

# ARA-DAC Weekly Analysis Result: 2082 (GFA)

## Technical Report

**GPS Week: 2082 (GFA)**

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

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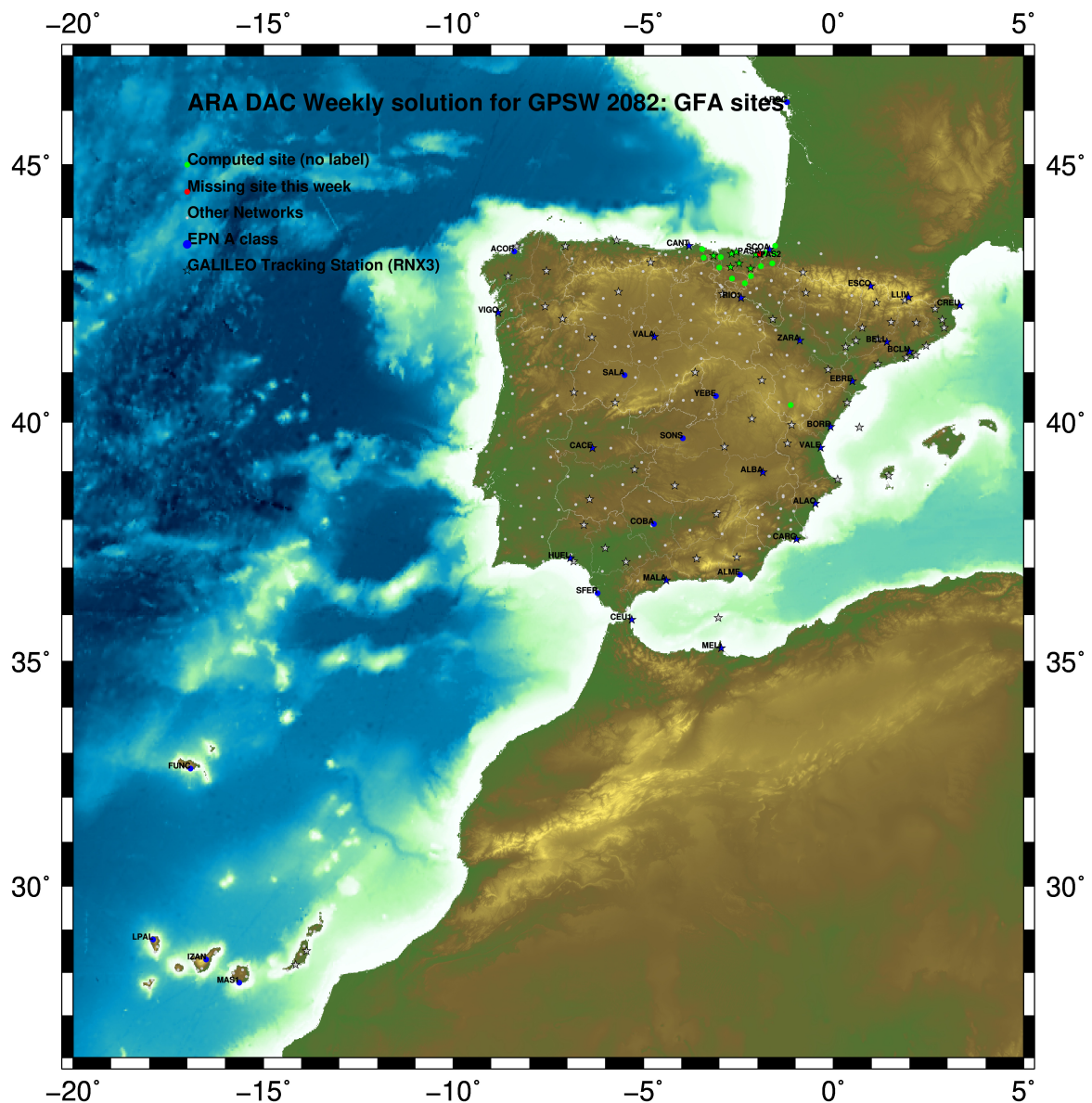
Report generated on 2019/12/27 at 15:05:01



# 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 2019 Dec 27 15:04:52

Fig.1: Computed Sites for GPS Week2082 (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 available 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 C2055.

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ARA LAC 2082 WEEK FINAL COMBINATION: PRECISE ORBITS                27-DEC-19 11:49
-----
LOCAL GEODETIC DATUM: IGS14                      EPOCH: 2019-12-04 12:00:00
-----
NUM  STATION NAME      X (M)      Y (M)      Z (M)      FLAG
-----
  1  ACRD 13434M001    4594489.55542  -678367.43471  4357066.29092  W
 34  ALDA 19383M001    4687280.14844  -190876.55762  4308106.96139  A
 43  ALSA 19419M001    4677250.82198  -176770.38416  4319079.87849  A
 45  AMUR 19388M001    4661499.43974  -244591.25031  4332269.88956  A
 81  BIAZ 10074M002    4634456.04222  -124344.96820  4365785.46428  A
 82  BIDA 00000M000    4644177.81534  -145778.31523  4354832.49023  A
 92  BRZR 19387M001    4662220.98597  -220769.89066  4333309.45091  A
  9  CACE 13447M001    4899866.49901  -544567.02785  4033770.21210  W
 10  CANT 13438M001    4625924.30622  -307096.22472  4365771.56247  W
118  CHER 00000M000    4645880.31494  -125721.91927  4353624.38025  A
 15  CREU 13432M001    4715420.12254  273178.06808  4271946.84664  W
 17  EBRE 13410M001    4833519.98434  41537.39863  4147461.72191  W
139  ELGE 19353S001    4657557.39647  -202241.46628  4338991.87641  A
141  EMAZ 17001M001    4645924.19948  -276949.85715  4347759.58496  A
209  GERN 19389M001    4642811.31334  -217222.91449  4353278.88681  A
183  IGEL 19352S001    4645951.42085  -165574.49490  4352550.42481  A
188  ISPS 19484M001    4640596.47197  -206963.76853  4356391.92096  A
193  KAST 19499M001    4646949.07217  -240747.26683  4348015.00135  A
198  LARE 19440M001    4632831.94439  -279026.12806  4360314.43414  A
199  LAZK 19354S001    4666098.33188  -178186.18371  4330463.67808  A
203  LEIT 19428M001    4663520.92410  -155858.70902  4334519.88844  A
260  ORDN 19427M001    4659695.76642  -130864.72690  4338948.88616  A
 33  PASA 19351S001    4644909.05141  -156645.05958  4353623.08403  W
 36  RID1 13448M002    4708446.81888  -199490.27502  4284089.74263  W
 37  SALA 13469M001    4803054.47704  -462131.06205  4158379.08506  W
 38  SCDA 10088M002    4639940.49140  -136224.93368  4359552.41784  W
321  SOPU 19386M001    4643997.90033  -255913.89805  4350063.15184  A
342  TERU 13487M001    4867391.31725  -95523.34390  4108341.69106  A
375  VITO 19385M001    4679397.68991  -218436.49656  4314898.37003  A
 49  YEBE 13420M001    4848724.56226  -261631.92242  4123094.33783  W
 50  ZARA 13462M001    4773803.16023  -73505.97656  4215454.10233  W
    
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### 5.2 ETRF2000 (ETRS89) Coordinates

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

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ETRF2000 FINAL COORD. wk 2082                                27-DEC-19 11:49
-----
LOCAL GEODETIC DATUM: ETRF2000                      EPOCH: 2019-12-04 12:00:00
-----
NUM  STATION NAME      X (M)      Y (M)      Z (M)      FLAG
-----
  1  ACRD 13434M001    4594489.86635  -678367.98227  4357065.86785  W
 34  ALDA 19383M001    4687280.51398  -190877.11390  4308106.53725  A
 43  ALSA 19419M001    4677251.18997  -176770.93934  4319079.45530  A
 45  AMUR 19388M001    4661499.80059  -244591.80401  4332269.46675  A
 81  BIAZ 10074M002    4634456.41972  -124345.51868  4365785.45053  A
 82  BIDA 00000M000    4644178.18952  -145778.86680  4354832.06997  A
 92  BRZR 19387M001    4662221.34973  -220770.44438  4333309.02834  A
  9  CACE 13447M001    4899866.80314  -544567.60728  4033769.76709  W
 10  CANT 13438M001    4625924.66199  -307096.77482  4365771.14163  W
118  CHER 00000M000    4645880.69142  -125722.47096  4353623.96010  A
 15  CREU 13432M001    4715420.54063  273177.51051  4271946.42595  W
 17  EBRE 13410M001    4833520.36619  41536.82774  4147461.28929  W
139  ELGE 19353S001    4657557.76283  -202242.01945  4338991.45443  A
141  EMAZ 17001M001    4645924.55757  -276950.40930  4347759.16295  A
209  GERN 19389M001    4642811.67892  -217223.46613  4353278.46578  A
183  IGEL 19352S001    4645951.79252  -165575.04673  4352550.00417  A
188  ISPS 19484M001    4640596.83899  -206964.31991  4356391.50023  A
193  KAST 19499M001    4646949.43458  -240747.81898  4348014.57971  A
198  LARE 19440M001    4632832.30311  -279026.67882  4360314.01311  A
199  LAZK 19354S001    4666098.70050  -178186.73770  4330463.25573  A
203  LEIT 19428M001    4663521.29566  -155859.26268  4334519.46657  A
260  ORDN 19427M001    4659696.14126  -130865.28007  4338948.46489  A
 33  PASA 19351S001    4644909.42421  -156645.61126  4353622.66358  W
 36  RID1 13448M002    4708447.18171  -199490.83355  4284089.31675  W
 37  SALA 13469M001    4803054.79978  -462131.63121  4158378.64860  W
 38  SCDA 10088M002    4639940.86705  -136225.48478  4359551.99802  W
321  SOPU 19386M001    4643998.26108  -255914.44993  4350062.73024  A
342  TERU 13487M001    4867391.68007  -95523.91881  4108341.25415  A
375  VITO 19385M001    4679398.05265  -218437.05208  4314897.94616  A
 49  YEBE 13420M001    4848724.90637  -261632.49587  4123093.90033  W
 50  ZARA 13462M001    4773803.53320  -73506.54158  4215453.67294  W
    
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### 5.3 ETRF2014 (ETRS89) Coordinates

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

ETRF2014 FINAL COORD. wk 2082 27-DEC-19 11:49

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 LOCAL GEODETIC DATUM: ETRF2014 EPOCH: 2019-12-04 12:00:00

NUM	STATION NAME	X (M)	Y (M)	Z (M)	FLAG
1	ACDR 13434M001	4594489.82398	-678368.02065	4357065.91649	W
34	ALDA 19383M001	4687280.46939	-190877.15365	4308106.58579	A
43	ALSA 19419M001	4677251.14543	-176770.97918	4319079.50387	A
45	AMUR 19388M001	4661499.75641	-244591.84367	4332269.51533	A
81	BIAZ 10074M002	4634456.37544	-124345.55887	4365785.09373	A
82	BIDA 00000M000	4644178.14521	-145778.90688	4354832.11863	A
92	BRZR 19387M001	4662221.30547	-220770.48412	4333309.07692	A
9	CACE 13447M001	4899866.75728	-544567.64493	4033769.81507	W
10	CANT 13438M001	4625924.61834	-307096.81440	4365771.19027	W
118	CHER 00000M000	4645880.64703	-125722.51110	4353624.00877	A
15	CREU 13432M001	4715420.49418	273177.46926	4271946.47471	W
17	EBRE 13410M001	4833520.31933	41536.78776	4147461.33763	W
139	ELGE 19353S001	4657557.71856	-202242.05928	4338991.50303	A
141	EMAZ 17001M001	4645924.51365	-276950.44891	4347759.21155	A
209	GERN 19389M001	4642811.63484	-217223.50596	4353278.51441	A
183	IGEL 19352S001	4645951.74826	-165575.08673	4352550.05282	A
188	ISPS 19484M001	4640596.79490	-206964.35979	4356391.54887	A
193	KAST 19499M001	4646949.39054	-240747.85872	4348014.62832	A
198	LARE 19440M001	4632832.25932	-279026.71847	4360314.06175	A
199	LAZK 19354S001	4666098.65607	-178186.77758	4330463.30433	A
203	LEIT 19428M001	4663521.25119	-155859.30265	4334519.51518	A
260	ORON 19427M001	4659696.09675	-130865.32014	4338948.51352	A
33	PASA 19351S001	4644909.37993	-156645.65130	4353622.71224	W
36	RI01 13448M002	4708447.13692	-199490.87319	4284089.36523	W
37	SALA 13469M001	4803054.75475	-462131.66954	4158378.69678	W
38	SOA 10088M002	4639940.82275	-136225.52490	4359552.04670	W
321	SOPU 19386M001	4643998.21711	-255914.48962	4350062.77886	A
342	TERU 13487M001	4867391.63330	-95523.95818	4108341.30233	A
375	VITO 19385M001	4679398.00821	-218437.09177	4314897.99470	A
49	YEBE 13420M001	4848724.86031	-261632.53473	4123093.94847	W
50	ZARA 13462M001	4773803.48735	-73506.58140	4215453.72134	W

## 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 IGS14 solution and are given with respect the Local frame (North-East-Up).

ARA LAC 2082 WEEK FINAL COMBINATION: PRECISE ORBITS 27-DEC-19 11:49

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	6	XXXXXX	0.75	1.04	2.08
ALDA 19383M001	7	XXXXXX	1.20	1.37	2.68
ALSA 19419M001	7	XXXXXX	1.14	0.53	2.35
AMUR 19388M001	7	XXXXXX	1.51	1.02	1.84
BIAZ 10074M002	7	XXXXXX	0.82	0.53	3.05
BIDA 00000M000	4	XXXX	1.25	1.27	1.99
BRZR 19387M001	7	XXXXXX	0.84	0.63	5.69
CACE 13447M001	7	XXXXXX	0.65	0.58	2.70
CANT 13438M001	7	XXXXXX	0.30	0.42	2.49
CHER 00000M000	7	XXXXXX	1.01	1.49	2.54
CREU 13432M001	7	XXXXXX	1.19	0.61	2.88
EBRE 13410M001	7	XXXXXX	0.94	0.51	0.81
ELGE 19353S001	6	X XXXX	0.44	0.36	2.27
EMAZ 17001M001	7	XXXXXX	0.93	0.64	4.12
GERN 19389M001	7	XXXXXX	0.88	1.01	4.32
IGEL 19352S001	7	XXXXXX	0.60	0.51	1.69
ISPS 19484M001	7	XXXXXX	0.73	0.88	1.76
KAST 19499M001	7	XXXXXX	1.14	0.74	3.69
LARE 19440M001	7	XXXXXX	1.53	0.71	2.20
LAZK 19354S001	7	XXXXXX	0.79	0.61	3.31
LEIT 19428M001	7	XXXXXX	0.85	0.63	2.32
ORON 19427M001	7	XXXXXX	1.00	1.03	2.87
PASA 19351S001	7	XXXXXX	0.60	0.47	2.31
RI01 13448M002	7	XXXXXX	0.35	0.44	1.87
SALA 13469M001	7	XXXXXX	0.29	0.16	2.50
SCOA 10088M002	7	XXXXXX	1.42	0.91	1.90
SOPU 19386M001	7	XXXXXX	0.89	1.12	4.92
TERU 13487M001	7	XXXXXX	0.87	0.50	2.94
VITO 19385M001	7	XXXXXX	0.56	0.48	2.33
YEBE 13420M001	7	XXXXXX	0.48	0.53	2.57
ZARA 13462M001	7	XXXXXX	0.35	0.53	2.62

Comparison of individual solutions:

ACOR 13434M001	N	0.75	-1.49	-0.38	-0.27	0.13	0.15	0.55
ACOR 13434M001	E	1.04	0.38	0.91	-0.15	-0.20	-0.91	-1.87
ACOR 13434M001	U	2.08	-0.74	-3.87	-0.16	-2.22	-0.99	-0.44
ALDA 19383M001	N	1.20	-0.58	0.18	-0.51	2.15	0.84	-1.33
ALDA 19383M001	E	1.37	0.33	-0.97	1.63	-2.65	0.54	-0.46
ALDA 19383M001	U	2.68	0.87	0.06	0.50	1.41	-3.50	2.80
ALSA 19419M001	N	1.14	-0.00	2.03	-0.24	-0.55	0.45	-1.51
ALSA 19419M001	E	0.53	0.49	-0.22	-0.06	-0.97	0.12	-0.24
ALSA 19419M001	U	2.35	-0.74	0.35	-2.06	3.89	-0.24	-1.73
AMUR 19388M001	N	1.51	0.38	2.50	1.61	-0.27	0.51	-1.19
AMUR 19388M001	E	1.02	1.08	1.05	0.39	-1.63	-0.67	-0.81
AMUR 19388M001	U	1.84	-1.12	-1.04	-1.62	1.19	2.32	0.01
BIAZ 10074M002	N	0.82	0.90	0.81	0.97	-0.09	-0.23	0.52
BIAZ 10074M002	E	0.53	-0.00	0.55	0.56	-0.32	0.65	0.49
BIAZ 10074M002	U	3.05	-0.88	5.70	-3.07	2.91	-0.00	0.06
BIDA 00000M000	N	1.25	1.83	0.61	0.41	-0.88		
BIDA 00000M000	E	1.27	-0.79	1.06	1.35	-1.15		
BIDA 00000M000	U	1.99	1.41	2.96	-0.39	-0.96		
BRZR 19387M001	N	0.84	1.51	-0.45	-0.04	0.06	-0.65	1.09
BRZR 19387M001	E	0.63	0.19	-0.34	-0.54	0.37	1.11	-0.29
BRZR 19387M001	U	5.69	-2.83	12.24	3.62	-2.19	-2.81	-2.46
CACE 13447M001	N	0.65	-0.03	-0.81	0.05	0.11	-0.98	0.22
CACE 13447M001	E	0.58	-0.46	-0.05	0.86	0.85	-0.39	-0.35
CACE 13447M001	U	2.70	-2.03	-2.72	-2.96	-0.59	4.31	1.50
CANT 13438M001	N	0.30	-0.28	-0.20	0.07	0.16	-0.46	-0.32
CANT 13438M001	E	0.42	0.12	0.24	0.53	-0.32	-0.12	-0.59
CANT 13438M001	U	2.49	2.78	-0.35	-1.64	0.36	-0.36	0.22
CHER 00000M000	N	1.01	-0.55	-0.46	0.95	0.60	0.94	0.12
CHER 00000M000	E	1.49	-1.34	0.47	0.09	-1.29	1.95	0.23
CHER 00000M000	U	2.54	1.91	4.01	-2.42	-0.51	1.39	2.07
CREU 13432M001	N	1.19	0.96	-2.09	-1.25	0.70	-0.24	0.45
CREU 13432M001	E	0.61	0.53	0.10	-0.78	0.03	0.85	-0.71
CREU 13432M001	U	2.88	0.08	-1.21	0.84	4.12	-5.37	0.25
EBRE 13410M001	N	0.94	-0.56	-0.49	0.17	-1.14	-0.31	1.55
EBRE 13410M001	E	0.51	-0.02	-0.37	-0.41	0.92	0.01	-0.57
EBRE 13410M001	U	0.81	0.19	1.32	0.09	1.12	0.33	0.57
ELGE 19353S001	N	0.44	0.29		0.82	0.19	0.40	-0.02
ELGE 19353S001	E	0.36	0.03		0.24	-0.10	0.68	0.15
ELGE 19353S001	U	2.27	0.93		-2.88	0.85	-1.72	2.55
EMAZ 17001M001	N	0.93	-0.37	-1.24	0.77	-0.03	0.29	1.06
EMAZ 17001M001	E	0.64	0.35	0.15	0.48	0.06	-1.21	-0.26
EMAZ 17001M001	U	4.12	-4.41	7.51	-2.65	-1.18	2.93	2.06
GERN 19389M001	N	0.88	-0.72	0.24	1.59	1.09	-0.23	0.29
GERN 19389M001	E	1.01	-0.71	-1.55	1.27	0.96	0.30	0.06
GERN 19389M001	U	4.32	8.35	0.57	3.32	0.38	-4.74	-1.95
IGEL 19352S001	N	0.60	0.28	0.14	0.69	-0.73	0.16	0.54
IGEL 19352S001	E	0.51	0.02	0.20	0.55	-0.73	0.36	0.19
IGEL 19352S001	U	1.69	-0.83	-1.15	-0.64	0.64	-0.07	1.26
ISPS 19484M001	N	0.73	-1.00	0.52	0.82	0.73	0.66	0.43
ISPS 19484M001	E	0.88	-0.74	0.25	0.46	-0.27	1.67	-0.78
ISPS 19484M001	U	1.76	-2.24	-1.00	0.51	1.47	0.17	1.70
KAST 19499M001	N	1.14	1.15	2.32	-0.95	-0.34	-0.26	0.17
KAST 19499M001	E	0.74	-0.01	-0.46	1.49	-0.44	0.06	-0.27
KAST 19499M001	U	3.69	2.10	7.78	-0.53	-0.19	-3.76	-1.40
LARE 19440M001	N	1.53	-0.29	-2.16	1.69	2.17	-1.05	-0.58
LARE 19440M001	E	0.71	-0.34	0.95	0.12	-1.16	0.76	-0.23
LARE 19440M001	U	2.20	1.46	2.49	-2.62	0.56	-0.37	2.37
LAZK 19354S001	N	0.79	0.98	0.37	1.41	0.33	-0.08	-0.57
LAZK 19354S001	E	0.61	-0.31	0.15	0.16	-0.86	0.71	0.54
LAZK 19354S001	U	3.31	2.87	-5.72	-2.45	2.90	0.65	1.54

LEIT 19428M001	N	0.85	0.41	0.74	0.82	-0.13	-0.34	-1.08	-1.30
LEIT 19428M001	E	0.63	-0.03	0.22	0.36	-1.42	-0.05	0.30	0.29
LEIT 19428M001	U	2.32	1.29	-2.93	-0.97	0.96	-0.56	0.60	4.42
ORON 19427M001	N	1.00	1.17	1.35	0.42	-0.82	0.09	-0.50	-1.31
ORON 19427M001	E	1.03	0.20	1.23	-1.02	-1.31	1.16	-0.29	0.81
ORON 19427M001	U	2.87	0.77	3.53	-2.59	-1.25	3.18	1.50	3.97
PASA 19351S001	N	0.60	0.48	0.66	1.10	0.18	0.22	-0.36	-0.16
PASA 19351S001	E	0.47	0.07	-0.12	0.31	-0.58	0.35	0.68	0.51
PASA 19351S001	U	2.31	-0.46	-3.72	0.49	-0.21	-0.78	1.99	3.64
RIO1 13448M002	N	0.35	0.18	-0.33	0.63	0.16	-0.13	-0.05	-0.39
RIO1 13448M002	E	0.44	-0.32	0.07	0.30	-0.76	0.59	-0.06	0.20
RIO1 13448M002	U	1.87	-0.29	1.22	-2.81	3.13	0.74	1.06	0.26
SALA 13469M001	N	0.29	0.17	0.01	0.09	0.25	-0.47	0.39	0.17
SALA 13469M001	E	0.16	-0.13	-0.04	0.22	-0.12	-0.04	-0.05	0.25
SALA 13469M001	U	2.50	-2.94	-3.42	-1.59	2.82	0.12	1.25	2.24
SCDA 10088M002	N	1.42	3.31	-0.33	-0.12	-0.23	-0.65	-0.23	0.64
SCDA 10088M002	E	0.91	1.49	0.44	0.05	-0.95	0.08	-0.01	1.27
SCDA 10088M002	U	1.90	-0.11	-2.56	1.58	1.75	0.84	0.67	2.88
SOPU 19386M001	N	0.89	1.66	-0.79	-0.14	1.00	-0.41	0.42	0.11
SOPU 19386M001	E	1.12	-2.07	0.27	1.03	-0.17	0.80	0.02	1.21
SOPU 19386M001	U	4.92	10.67	0.05	-2.72	-1.24	-4.10	1.92	-1.31
TERU 13487M001	N	0.87	0.86	0.63	0.95	-1.51	-0.01	-0.28	0.41
TERU 13487M001	E	0.50	-0.22	0.03	-0.40	-0.82	0.64	0.24	0.37
TERU 13487M001	U	2.94	-0.31	-1.58	-1.84	4.36	-2.24	-3.93	-2.50
VITO 19385M001	N	0.56	0.51	0.19	0.40	-0.02	0.73	-0.89	-0.33
VITO 19385M001	E	0.48	0.29	-0.24	-0.15	-0.82	-0.36	0.44	0.50
VITO 19385M001	U	2.33	0.68	1.65	-3.04	3.80	-2.02	0.90	0.90
YEBE 13420M001	N	0.48	0.63	-0.71	-0.08	0.05	-0.62	0.10	0.24
YEBE 13420M001	E	0.53	0.37	0.07	0.12	-0.51	1.09	0.21	0.18
YEBE 13420M001	U	2.57	-2.67	-2.40	-0.95	3.16	-0.77	-3.66	-1.35
ZARA 13462M001	N	0.35	-0.19	-0.48	0.02	-0.38	-0.00	0.55	-0.21
ZARA 13462M001	E	0.53	0.04	0.08	-0.39	-1.16	0.35	0.14	0.23
ZARA 13462M001	U	2.62	-3.29	-0.27	-2.65	1.37	-0.38	3.05	3.46

## 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	-0.78	-1.11	-3.20
2	ALAC 13433M001	I W	0.49	0.05	0.97
3	ALBA 13452M001	I W	0.16	0.02	-2.28
4	ALME 13437M001	I W	-1.57	0.95	-2.09
5	BCLN 13412M001	I W	-0.45	-1.08	1.95
6	BELL 13431M001	I W	0.98	2.59	2.55
7	BORR 13480M001	I W	-1.90	-0.60	-2.73
8	BRST 10004M004	I W	0.23	-0.20	0.91
9	CACE 13447M001	I W	0.80	1.16	-0.81
10	CANT 13438M001	I W	-0.61	-0.54	-0.33
11	CARG 19412M001	I W	0.06	-1.18	-0.64
13	CEU1 13449M002	I W	-0.09	-0.22	-1.88
14	COBA 13453M001	I W	0.49	0.53	-4.10
15	CREU 13432M001	I W	0.17	1.05	0.51
17	EBRE 13410M001	I W	0.73	1.17	-2.02
18	ESCO 13435M001	I W	2.57	1.71	-0.05
19	FUNC 13911S001	I W	-2.24	-7.02	2.08
22	HUEL 13451M001	I W	0.16	3.55	-4.16
23	IZAN 31309M002	I W	-0.50	-4.37	1.46
25	LLIV 13436M001	I W	-0.41	-0.57	0.62
26	LPAL 81701M001	I W	-2.44	1.41	0.76
27	LRDC 10023M001	I W	0.15	-0.14	2.81
28	MALA 13443M001	I W	0.13	-1.40	0.12
29	MAS1 31303M002	I W	-0.50	-0.52	1.96
32	MELI 19379M001	I W	-0.45	1.50	-3.06
33	PASA 19351S001	I W	-0.77	0.23	-0.20
34	PDEL 31906M004	I W	-0.06	0.06	5.27
36	RID1 13448M002	I W	-0.72	-0.01	-1.37
37	SALA 13469M001	I W	-0.37	1.67	-2.84
38	SCOA 10088M002	I W	1.13	0.94	-0.22
39	SFER 13402M004	I W	1.05	-1.68	1.18
42	SONS 13446M001	I W	-0.20	0.37	-3.58
44	TERC 31909M001	I W	2.96	-4.62	1.40
46	VALA 13463M002	I W	-1.17	1.31	0.81
47	VALE 13439M001	I W	-0.11	1.31	-0.08
48	VIGO 13450M001	I W	0.42	0.13	5.31
49	YEBE 13420M001	I W	0.63	1.65	0.81
50	ZARA 13462M001	I W	0.42	0.99	0.38
51	ZIMM 14001M004	I W	1.62	0.88	3.78
	RMS / COMPONENT		1.10	1.94	2.34
	MEAN		0.00	-0.00	0.00
	MIN		-2.44	-7.02	-4.16
	MAX		2.96	3.55	5.31

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 117  
RMS OF TRANSFORMATION : 1.87 MM

BARYCENTER COORDINATES:

LATITUDE : 39 43 1.41  
LONGITUDE : - 5 15 34.67  
HEIGHT : -51.112 KM

PARAMETERS:

TRANSLATION IN N : -0.00 +- 0.30 MM  
TRANSLATION IN E : -0.00 +- 0.30 MM  
TRANSLATION IN U : 0.00 +- 0.30 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          14925679
NUMBER OF UNKNOWN               171525
NUMBER OF DEGREES OF FREEDOM    14754154
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  1.763864627128511

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00407    -0.0016 -0.0054  0.0017  0.0002 -0.0001 -0.0001  -0.00023
 2  0.00392     0.0087 -0.0063 -0.0078  0.0002  0.0004 -0.0001  -0.00055
 3  0.00388    -0.0089 -0.0050  0.0156  0.0000 -0.0006 -0.0002  -0.00052
 4  0.00500     0.0032 -0.0011  0.0058  0.0000 -0.0001  0.0000  -0.00084
 5  0.00372     0.0046 -0.0042 -0.0126  0.0001  0.0004 -0.0001  0.00053
 6  0.00330    -0.0033 -0.0051 -0.0063  0.0001  0.0001 -0.0001  0.00103
 7  0.00377     0.0072  0.0049 -0.0074  0.0000  0.0003  0.0002  0.00009
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00141    1956778    1.99          1981223          3          909    23539    0
 2  0.00135    1966376    1.83          1990723          3          918    23432    0
 3  0.00130    1988098    1.70          2011297          3          918    22284    2
 4  0.00130    2181269    1.68          2207816          3          996    25554    0
 5  0.00132    2213387    1.75          2239907          3          1002   25521    0
 6  0.00130    2227311    1.70          2253549          3          1005   25236    0
 7  0.00128    2215226    1.65          2241164          3          1002   24939    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 19:335:00000 19:340:86370 LEICA GR50      -----
ALDA  A  1 P 19:335:00000 19:341:86370 LEICA GR10      -----
ALSA  A  1 P 19:335:00000 19:341:86370 LEICA GR50      -----
AMUR  A  1 P 19:335:00000 19:341:86370 LEICA GR10      -----
BIAZ  A  1 P 19:335:00000 19:341:86370 TRI SP90M     -----
BIDA  A  1 P 19:335:00000 19:338:86370 LEICA GR10      -----
BRZR  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
CACE  A  1 P 19:335:00000 19:341:86370 TRIMBLE NETR9  -----
CANT  A  1 P 19:335:00000 19:341:86370 LEICA GR10      -----
CHER  A  1 P 19:335:00000 19:341:31650 LEICA GRX1200+GNSS -----
CREU  A  1 P 19:335:00000 19:341:86370 LEICA GR50      -----
EBRE  A  1 P 19:335:00000 19:341:86370 LEICA GR50      -----
ELGE  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
EMAZ  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
GERN  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
IGEL  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
ISPS  A  1 P 19:335:00000 19:341:86370 TRIMBLE NETR9  -----
KAST  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
LARE  A  1 P 19:335:00000 19:341:86370 LEICA GRX1200GGPRO -----
LAZK  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
LEIT  A  1 P 19:335:00000 19:341:86370 LEICA GR50      -----
ORON  A  1 P 19:335:00000 19:341:86370 LEICA GR50      -----
PASA  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
RIO1  A  1 P 19:335:00000 19:341:86370 LEICA GR25      -----
SALA  A  1 P 19:335:00000 19:341:86370 LEICA GRX1200+GNSS -----
SCOA  A  1 P 19:335:00000 19:341:86370 LEICA GR25      -----
SOPU  A  1 P 19:335:00000 19:341:86370 LEICA GR30      -----
TERU  A  1 P 19:335:00000 19:341:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 19:335:00000 19:341:86370 LEICA GR10      -----
YEBE  A  1 P 19:335:00000 19:341:86370 TRIMBLE NETR9  -----
ZARA  A  1 P 19:335:00000 19:341:86370 TRIMBLE NETR9  -----
```

### 7.2 Antennas

Serial number ONLY provided in case individual calibrations are available.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_____ S/N__
ACOR  A  1 P 19:335:00000 19:340:86370 LEIAT504    LEIS  -----
ALDA  A  1 P 19:335:00000 19:341:86370 LEIAS10     NONE  -----
ALSA  A  1 P 19:335:00000 19:341:86370 LEIAR10     NONE  -----
AMUR  A  1 P 19:335:00000 19:341:86370 LEIAS10     NONE  -----
BIAZ  A  1 P 19:335:00000 19:341:86370 LEIAR25     LEIT  -----
```

```

BIDA A 1 P 19:335:00000 19:338:86370 LEIAS10 NONE -----
BRZR A 1 P 19:335:00000 19:341:86370 LEIAS10 NONE -----
CACE A 1 P 19:335:00000 19:341:86370 TRM29659.00 NONE -----
CANT A 1 P 19:335:00000 19:341:86370 LEIAR25_R4 LEIT 25066
CHER A 1 P 19:335:00000 19:341:31650 LEIAX1203+GNSS NONE -----
CREU A 1 P 19:335:00000 19:341:86370 LEIAR25_R4 NONE 26357
EBRE A 1 P 19:335:00000 19:341:86370 LEIAR25_R4 NONE 26359
ELGE A 1 P 19:335:00000 19:341:86370 LEIAR25_R4 LEIT -----
EMAZ A 1 P 19:335:00000 19:341:86370 LEIAS10 NONE -----
GERN A 1 P 19:335:00000 19:341:86370 LEIAS10 NONE -----
IGEL A 1 P 19:335:00000 19:341:86370 LEIAR20 LEIM -----
ISPS A 1 P 19:335:00000 19:341:86370 TRM59900.00 SCIS -----
KAST A 1 P 19:335:00000 19:341:86370 LEIAS10 NONE -----
LARE A 1 P 19:335:00000 19:341:86370 LEIAT504 NONE -----
LAZK A 1 P 19:335:00000 19:341:86370 LEIAR25_R4 LEIT -----
LEIT A 1 P 19:335:00000 19:341:86370 LEIAR10 NONE -----
ORDN A 1 P 19:335:00000 19:341:86370 LEIAR10 NONE -----
PASA A 1 P 19:335:00000 19:341:86370 LEIAR20 LEIM 73034
RID1 A 1 P 19:335:00000 19:341:86370 LEIAR25_R4 LEIT 25138
SALA A 1 P 19:335:00000 19:341:86370 LEIAR25 NONE -----
SCDA A 1 P 19:335:00000 19:341:86370 TRM55971.00 NONE -----
SOPU A 1 P 19:335:00000 19:341:86370 LEIAS10 NONE -----
TERU A 1 P 19:335:00000 19:341:86370 LEIAT504GG LEIS -----
VITO A 1 P 19:335:00000 19:341:86370 LEIAS10 NONE -----
YEBE A 1 P 19:335:00000 19:341:86370 TRM29659.00 NONE -----
ZARA A 1 P 19:335:00000 19:341:86370 TRM29659.00 NONE -----

```

### 7.3 Eccentricities

```

*
*SITE PT SOLN T DATA_START_ DATA_END_ AXE ARP->BENCHMARK(M) NORTH_ EAST_
ACOR A 1 P 19:335:00000 19:340:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
AMUR A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
BIDA A 1 P 19:335:00000 19:338:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 19:335:00000 19:341:86370 UNE 0.0771 0.0000 0.0000
CACE A 1 P 19:335:00000 19:341:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 19:335:00000 19:341:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 19:335:00000 19:341:31650 UNE 0.0000 0.0000 0.0000
CREU A 1 P 19:335:00000 19:341:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 19:335:00000 19:341:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
EMAZ A 1 P 19:335:00000 19:341:86370 UNE 0.0350 0.0000 0.0000
GERN A 1 P 19:335:00000 19:341:86370 UNE 0.0771 0.0000 0.0000
IGEL A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 19:335:00000 19:341:86370 UNE 0.0350 0.0000 0.0000
KAST A 1 P 19:335:00000 19:341:86370 UNE 0.0350 0.0000 0.0000
LARE A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
LAZK A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
ORON A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
RID1 A 1 P 19:335:00000 19:341:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 19:335:00000 19:341:86370 UNE 0.0600 0.0000 0.0000
SCDA A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
SOPU A 1 P 19:335:00000 19:341:86370 UNE 0.0771 0.0000 0.0000
TERU A 1 P 19:335:00000 19:341:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 19:335:00000 19:341:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 19:335:00000 19:341:86370 UNE 3.2590 0.0000 0.0000

```

## 8 Inconsistencies (logsheet-RINEX metadata)

The following inconsistencies were found comparing the data available in the logsheets and the RINEX headers:

```

2019-12-16 23:08 UTC | ELGE3360.190 | RECEIVER SER. NO. | 1700316 -> 1700003
2019-12-17 23:21 UTC | ELGE3370.190 | RECEIVER SER. NO. | 1703003 -> 1700003
2019-12-26 19:18 UTC | ELGE3380.190 | RECEIVER SER. NO. | 1703003 -> 1700003
2019-12-27 02:45 UTC | ELGE3390.190 | RECEIVER SER. NO. | 1703003 -> 1700003
2019-12-27 04:32 UTC | ELGE3400.190 | RECEIVER SER. NO. | 1703003 -> 1700003
2019-12-27 06:11 UTC | ELGE3410.190 | RECEIVER SER. NO. | 1703003 -> 1700003

```

## 9 References

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

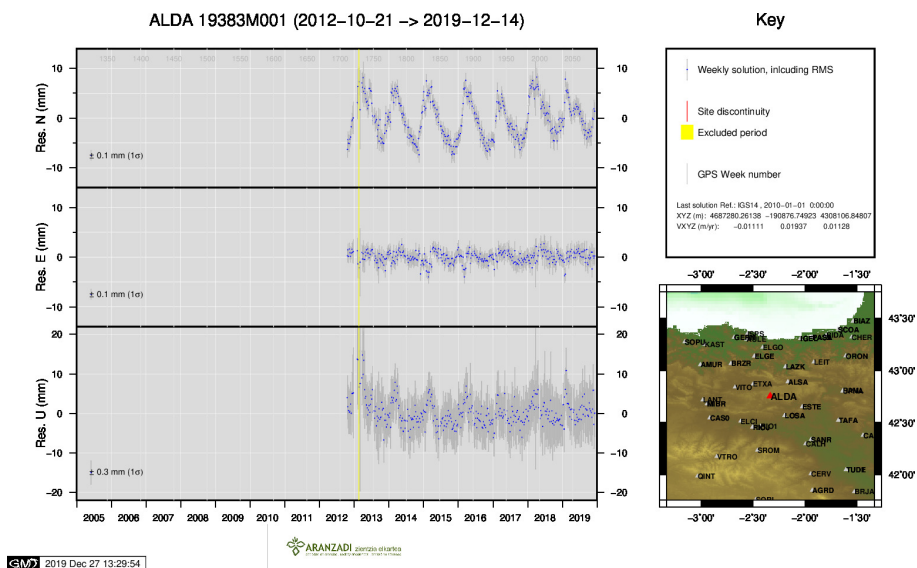
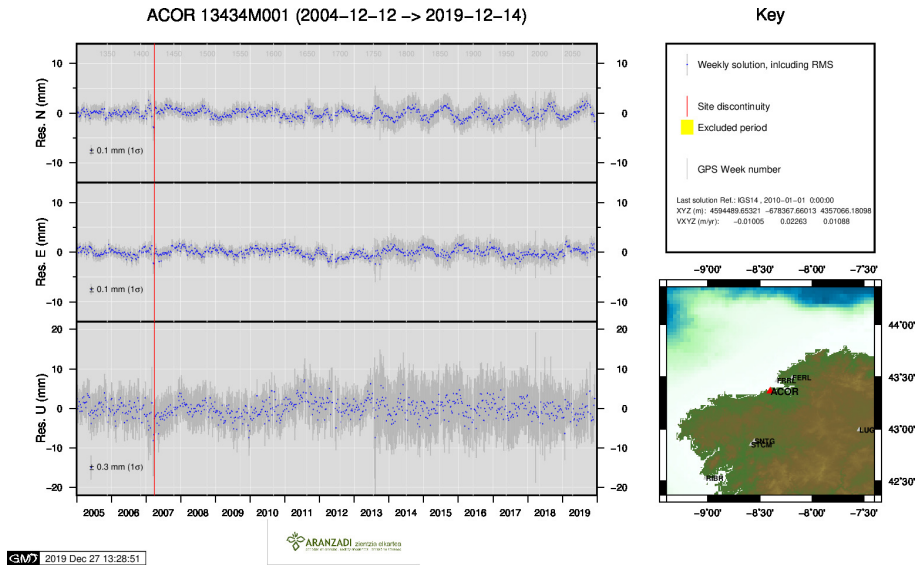
EPN Coordination Group and the EPN Central Bureau (2018): *Guidelines for the EPN Analysis Centres*. [epncb.oma.be/documentation/guidelines/guidelines\\_analysis\\_centres.pdf](https://epncb.oma.be/documentation/guidelines/guidelines_analysis_centres.pdf)

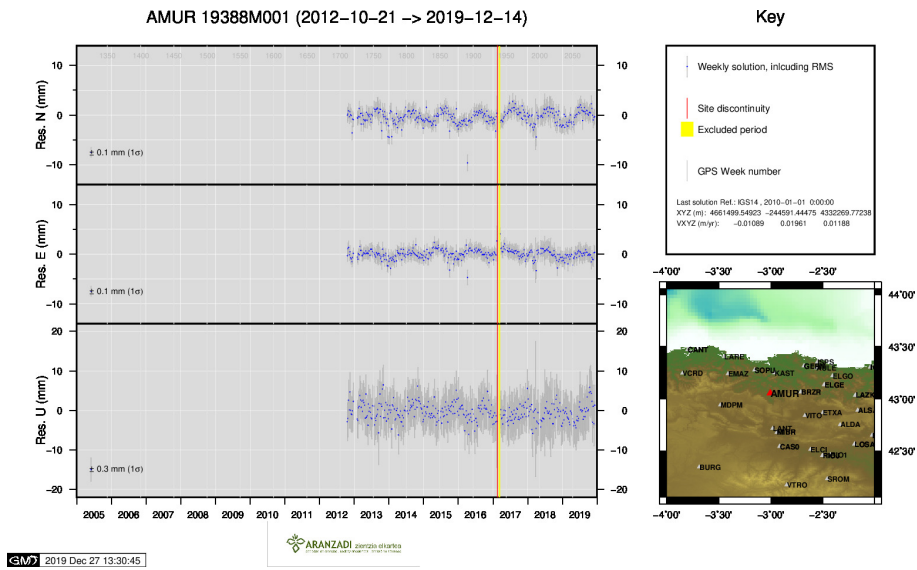
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](https://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)



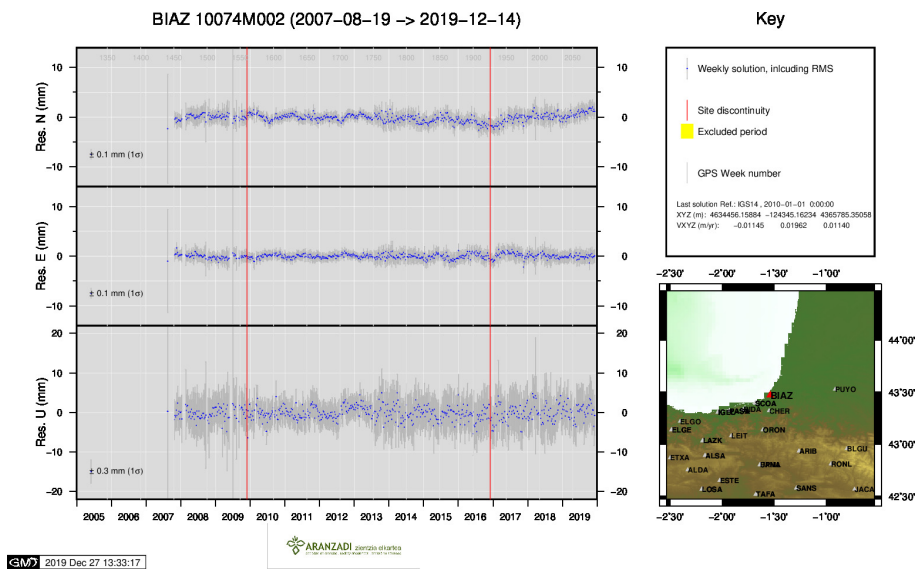
## 10 Cumulative Time Series

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

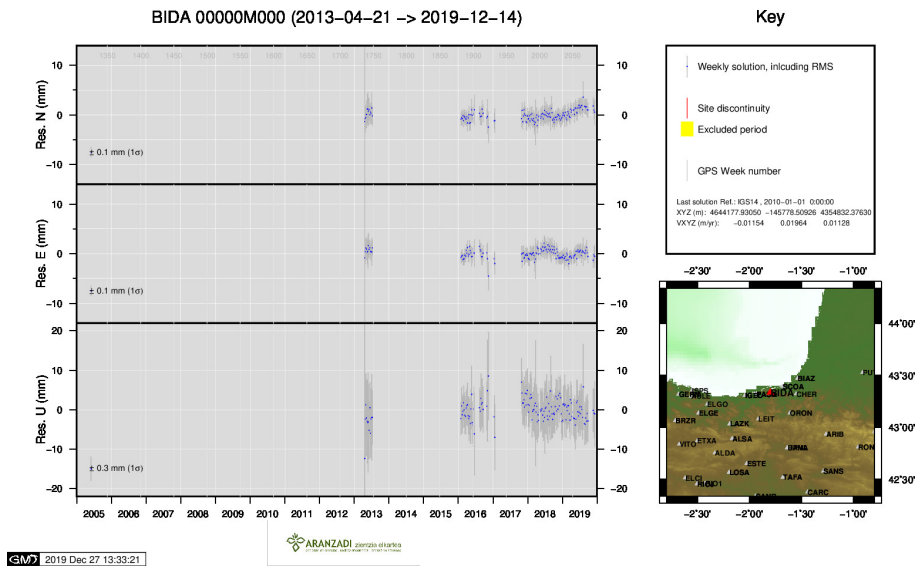




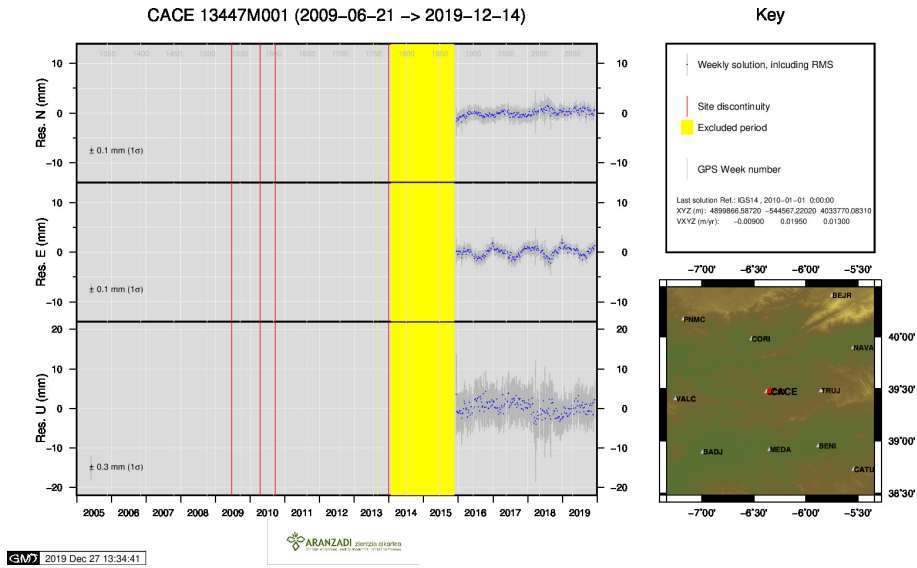
3 ) AMUR



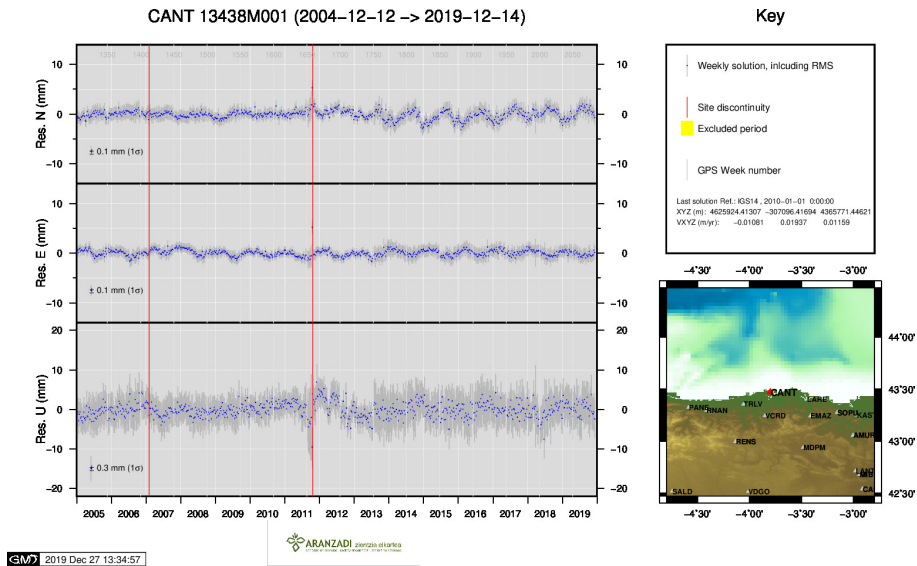
4 ) BIAZ



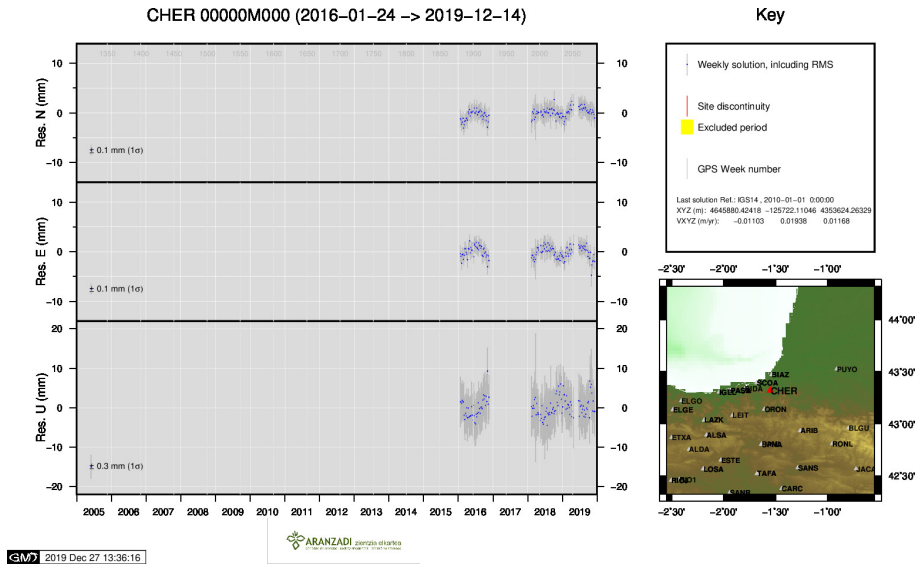
5 ) BIDA



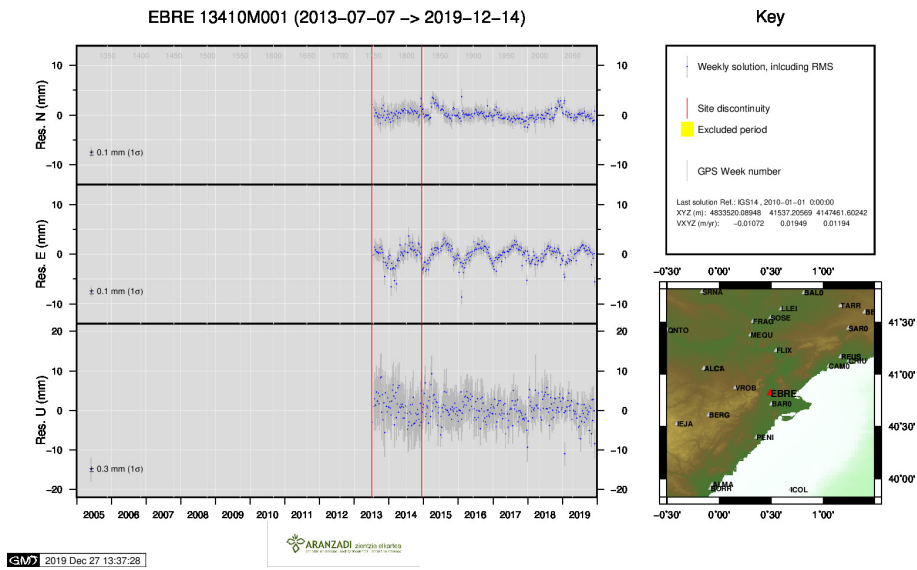
6 ) CACE



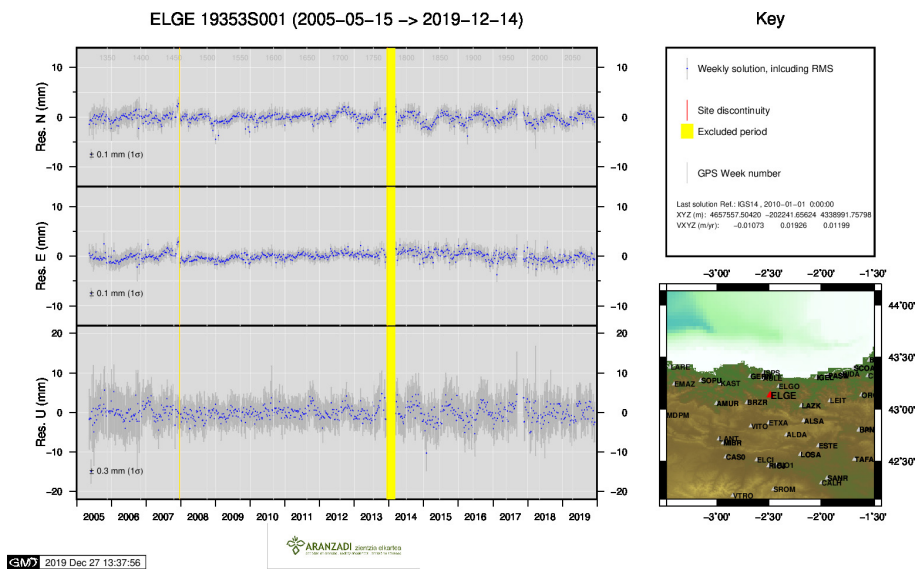
7 ) CANT



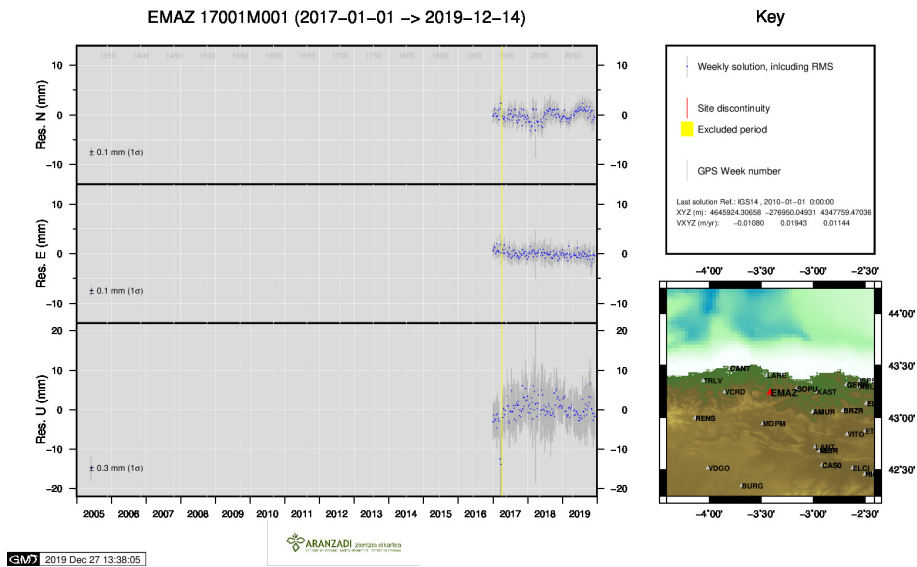
8 ) CHER



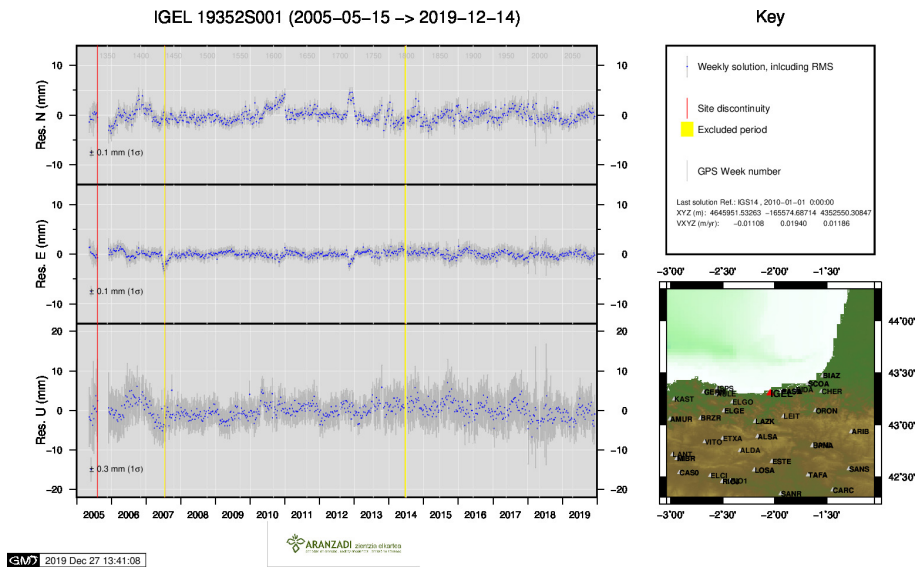
9 ) EBRE



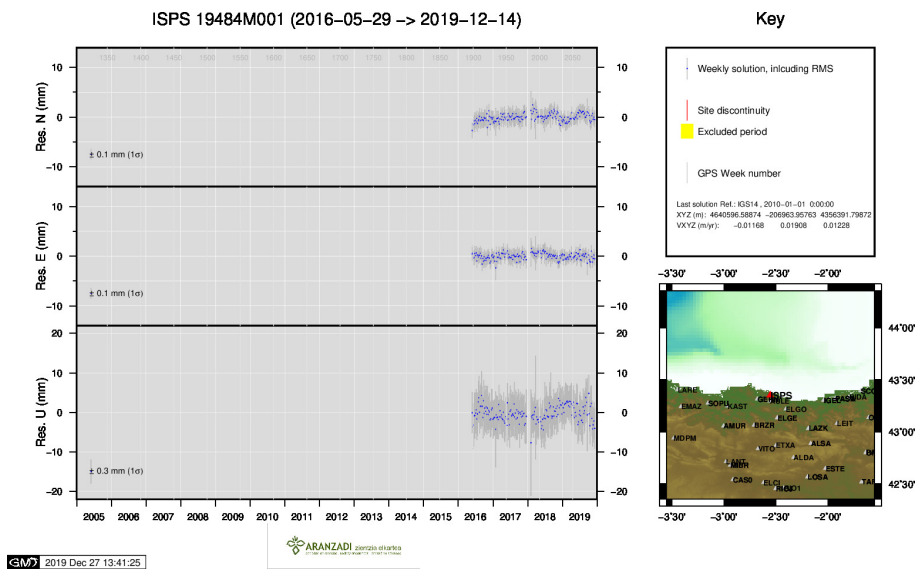
10 ) ELGE



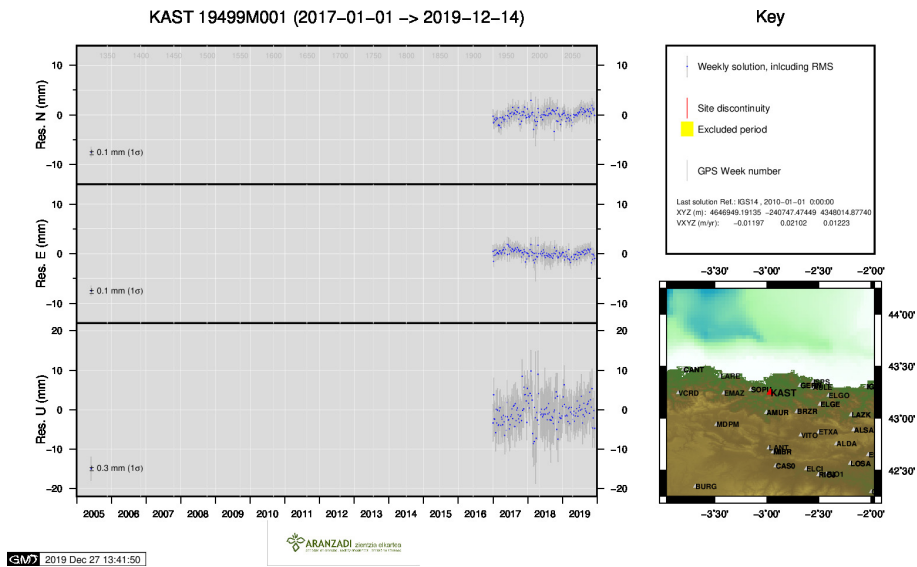
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12 ) IGEL

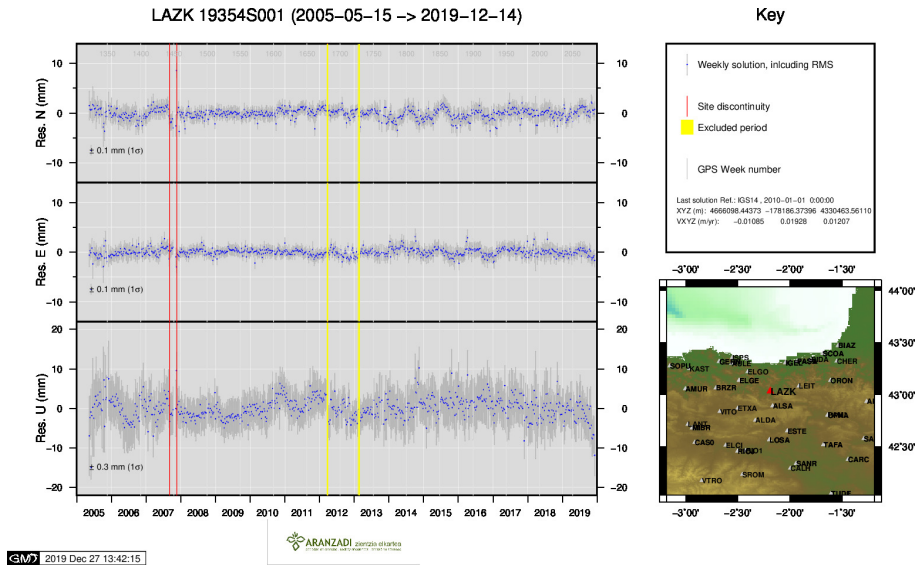


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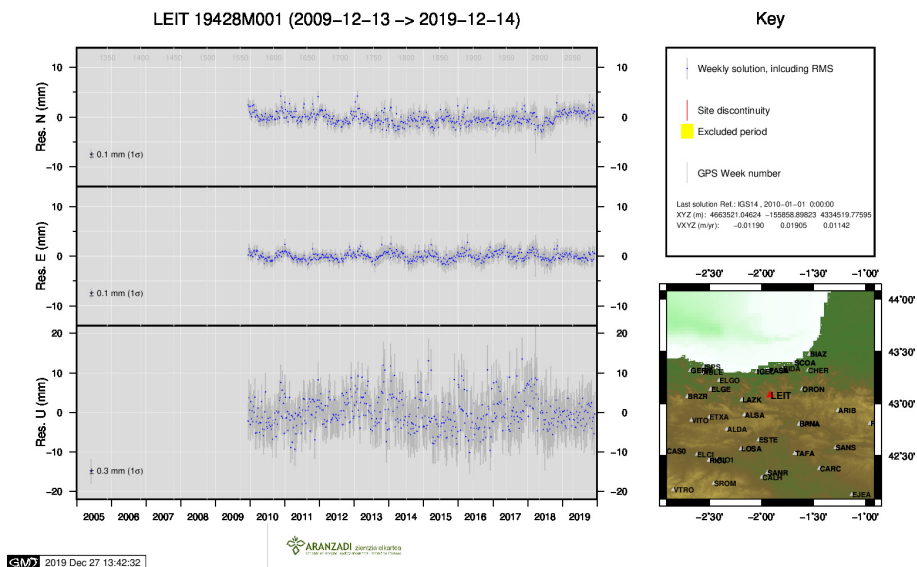


14 ) KAST

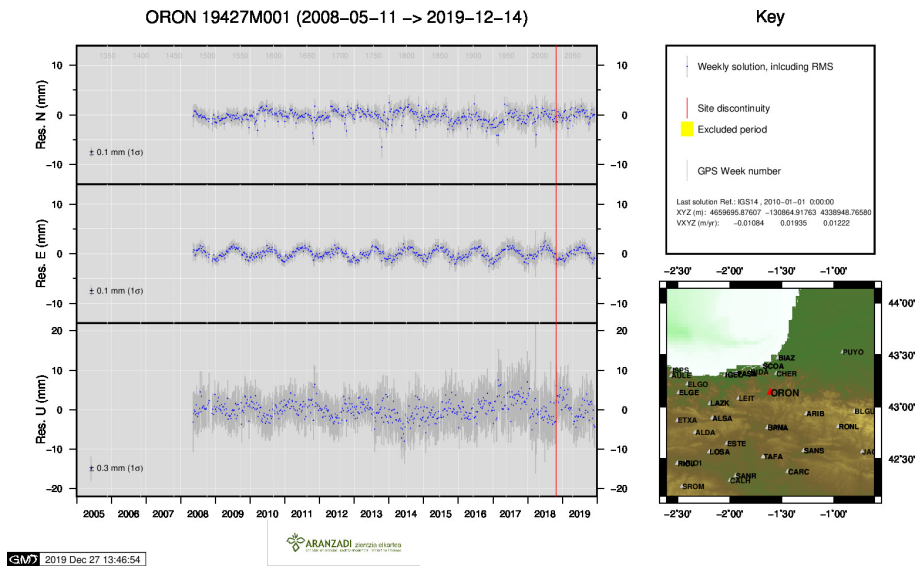




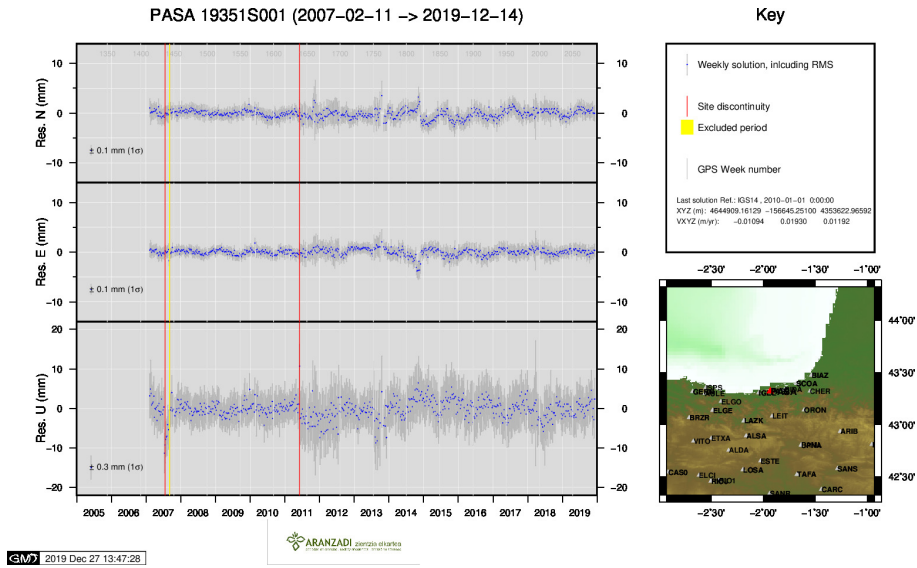
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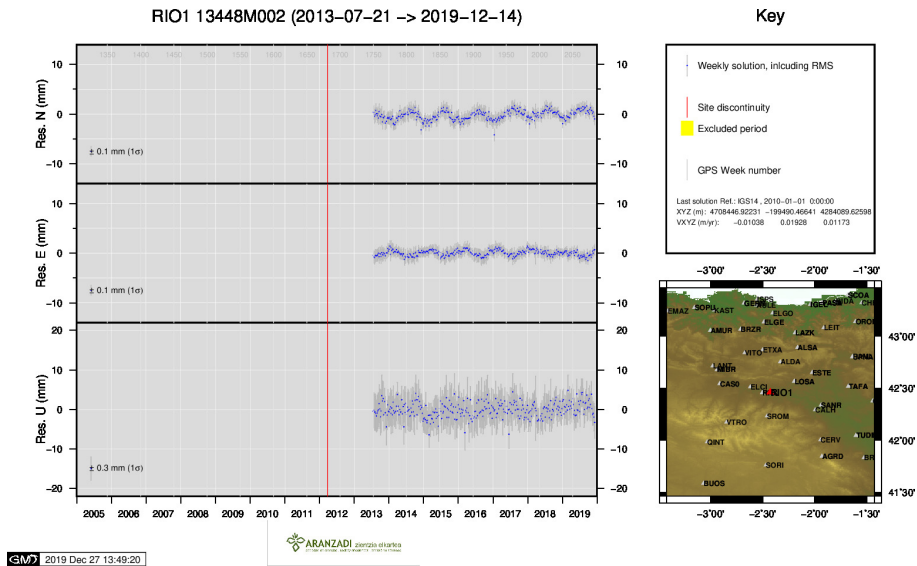
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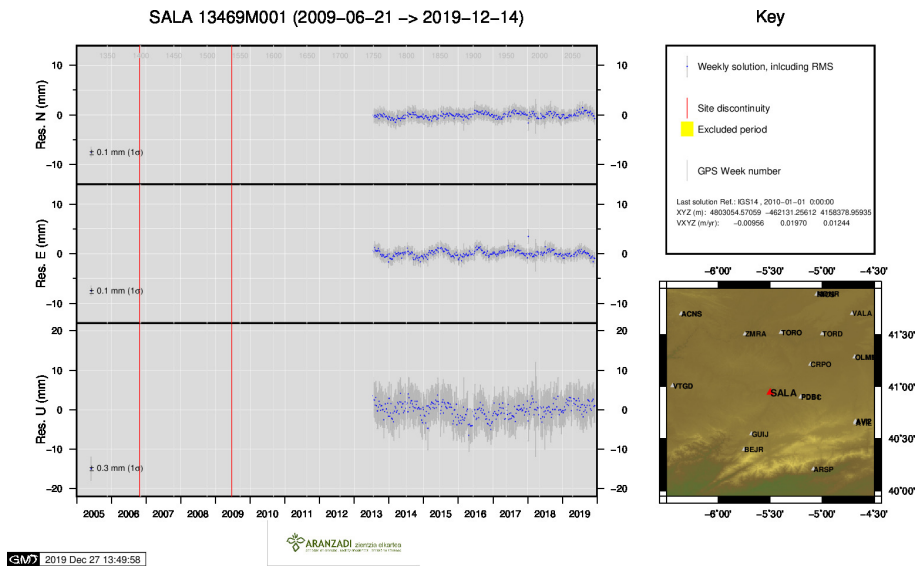
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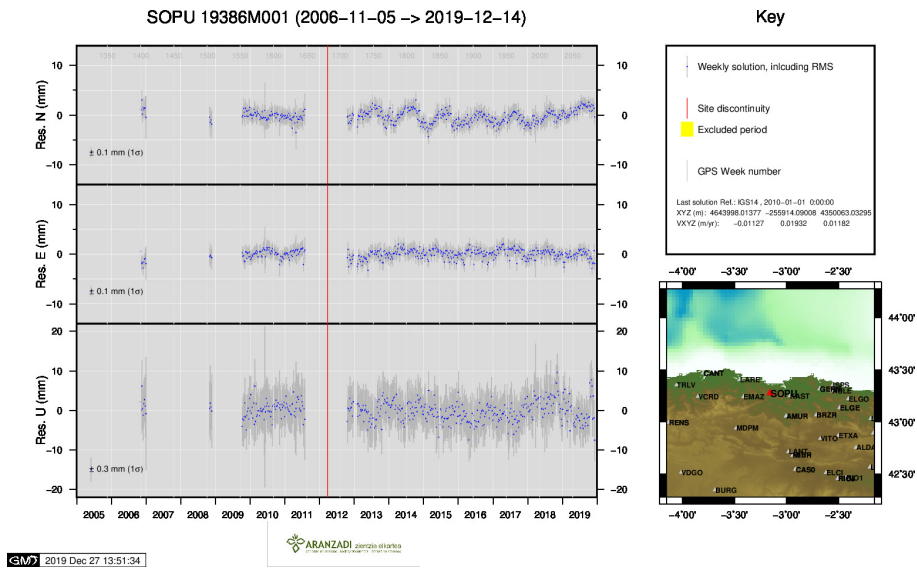
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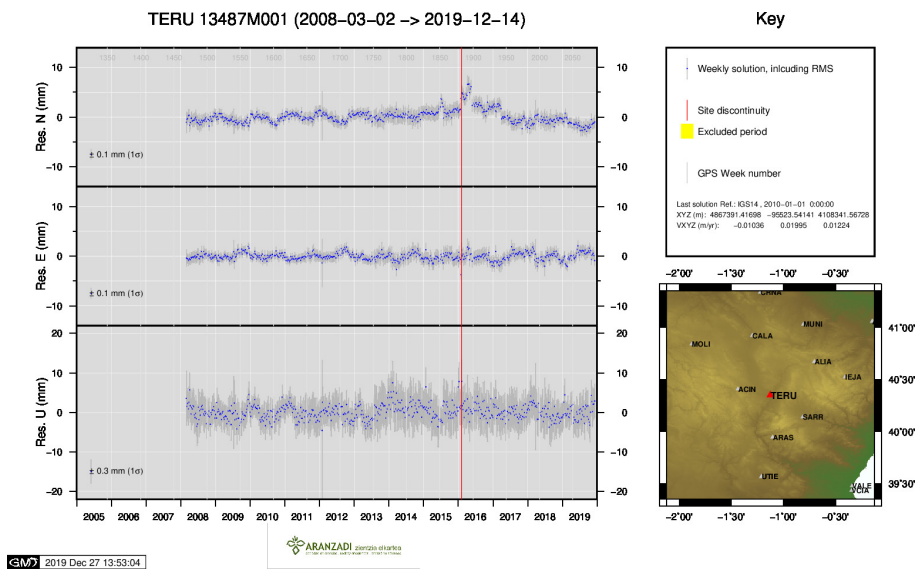
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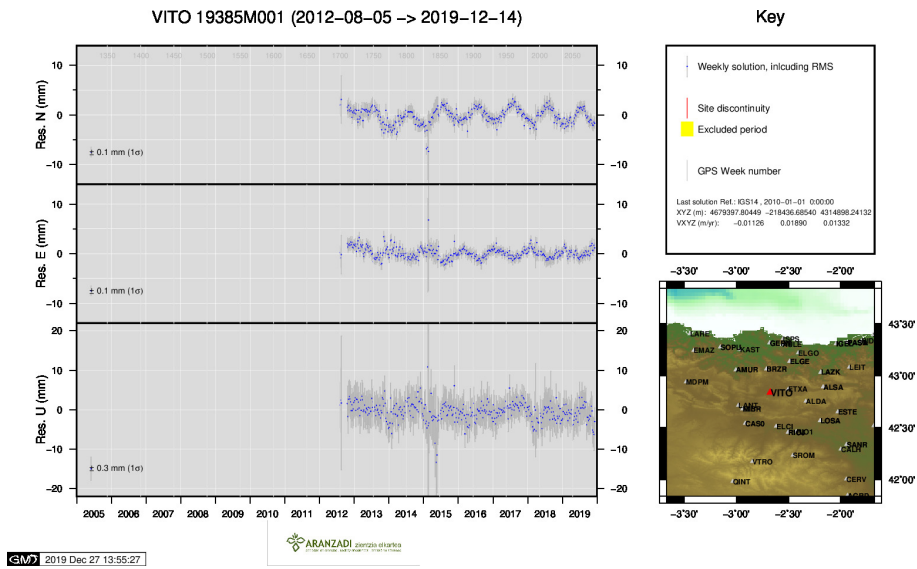
20 ) SALA



21 ) SOPU

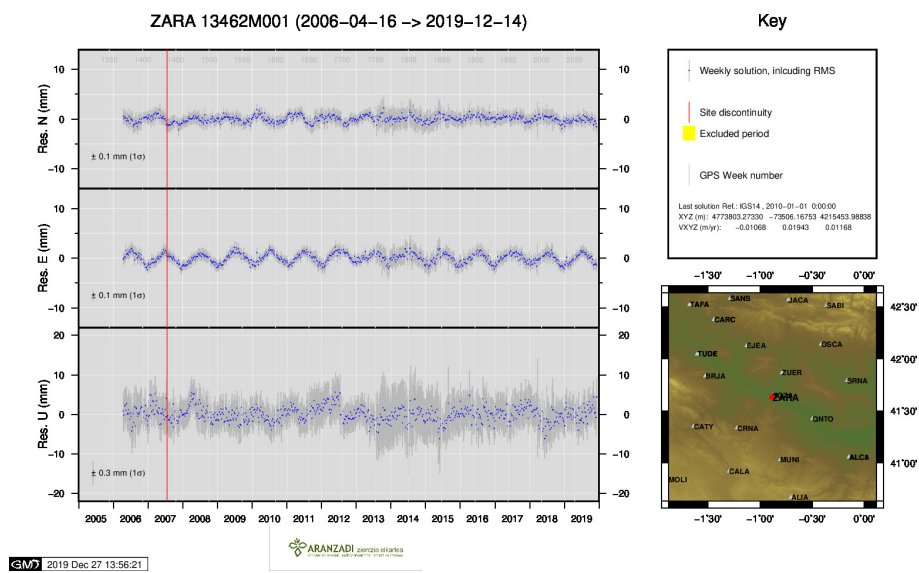


22 ) TERU



23 ) VITO





24 ) ZARA