04
EBRE 13410M001	U	2.89	2.81	4.37	2.64	2.68		0.19	-0.82
ELGE 19353S001	N	0.63	-0.74	-0.14	0.96	0.27	0.66		0.10
ELGE 19353S001	E	1.15	-0.18	-0.18	0.49	-0.17	-0.92		-2.33
ELGE 19353S001	U	4.45	5.98	3.24	6.65	-0.11	1.52		-2.52
EMAZ 17001M001	N	1.18	-0.75	0.26	1.41	0.57	2.11	0.90	0.32
EMAZ 17001M001	E	0.73	-0.97	-0.75	-0.26	-0.91	0.74	0.02	-0.54
EMAZ 17001M001	U	3.73	5.71	-0.88	5.54	0.03	-0.47	-4.18	-1.27
GERN 19389M001	N	0.99	-0.63	-1.36	-0.03	-0.10	-0.16	0.57	1.80
GERN 19389M001	E	4.29	-7.22	-1.76	-1.00	0.36	-2.24	0.99	6.92
GERN 19389M001	U	6.26	10.12	8.66	3.72	-0.60	2.85	-4.09	-4.32
HOND 15012M002	N	1.23	-0.17	-1.08	2.50	-0.13	-0.51	-0.96	-0.67
HOND 15012M002	E	1.10	0.78	-2.40	-0.64	-0.65	-0.34	0.05	-0.12
HOND 15012M002	U	5.00	-2.20	2.91	1.85	0.01	11.50	1.14	-0.16
IGEL 19352S001	N	0.78	-0.03	-1.52	0.76	-0.26	-0.05	-0.50	0.67
IGEL 19352S001	E	0.75	0.49	-1.18	-0.88	-0.22	-0.69	-0.48	-0.46
IGEL 19352S001	U	5.07	4.04	0.58	2.11	-1.35	11.28	-2.06	0.28
ISPS 19484M001	N	0.82	-1.31	-0.73	1.08	0.72	-0.14	0.13	0.22
ISPS 19484M001	E	2.57	-4.24	-1.55	-1.31	0.37	-0.94	-0.16	4.06
ISPS 19484M001	U	4.59	7.47	4.32	3.46	-1.38	5.60	-2.48	-0.81
KAST 19499M001	N	2.08	-0.93	-3.42	2.44	2.46	0.65	-0.26	-0.92
KAST 19499M001	E	1.46	0.93	-3.13	-0.90	-0.75	0.71	0.46	-0.31
KAST 19499M001	U	5.75	-6.21	4.07	7.00	9.45	1.53	-1.32	0.88
LARE 19440M001	N	2.03	-1.61	-2.33	0.99	1.05	2.73	1.25	2.39
LARE 19440M001	E	0.61	-0.23	-0.43	-0.75	0.37	-0.91	-0.61	-0.35
LARE 19440M001	U	2.39	2.12	-0.70	4.16	-0.75	-1.87	1.78	2.20
LAZK 19354S001	N	2.76	-0.00	-1.74	5.42	-0.37	0.59	-2.06	-2.93
LAZK 19354S001	E	1.01	0.26	-1.46	1.29	-0.46	0.04	-1.06	0.96
LAZK 19354S001	U	6.27	0.34	-6.42	1.18	1.47	11.71	6.84	2.63

LEIT 19428M001	N	1.63	1.39	-0.68	2.27	-0.50	-0.02	-2.83	0.43
LEIT 19428M001	E	1.21	-0.92	-2.06	-0.18	-0.88	0.60	-0.38	1.52
LEIT 19428M001	U	5.94	1.99	6.54	2.28	2.21	11.64	-1.90	-3.96
ORDN 19427M001	N	3.14			1.60		-2.71		
ORDN 19427M001	E	2.09			-0.31		-2.07		
ORDN 19427M001	U	13.82			1.92		13.68		
PASA 19351S001	N	0.77	0.10	-1.18	1.00	-0.16	0.51	-0.86	-0.38
PASA 19351S001	E	0.79	-0.31	-1.76	-0.23	-0.61	-0.08	-0.16	-0.28
PASA 19351S001	U	4.93	-2.34	1.31	1.79	0.90	11.44	0.67	1.85
RIO1 13448M002	N	2.76	-1.39	-2.71	5.17	-0.18		-1.06	-0.87
RIO1 13448M002	E	1.02	-0.24	-1.89	0.18	1.10		-0.07	0.58
RIO1 13448M002	U	2.48	2.52	-0.01	4.44	-0.42		1.56	-1.46
SALA 13469M001	N	0.85	0.23	0.92	-1.64	0.20	0.11	-0.77	-0.23
SALA 13469M001	E	0.93	-0.84	1.68	-1.02	-0.20	-0.65	-0.44	0.17
SALA 13469M001	U	3.53	-0.24	-7.14	1.91	2.56	3.40	1.33	-0.19
SCDA 10088M002	N	2.80	2.19	1.58	4.28	-2.22	-2.68	-2.64	-1.51
SCDA 10088M002	E	1.61	1.92	-0.59	1.12	-0.27	-2.00	-1.63	-1.88
SCDA 10088M002	U	5.17	-3.17	0.13	0.43	2.14	11.85	1.96	1.21
SOPU 19386M001	N	1.25	0.48	0.20	1.19	-0.18	1.35	-2.25	-0.92
SOPU 19386M001	E	1.31	1.00	-2.77	-0.13	0.19	0.45	-0.76	-0.90
SOPU 19386M001	U	4.60	3.15	-2.72	7.21	-3.33	2.74	3.72	5.00
TERU 13487M001	N	2.54	0.19	-1.74	5.37	0.59		-0.14	-0.04
TERU 13487M001	E	1.53	0.47	-3.19	-0.23	0.69		0.42	0.81
TERU 13487M001	U	3.04	3.60	4.24	1.10	0.65		3.58	-0.93
VITO 19385M001	N	1.43	-1.18	-1.16	2.36	0.06		-1.36	-0.36
VITO 19385M001	E	1.23	1.57	-2.17	0.42	-0.23		-0.16	-0.33
VITO 19385M001	U	4.32	-5.87	5.18	5.33	-0.18		-1.77	0.76
YEBE 13420M001	N	1.96	-0.22	0.34	4.71	0.40	0.61	-0.28	-0.02
YEBE 13420M001	E	0.98	-0.87	1.73	-0.48	-0.56	-1.20	-0.09	-0.09
YEBE 13420M001	U	2.76	-0.83	-4.55	3.06	2.77	2.67	-0.27	0.02
ZARA 13462M001	N	1.71	-0.10	-1.63	3.04	-0.72		-1.00	-1.05
ZARA 13462M001	E	1.03	0.97	-1.55	-0.87	-0.84		0.42	0.62
ZARA 13462M001	U	2.36	1.47	1.31	-2.29	2.51		3.39	0.93

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	-0.53	0.17	-0.56
3	ALME 13437M001	I W	-0.67	-0.13	0.08
4	BCL1 19482M001	I W	-0.32	0.07	2.78
5	BELL 13431M001	I W	3.43	2.29	7.00
6	BIAZ 10074M002	I W	0.91	0.77	-1.16
7	BORR 13480M001	I W	-3.13	0.35	-0.36
8	BRST 10004M004	I W	1.19	-1.32	2.36
9	CACE 13447M001	I W	3.02	1.13	4.25
10	CANT 13438M001	I W	1.39	0.59	1.24
11	CASC 13909S001	I W	1.05	-1.23	-0.10
12	CEU1 13449M002	I W	0.22	0.18	-4.27
14	EBRE 13410M001	I W	-3.76	1.09	-1.94
16	FLRS 31907M001	I W	-1.18	-3.65	-9.12
17	FUER 31330M001	I W	-0.77	-1.91	0.80
19	HUEL 13451M001	I W	2.59	2.64	-6.68
20	IBIZ 13454S001	I W	-1.45	1.30	-1.51
21	IZAN 31309M002	I W	-2.39	-2.90	-0.15
22	LAGO 13903M001	I W	1.15	-1.48	1.51
23	LLIV 13436M001	I W	-3.00	2.01	6.42
24	LPAL 81701M001	I W	0.10	-0.48	-2.69
25	LROC 10023M001	I W	0.22	0.36	3.50
26	MADR 13407S012	I W	-2.39	1.16	-5.14
27	MAL1 13444M002	I W	2.03	-0.35	-8.86
28	MALA 13443M001	I W	2.29	-0.67	5.31
29	MALL 13444M001	I W	-1.98	1.57	1.03
30	MAS1 31303M002	I W	-2.28	-4.18	4.51
31	MELI 19379M001	I W	-0.20	-0.15	0.27
32	PDEL 31906M004	I W	-3.86	-2.12	0.79
33	RABT 35001M002	I W	0.97	-1.82	-4.96
34	SCOA 10088M002	I W	1.35	1.44	-7.88
35	SFER 13402M004	I W	0.00	-5.45	3.14
36	SOPU 19386M001	I W	0.14	0.46	2.48
37	VALE 13439M001	I W	-0.30	3.11	-4.13
38	VIGO 13450M001	I W	2.58	1.78	0.19
39	VILL 13406M001	I W	-0.08	-1.14	5.12
40	YEBE 13420M001	I W	-0.69	-0.19	5.69
41	ZARA 13462M001	I W	-0.67	1.73	0.02
42	ZIMM 14001M004	I W	-0.68	1.28	6.74
RMS / COMPONENT			1.86	1.90	4.28
IQR			2.33	2.51	5.09
MEAN			-0.15	-0.10	0.15
MEDIAN			-0.14	0.18	0.23
MIN			-3.86	-5.45	-9.12
MAX			3.43	3.11	7.00
OVERALL RMS/IQR/MAX(3D)			2.91	2.70	9.89
					FLRS 31907M001 #SUM
ALL RMS / COMPONENT			1.86	1.90	4.28
ALL IQR			2.33	2.51	5.09
ALL MEAN			-0.15	-0.10	0.15
ALL MEDIAN			-0.14	0.18	0.23
ALL MIN			-3.86	-5.45	-9.12
ALL MAX			3.43	3.11	7.00
ALL OVERALL RMS/IQR/MAX(3D)			2.91	2.70	9.89
					FLRS 31907M001 #SUM_ALL

NUMBER OF PARAMETERS : 3
NUMBER OF STATIONS : 38
NUMBER OF COORDINATES : 114
RMS OF TRANSFORMATION : 2.91 MM

PARAMETERS:

TRANSLATION IN X : -0.01 +- 0.47 MM
TRANSLATION IN Y : -0.00 +- 0.47 MM
TRANSLATION IN Z : 0.01 +- 0.47 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          19405263
NUMBER OF UNKNOWN(S)            202851
NUMBER OF DEGREES OF FREEDOM    19202412
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)     180
VARIANCE FACTOR                  3.880447594813813
```

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 24:315:00000 24:321:86370 LEICA GR50 -----
ALDA A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
ALSA A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
AMUR A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
BIAZ A 1 P 24:315:00000 24:321:86370 SPECTRA SP90M -----
BIDA A 1 P 24:315:00000 24:321:86370 LEICA GR10 -----
BRZR A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
CACE A 1 P 24:315:00000 24:321:86370 TRIMBLE NETR9 -----
CANT A 1 P 24:315:00000 24:321:86370 LEICA GR10 -----
CREU A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
EBRE A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
ELGE A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
EMAZ A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
GERN A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
HOND A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
IGEL A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
ISPS A 1 P 24:315:00000 24:321:86370 TRIMBLE NETR9 -----
KAST A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
LARE A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
LAZK A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
LEIT A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
ORON A 1 P 24:317:00000 24:319:86370 LEICA GR50 -----
PASA A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
RIO1 A 1 P 24:315:00000 24:321:86370 LEICA GR25 -----
SALA A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
SCDA A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
SOPU A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
TERU A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
VITO A 1 P 24:315:00000 24:321:86370 LEICA GR30 -----
YEBE A 1 P 24:315:00000 24:321:86370 LEICA GR50 -----
ZARA A 1 P 24:315:00000 24:321:86370 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 24:315:00000 24:321:86370 LEIAT504 LEIS -----
ALDA A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
ALSA A 1 P 24:315:00000 24:321:86370 LEIAR10 NONE -----
AMUR A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
BIAZ A 1 P 24:315:00000 24:321:86370 LEIAR25 LEIT -----
BIDA A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
BRZR A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
CACE A 1 P 24:315:00000 24:321:86370 TRM29659.00 NONE -----
CANT A 1 P 24:315:00000 24:321:86370 LEIAR25_R4 LEIT -----
CREU A 1 P 24:315:00000 24:321:86370 LEIAR25_R4 NONE -----
EBRE A 1 P 24:315:00000 24:321:86370 LEIAR25_R4 NONE -----
ELGE A 1 P 24:315:00000 24:321:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
GERN A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
HOND A 1 P 24:315:00000 24:321:86370 LEIAR20 LEIM -----
IGEL A 1 P 24:315:00000 24:321:86370 LEIAR20 LEIM -----
ISPS A 1 P 24:315:00000 24:321:86370 TRM59900.00 SCIS -----
KAST A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
LARE A 1 P 24:315:00000 24:321:86370 LEIAR20 LEIM -----
LAZK A 1 P 24:315:00000 24:321:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 24:315:00000 24:321:86370 LEIAR10 NONE -----
ORON A 1 P 24:317:00000 24:319:86370 LEIAR10 NONE -----
PASA A 1 P 24:315:00000 24:321:86370 LEIAR20 LEIM -----
RIO1 A 1 P 24:315:00000 24:321:86370 LEIAR25_R4 LEIT -----
SALA A 1 P 24:315:00000 24:321:86370 LEIAR25 NONE -----
SCDA A 1 P 24:315:00000 24:321:86370 TRM55971.00 NONE -----
SOPU A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
TERU A 1 P 24:315:00000 24:321:86370 LEIAR20 LEIM -----
VITO A 1 P 24:315:00000 24:321:86370 LEIAS10 NONE -----
YEBE A 1 P 24:315:00000 24:321:86370 LEIAR20 LEIM -----
ZARA A 1 P 24:315:00000 24:321:86370 TRM29659.00 NONE -----
```

7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START__ DATA_END_____ AXE ARP->BENCHMARK(M)-----
ACOR A 1 P 24:315:00000 24:321:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 24:315:00000 24:321:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 24:315:00000 24:321:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 24:315:00000 24:321:86370 UNE 3.0490 0.0000 0.0000
CREU A 1 P 24:315:00000 24:321:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 24:315:00000 24:321:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 24:315:00000 24:321:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 24:315:00000 24:321:86370 UNE 0.0771 0.0000 0.0000
HOND A 1 P 24:315:00000 24:321:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 24:315:00000 24:321:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 24:315:00000 24:321:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
ORDN A 1 P 24:317:00000 24:319:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
RI01 A 1 P 24:315:00000 24:321:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 24:315:00000 24:321:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 24:315:00000 24:321:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 24:315:00000 24:321:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 24:315:00000 24:321:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 24:315:00000 24:321:86370 UNE 0.0600 0.0000 0.0000
ZARA A 1 P 24:315:00000 24:321:86370 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

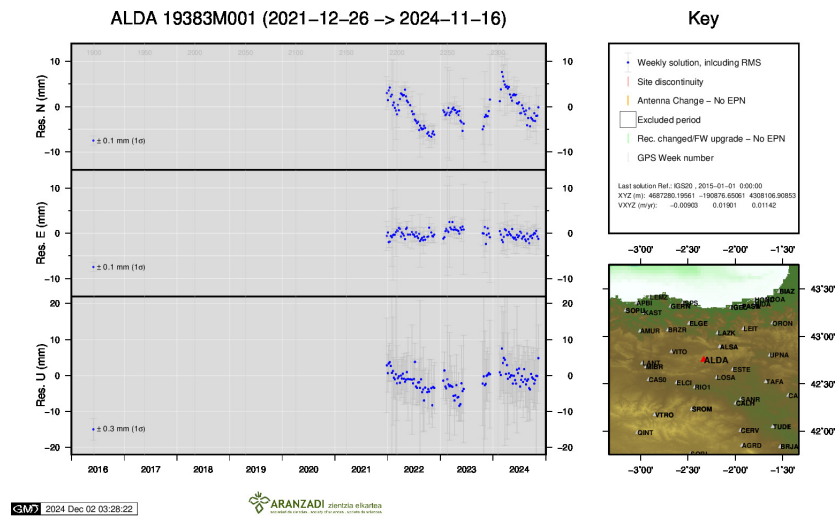
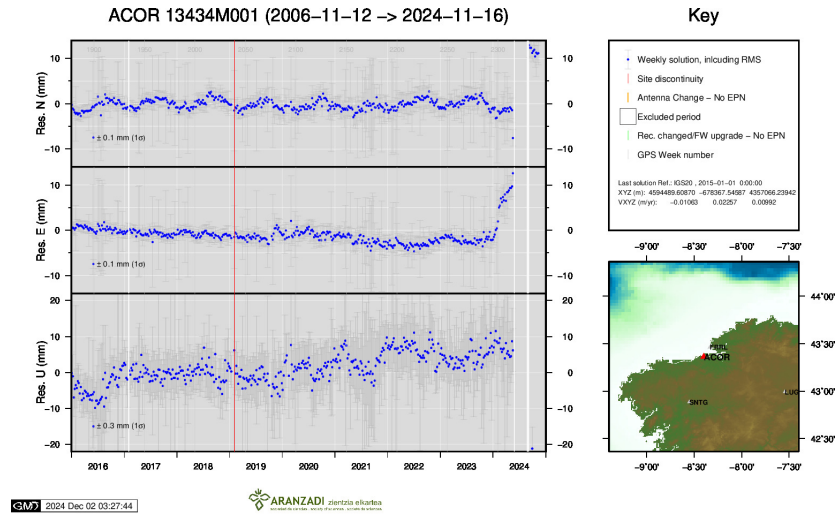
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf

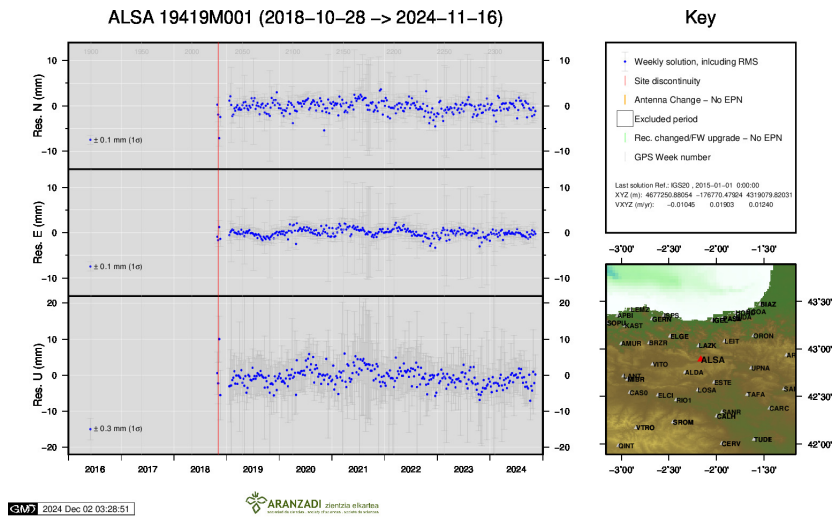
Johnston, G., Riddell, A., Hausler, G. (2017). The International GNSS Service. Teunissen, Peter J.G., Montenbruck, O. (Eds.), Springer Handbook of Global Navigation Satellite Systems (1st ed., pp. 967-982). Cham, Switzerland: Springer International Publishing. DOI: 10.1007/978-3-319-42928-1

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

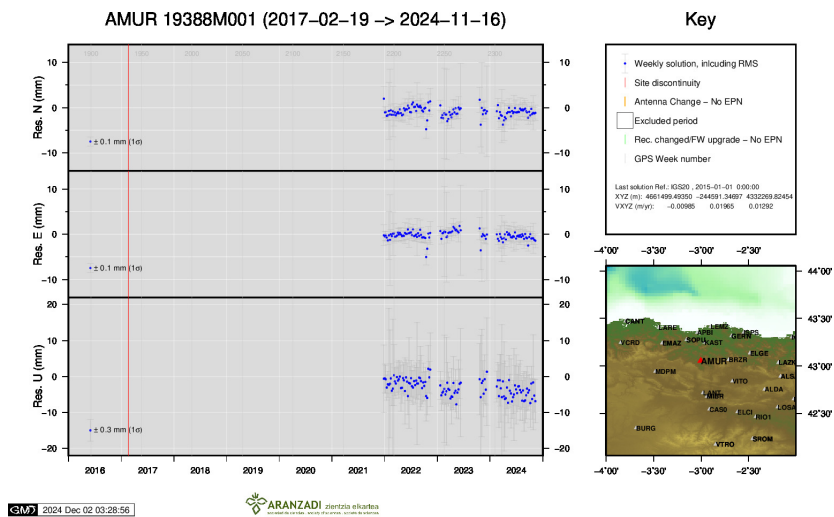
9 Cumulative Time Series

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

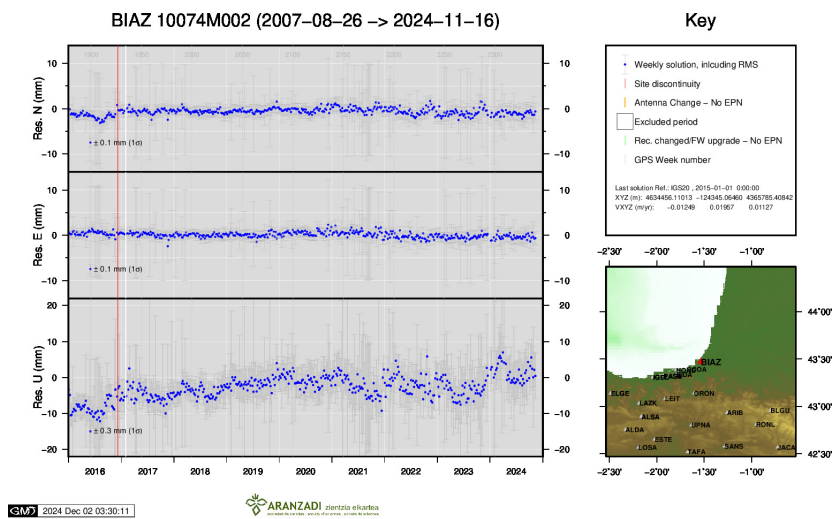




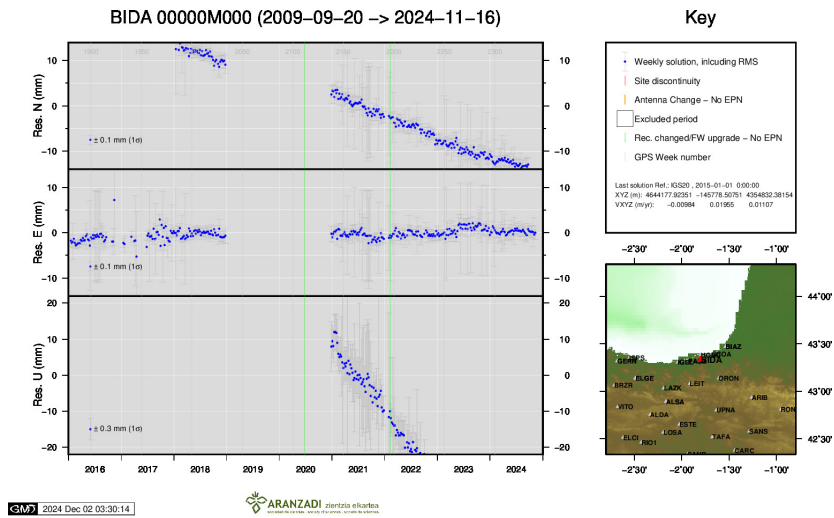
3) ALSA



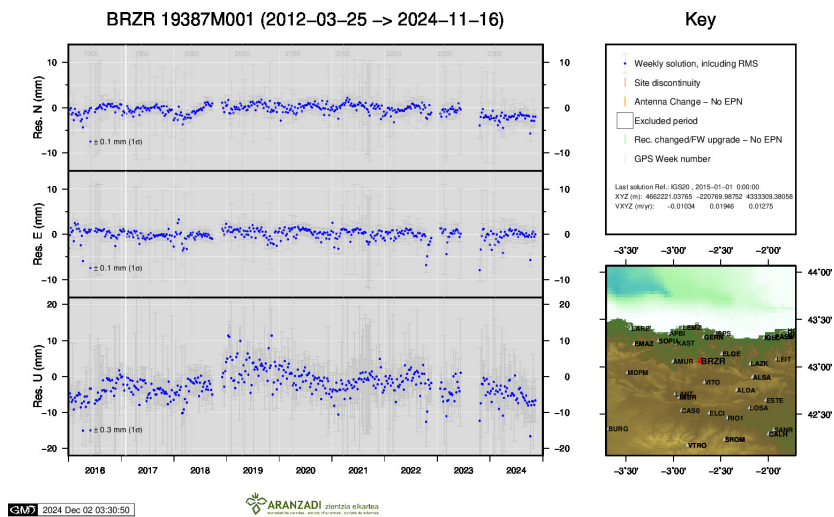
4) AMUR



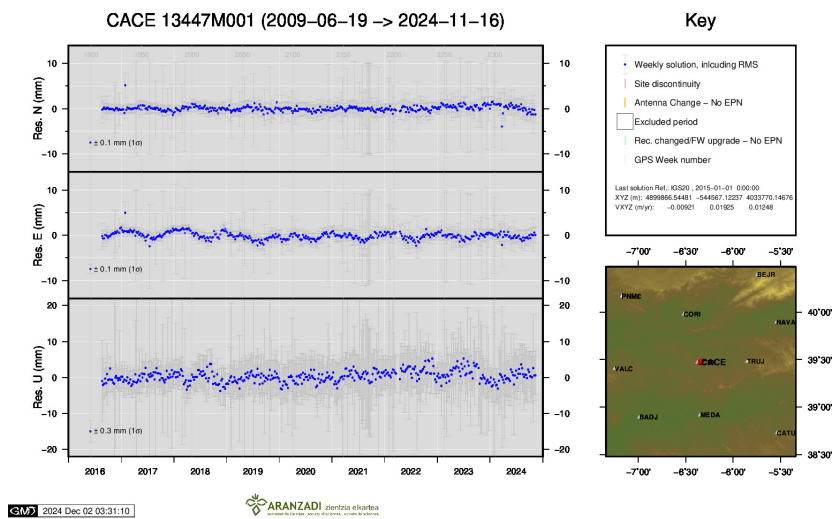
5) BIAZ



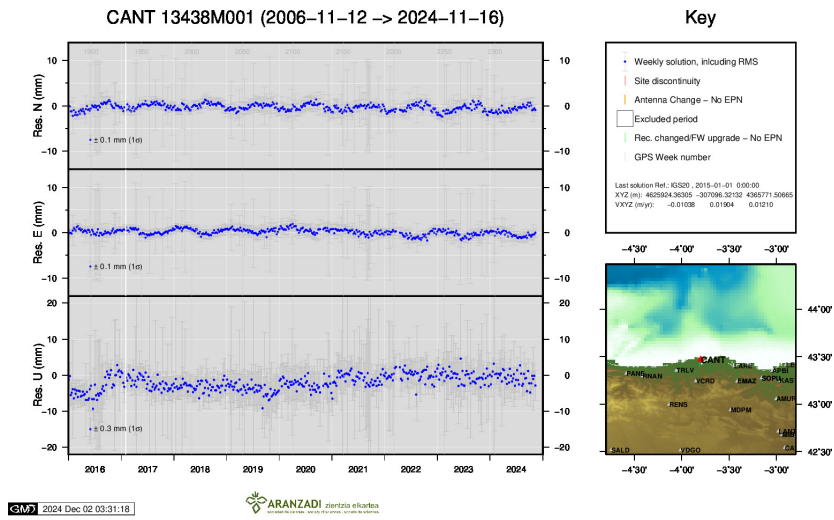
6) BIDA



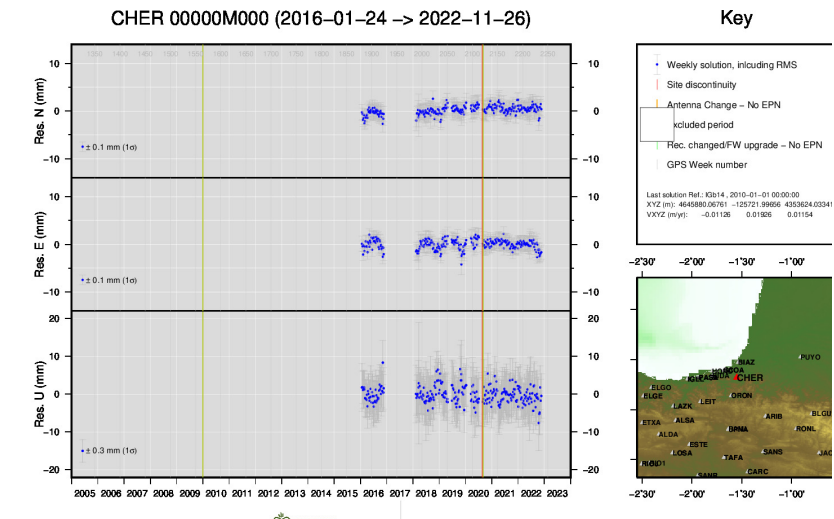
7) BRZR



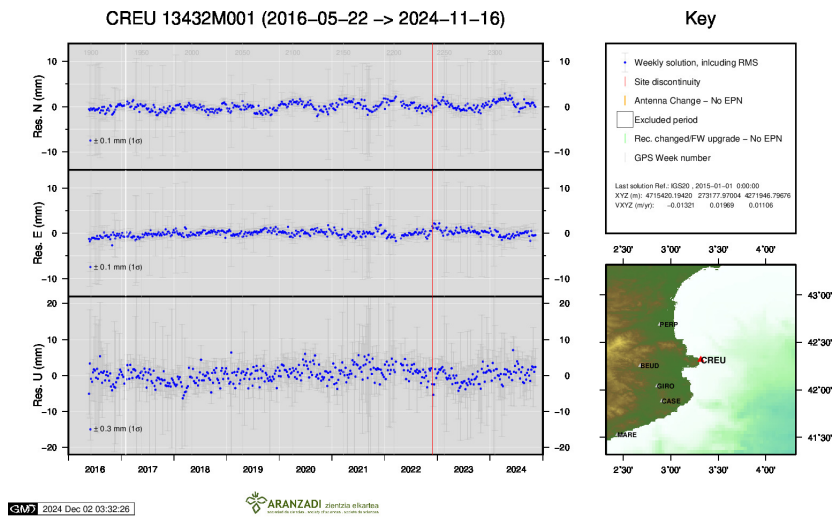
8) CACE



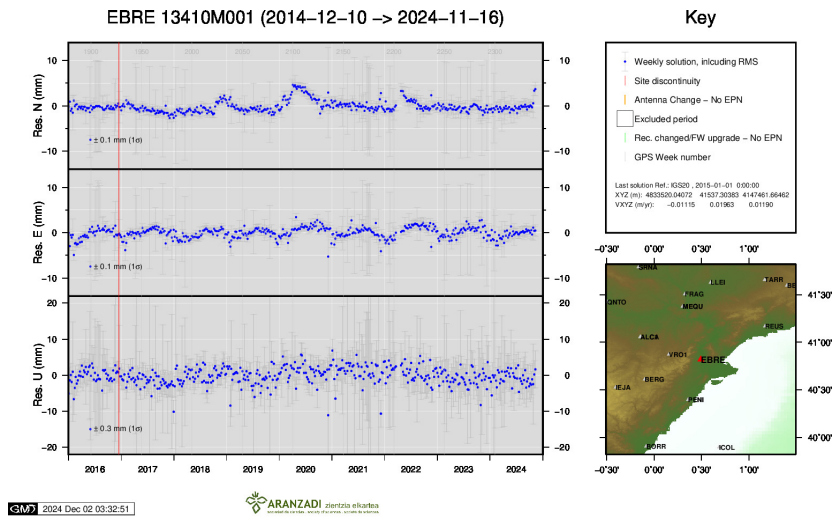
9) CANT



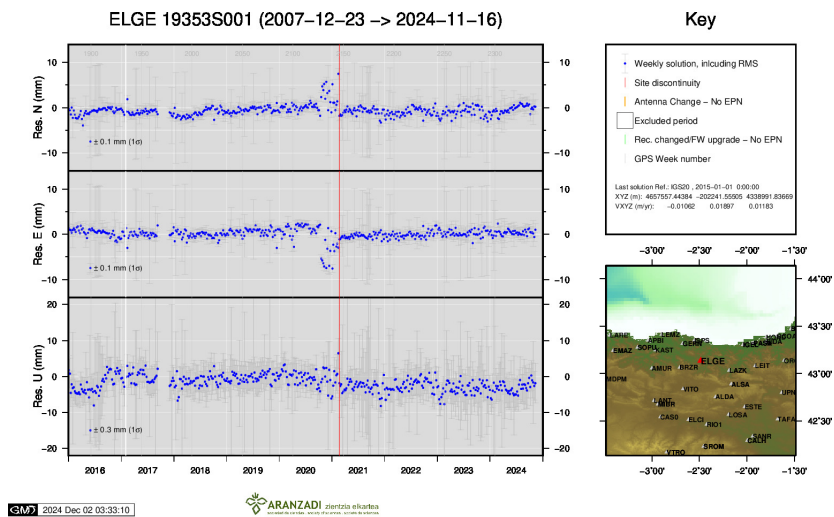
10) CHER



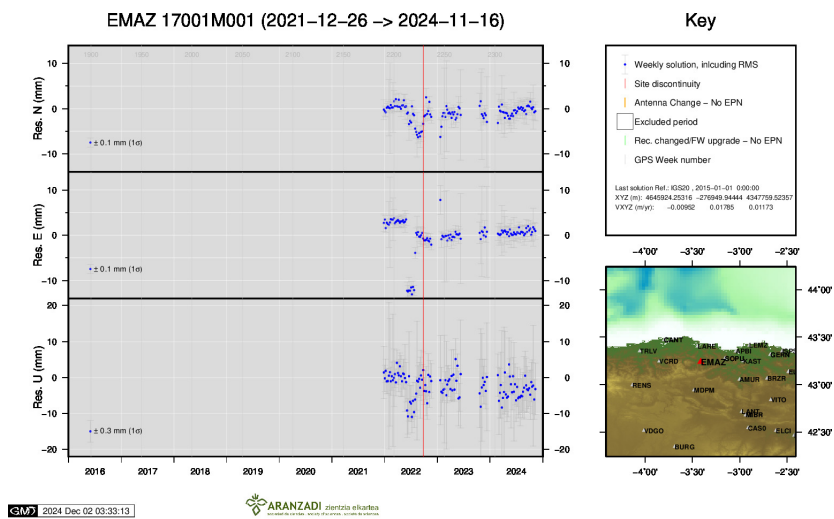
11) CREU



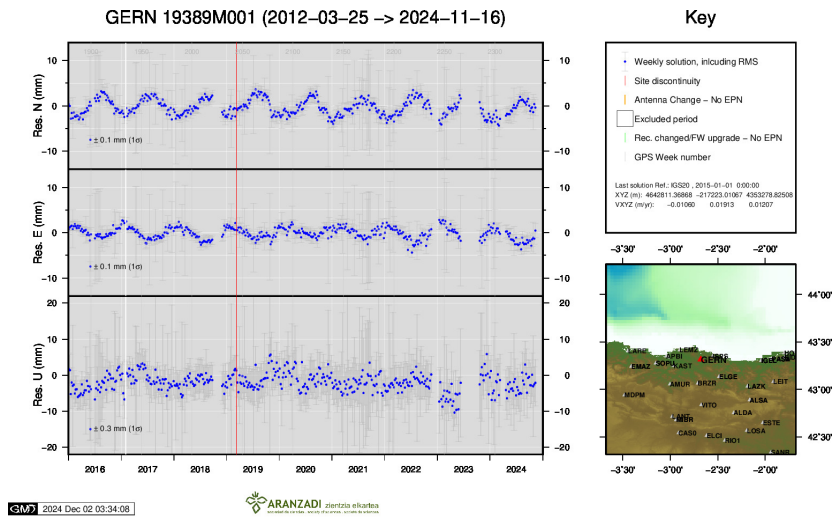
12) EBRE



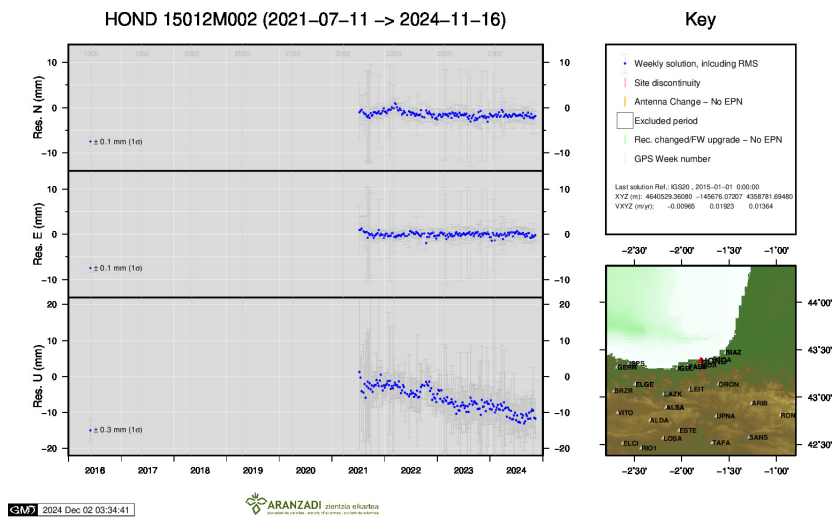
13) ELGE



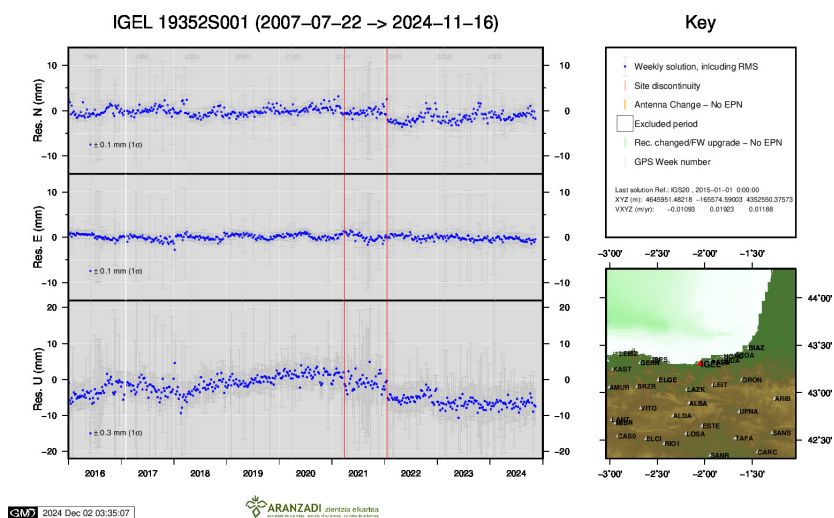
14) EMAZ



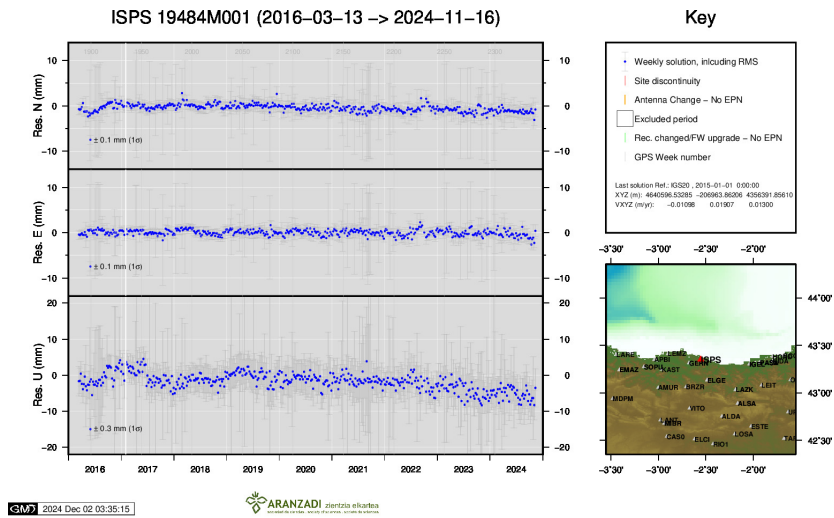
15) GERN



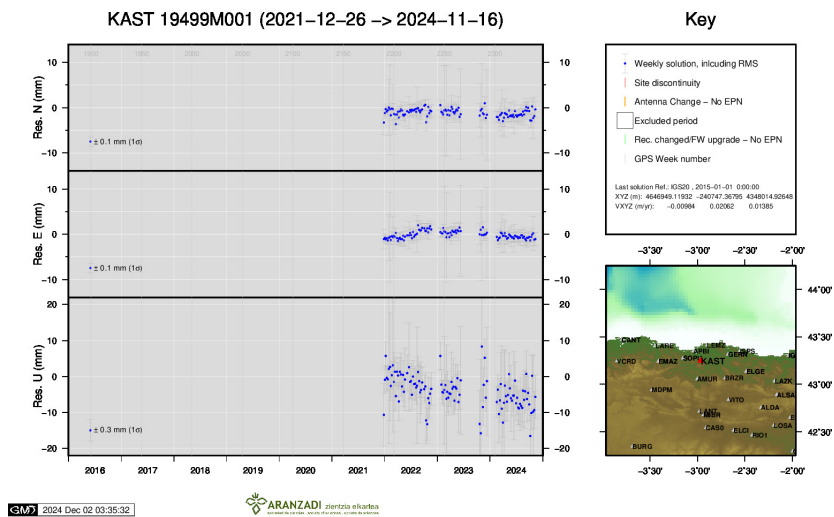
16) HOND



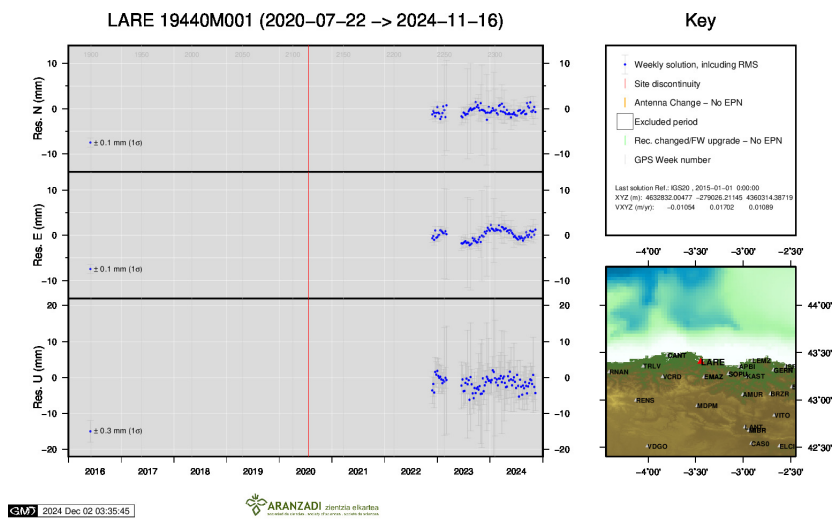
17) IGEL



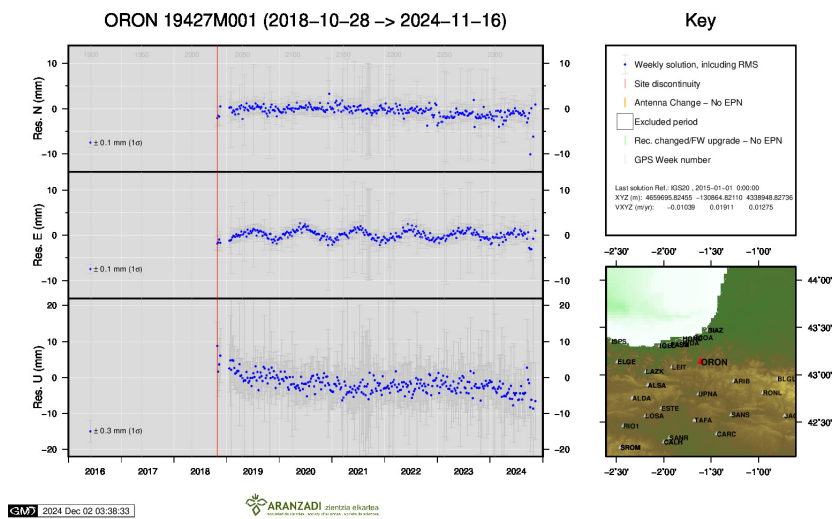
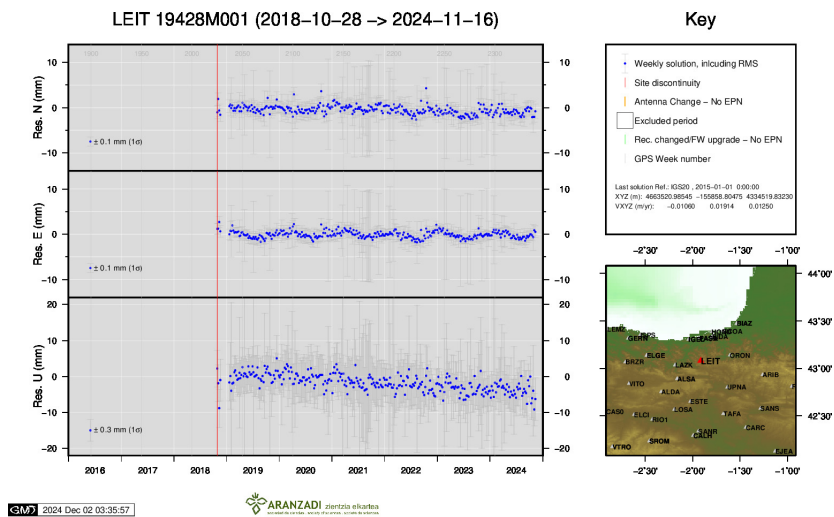
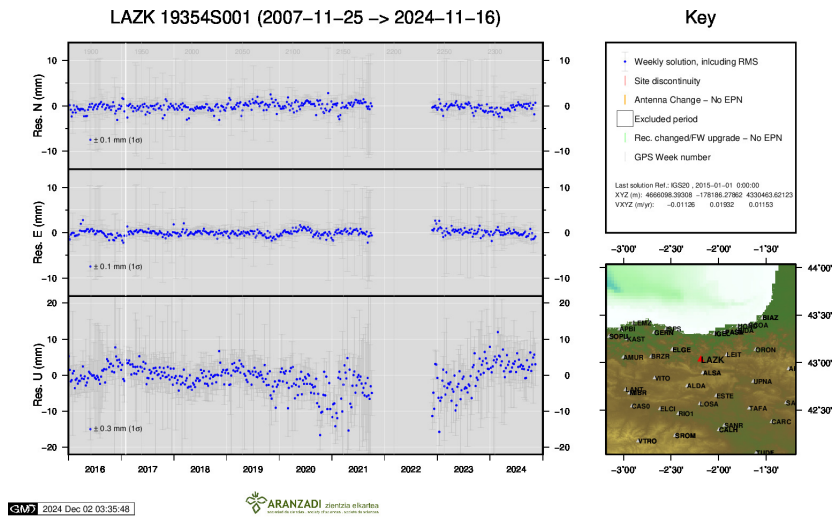
18) ISPS

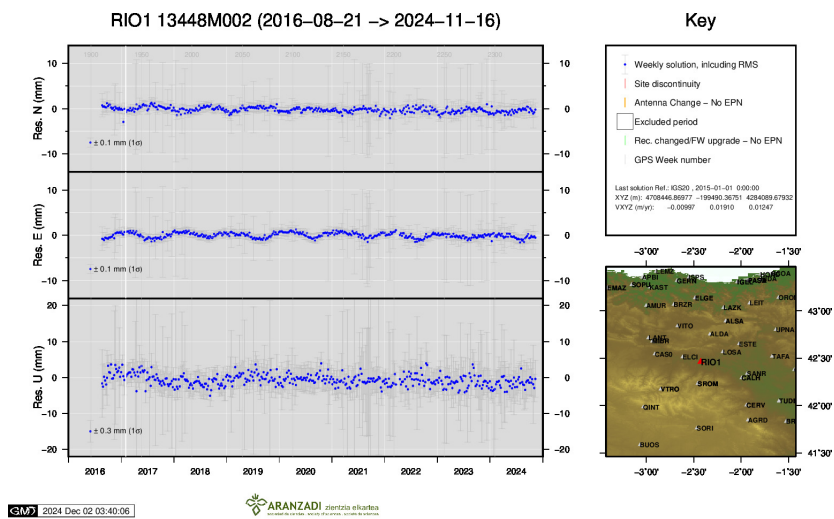
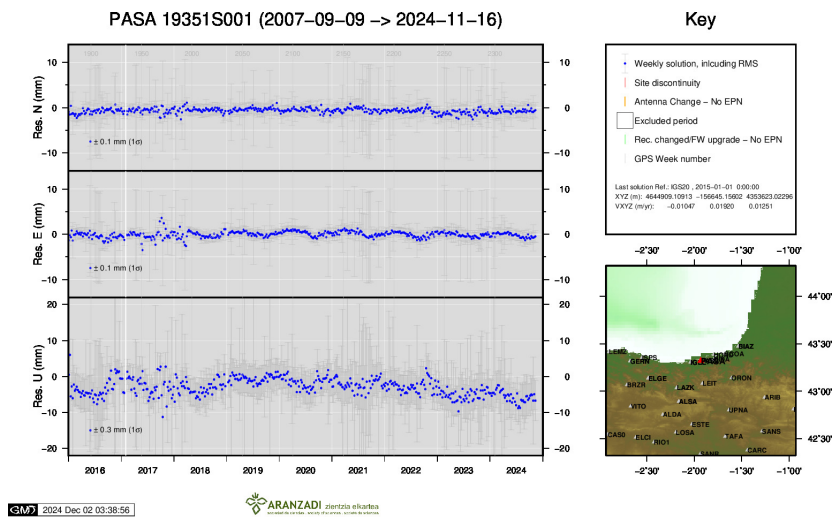
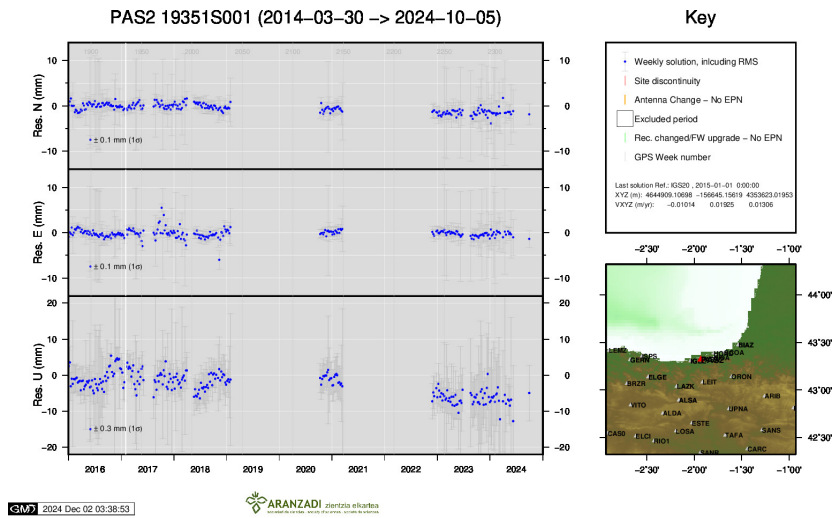


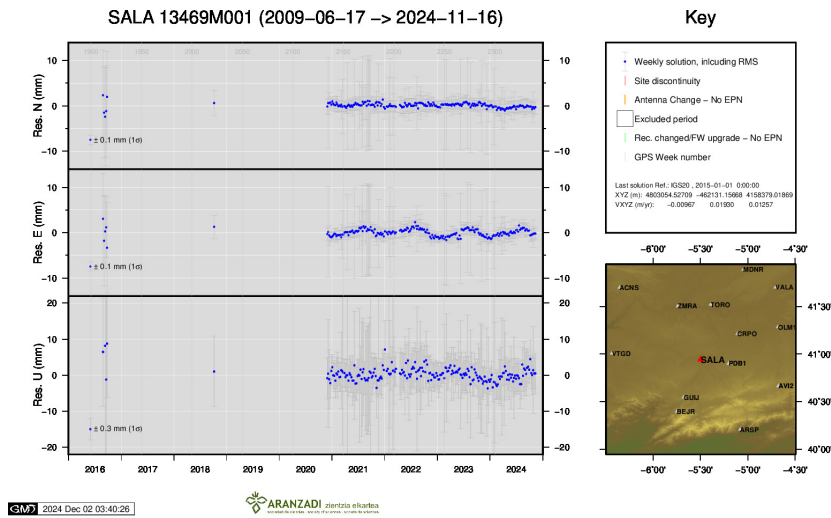
19) KAST



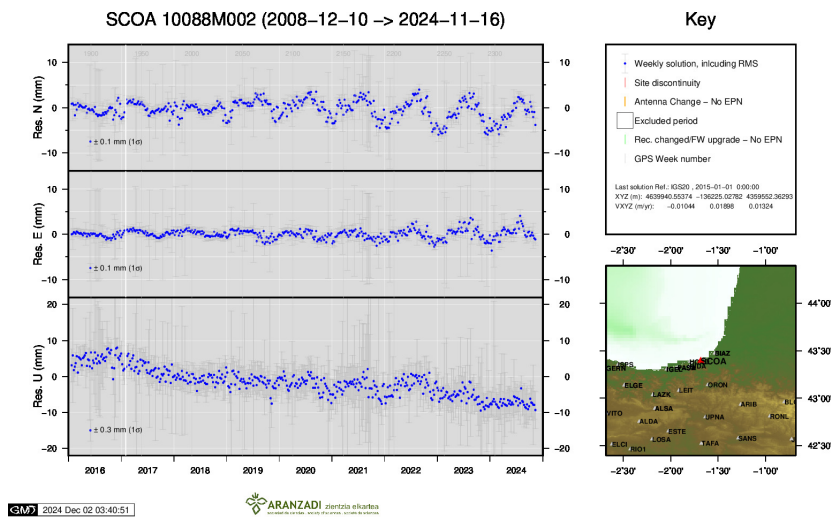
20) LARE



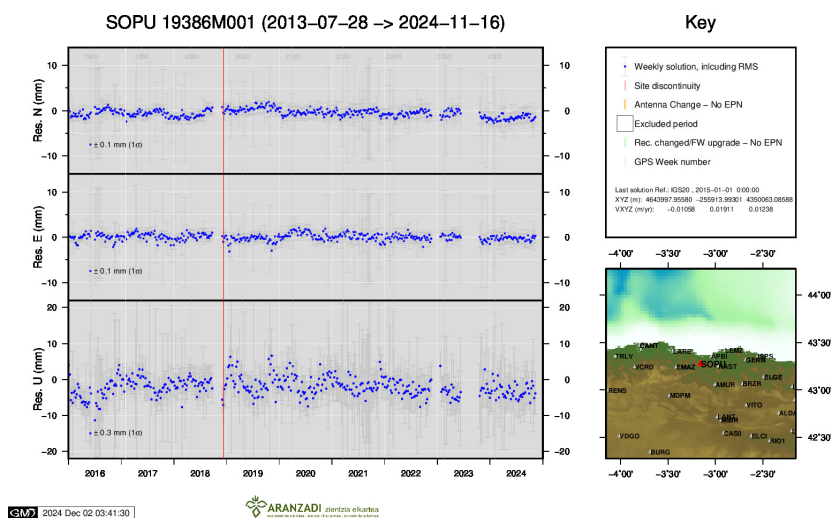




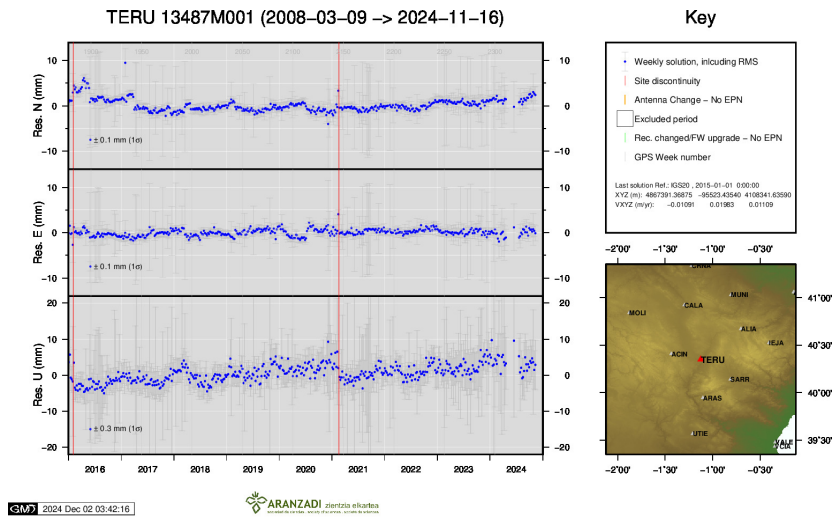
27) SALA



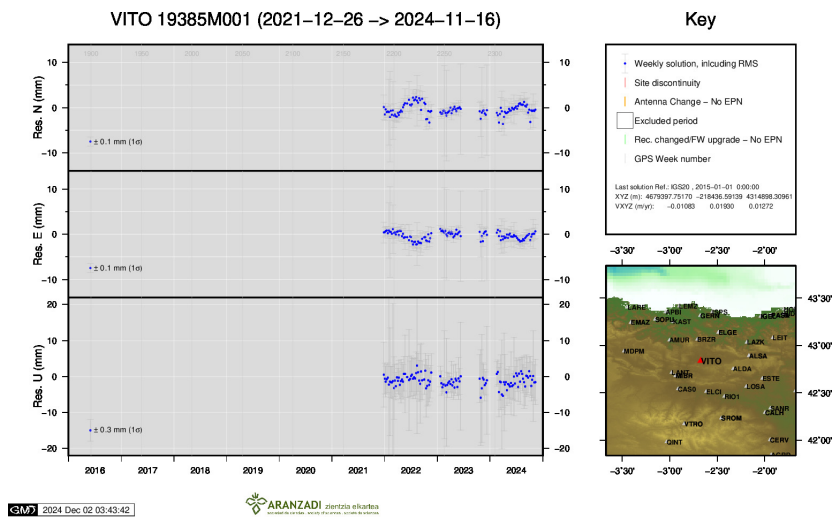
28) SCOA



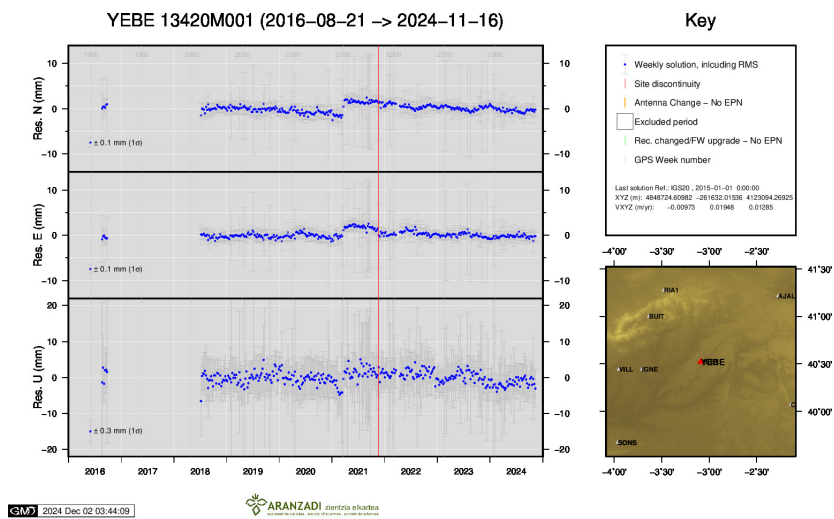
29) SOPU



30) TERU



31) VITO



32) YEBE

