

# ARA-DAC Weekly Analysis Result: 2080 (GFA)

## Technical Report

**GPS Week: 2080 (GFA)**

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

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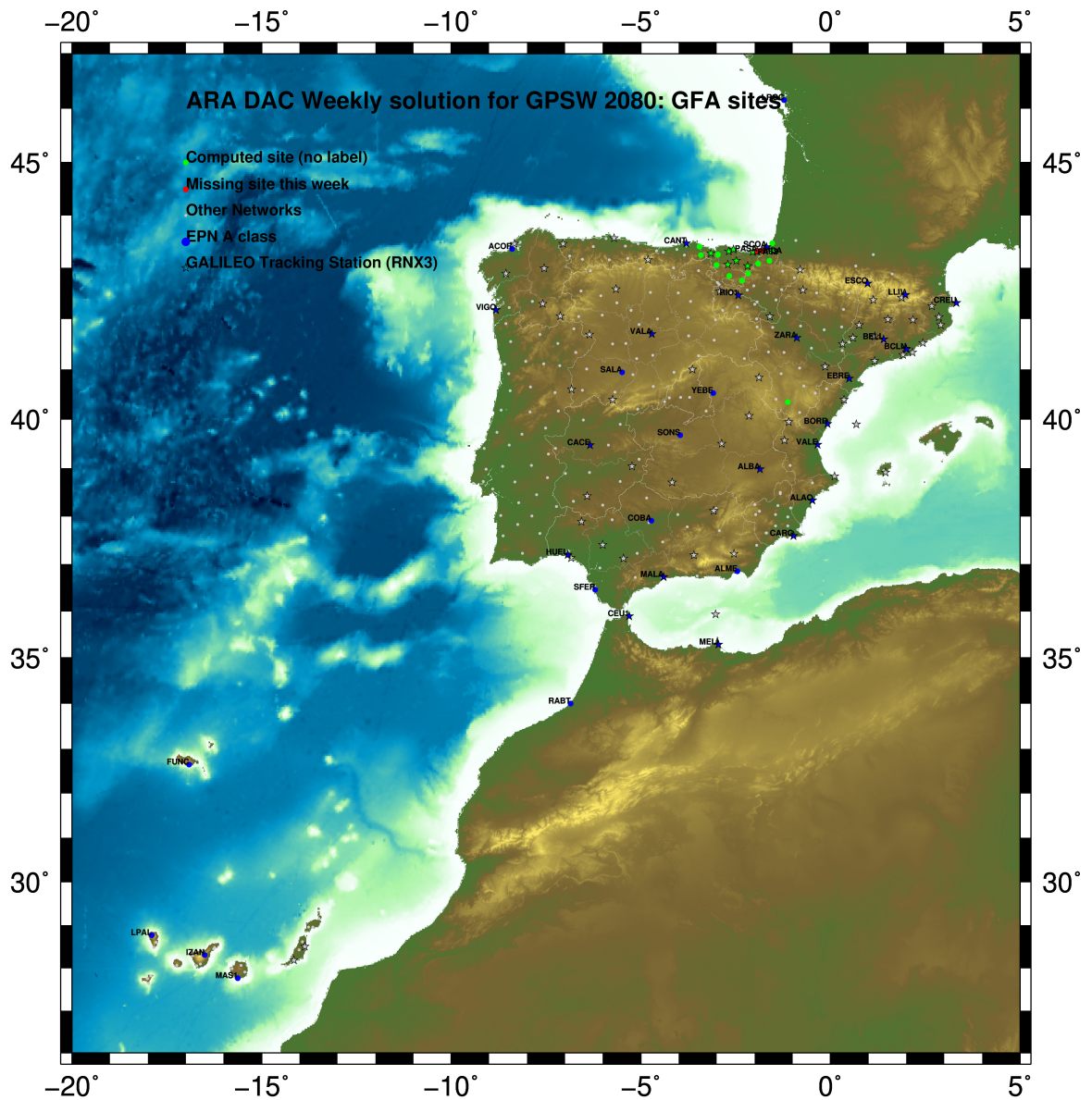
Report generated on 2019/12/08 at 15:32:59



# 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 08 15:32:50

Fig.1: Computed Sites for GPS Week2080 (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 2080 WEEK FINAL COMBINATION: PRECISE ORBITS                08-DEC-19 11:35
-----
LOCAL GEODETIC DATUM: IGS14                EPOCH: 2019-11-20 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  1 ACRD 13434M001        4594489.55337       -678367.43538       4357066.28912       W
 34 ALDA 19383M001        4687280.15328       -190876.55730       4308106.96234       A
 43 ALSA 19419M001        4677250.82188       -176770.38559       4319079.87879       A
 45 AMUR 19388M001        4661499.44030       -244591.25229       4332269.88986       A
 81 BIAZ 10074M002        4634456.04562       -124344.96919       4365785.46723       A
 92 BRZR 19387M001        4662220.98321       -220769.89438       4333309.44550       A
  9 CACE 13447M001        4899866.49979       -544567.02818       4033770.21123       W
 10 CANT 13438M001        4625924.30614       -307096.22634       4365771.56223       W
118 CHER 00000M000        4645880.31500       -125721.92140       4353624.38062       A
 15 CREU 13432M001        4715420.12331       273178.06773       4271946.84615       W
 17 EBRE 13410M001        4833519.98325       41537.39770       4147461.71985       W
139 ELGE 19353S001        4657557.39620       -202241.46814       4338991.87720       A
141 EMAZ 17001M001        4645924.19935       -276949.85883       4347759.58556       A
209 GERN 19389M001        4642811.31471       -217222.91811       4353278.88606       A
183 IGEL 19352S001        4645951.42051       -165574.49694       4352550.42634       A
188 ISPS 19484M001        4640596.47058       -206963.77055       4356391.91979       A
193 KAST 19499M001        4646949.06952       -240747.26812       4348014.99816       A
198 LARE 19440M001        4632831.94369       -279026.13001       4360314.43367       A
199 LAZK 19354S001        4666098.33123       -178186.18484       4330463.67770       A
203 LEIT 19428M001        4663520.92627       -155858.70944       4334519.89112       A
260 ORDN 19427M001        4659695.76833       -130864.72870       4338948.88702       A
 33 PASA 19351S001        4644909.05180       -156645.06083       4353623.08507       W
 36 RID1 13448M002        4708446.81961       -199490.27588       4284089.74329       W
 37 SALA 13469M001        4803054.47847       -462131.06251       4158379.08613       W
 38 SCDA 10088M002        4639940.49192       -136224.93562       4359552.41806       W
321 SOPU 19386M001        4643997.90909       -255913.90135       4350063.15104       A
342 TERU 13487M001        4867391.31654       -95523.34437       4108341.68943       A
375 VITO 19385M001        4679397.69175       -218436.49830       4314898.36999       A
 49 YEBE 13420M001        4848724.56316       -261631.92257       4123094.33932       W
 50 ZARA 13462M001        4773803.16138       -73505.97750       4215454.10308       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 2080                08-DEC-19 11:35
-----
LOCAL GEODETIC DATUM: ETRF2000            EPOCH: 2019-11-20 12:00:00
-----
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
-----
  1 ACRD 13434M001        4594489.86398       -678367.98219       4357065.86653       W
 34 ALDA 19383M001        4687280.51843       -190877.11283       4308106.53869       A
 43 ALSA 19419M001        4677251.18948       -176770.94002       4319079.45608       A
 45 AMUR 19388M001        4661499.80077       -244591.80524       4332269.46753       A
 81 BIAZ 10074M002        4634456.42271       -124345.51892       4365785.04846       A
 92 BRZR 19387M001        4662221.34658       -220770.44735       4333309.02341       A
  9 CACE 13447M001        4899866.80361       -544567.60682       4033769.76673       W
 10 CANT 13438M001        4625924.66153       -307096.77570       4365771.14187       W
118 CHER 00000M000        4645880.69108       -125722.47235       4353623.96095       A
 15 CREU 13432M001        4715420.54094       273177.51091       4271946.42593       W
 17 EBRE 13410M001        4833520.36469       41536.82758       4147461.28773       W
139 ELGE 19353S001        4657557.76417       -202242.02056       4338991.45570       A
141 EMAZ 17001M001        4645924.55706       -276950.41024       4347759.16403       A
209 GERN 19389M001        4642811.67990       -217223.46901       4353278.46551       A
183 IGEL 19352S001        4645951.79178       -165575.04802       4352550.00618       A
188 ISPS 19484M001        4640596.83721       -206964.32119       4356391.49953       A
193 KAST 19499M001        4646949.43155       -240747.81952       4348014.57700       A
198 LARE 19440M001        4632832.30203       -279026.68002       4360314.01312       A
199 LAZK 19354S001        4666098.69946       -178186.73809       4330463.25583       A
203 LEIT 19428M001        4663521.29743       -155859.26235       4334519.46973       A
260 ORDN 19427M001        4659696.14277       -130865.28112       4338948.46622       A
 33 PASA 19351S001        4644909.42421       -156645.61177       4353622.66510       W
 36 RID1 13448M002        4708447.18205       -199490.83366       4284089.31789       W
 37 SALA 13469M001        4803054.80087       -462131.63090       4158378.65017       W
 38 SCDA 10088M002        4639940.86717       -136225.48597       4359551.99872       W
321 SOPU 19386M001        4643998.26127       -255914.45248       4350062.72992       A
342 TERU 13487M001        4867391.67897       -95523.91851       4108341.25302       A
375 VITO 19385M001        4679398.05411       -218437.05307       4314897.94660       A
 49 YEBE 13420M001        4848724.90691       -261632.49525       4123093.90232       W
 50 ZARA 13462M001        4773803.53396       -73506.54176       4215453.67418       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).

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ETRF2014 FINAL COORD. wk 2080                                08-DEC-19 11:35
-----
LOCAL GEODETIC DATUM: ETRF2014          EPOCH: 2019-11-20 12:00:00
NUM STATION NAME          X (M)          Y (M)          Z (M)          FLAG
1  ACRD 13434M001         4594489.82160    -678368.02060   4357065.91516    W
34 ALDA 19383M001         4687280.47383    -190877.15259   4308106.58720    A
43 ALSA 19419M001         4677251.14493    -176770.97987   4319079.50463    A
45 AMUR 19388M001         4661499.75658    -244591.84492   4332269.51609    A
81 BIAZ 10074M002         4634456.37843    -124345.55913   4365785.09714    A
92 BRZR 19387M001         4662221.30232    -220770.48711   4333309.07198    A
9  CACE 13447M001         4899866.75774    -544567.64449   4033769.81469    W
10 CANT 13438M001         4625924.61787    -307096.81529   4365771.19049    W
118 CHER 00000M000         4645880.64668    -125722.51250   4353624.00961    A
15 CREU 13432M001         4715420.49449    273177.46965    4271946.47468    W
17 EBRE 13410M001         4833520.31782    41536.78759    4147461.33604    W
139 ELGE 19353S001         4657557.71989    -202242.06040   4338991.50428    A
141 EMAZ 17001M001         4645924.51313    -276950.44986   4347759.21262    A
209 GERN 19389M001         4642811.63581    -217223.50885   4353278.51412    A
183 IGEL 19352S001         4645951.74751    -165575.08803   4352550.05481    A
188 ISPS 19484M001         4640596.79311    -206964.36108   4356391.54816    A
193 KAST 19499M001         4646949.38749    -240747.85927   4348014.62560    A
198 LARE 19440M001         4632832.25823    -279026.71969   4360314.06174    A
199 LAZK 19354S001         4666098.65502    -178186.77798   4330463.30441    A
203 LEIT 19428M001         4663521.25296    -155859.30233   4334519.51832    A
260 ORON 19427M001         4659696.09825    -130865.32121   4338948.51484    A
33 PASA 19351S001         4644909.37991    -156645.65182   4353622.71374    W
36 RIO1 13448M002         4708447.13726    -199490.87331   4284089.36636    W
37 SALA 13469M001         4803054.75584    -462131.66925   4158378.69834    W
38 SOCA 10088M002         4639940.82286    -136225.52611   4359552.04738    W
321 SOPU 19386M001         4643998.21729    -255914.49219   4350062.77852    A
342 TERU 13487M001         4867391.63220    -95523.95789    4108341.30119    A
375 VITO 19385M001         4679398.00966    -218437.09277   4314897.99513    A
49 YEBE 13420M001         4848724.86084    -261632.53412   4123093.95045    W
50 ZARA 13462M001         4773803.48809    -73506.58159    4215453.72256    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 IGS14 solution and are given with respect the Local frame (North-East-Up).

ARA LAC 2080 WEEK FINAL COMBINATION: PRECISE ORBITS 08-DEC-19 11:35

Station	#Days	Weekday 0123456	Repeatability (mm)		
			N	E	U
ACOR 13434M001	7	XXXXXX	0.54	0.73	2.36
ALDA 19383M001	7	XXXXXX	2.43	1.38	5.74
ALSA 19419M001	7	XXXXXX	2.51	0.59	2.94
AMUR 19388M001	7	XXXXXX	4.05	3.01	5.05
BLAZ 10074M002	7	XXXXXX	0.95	1.32	2.85
BRZR 19387M001	7	XXXXXX	1.83	1.88	11.76
CACE 13447M001	7	XXXXXX	0.67	0.50	1.73
CANT 13438M001	7	XXXXXX	1.66	0.97	2.29
CHER 00000M000	7	XXXXXX	1.04	2.21	7.85
CREU 13432M001	7	XXXXXX	0.67	0.94	1.68
EBRE 13410M001	7	XXXXXX	1.06	1.90	3.26
ELGE 19353S001	7	XXXXXX	1.36	3.14	2.77
EMAZ 17001M001	7	XXXXXX	2.95	1.29	1.29
GERN 19389M001	7	XXXXXX	1.74	2.59	5.37
IGEL 19352S001	7	XXXXXX	1.90	1.08	2.89
ISPS 19484M001	7	XXXXXX	2.56	1.50	1.85
KAST 19499M001	7	XXXXXX	1.45	1.58	12.28
LARE 19440M001	7	XXXXXX	0.88	1.19	2.74
LAZK 19354S001	7	XXXXXX	1.83	1.77	4.01
LEIT 19428M001	7	XXXXXX	3.49	2.16	7.74
ORDN 19427M001	7	XXXXXX	3.34	1.63	3.54
PASA 19351S001	7	XXXXXX	1.31	0.78	3.31
RI01 13448M002	7	XXXXXX	1.62	0.47	2.84
SALA 13469M001	7	XXXXXX	0.44	0.41	1.79
SCDA 10088M002	6	XXXXX	1.59	0.92	4.91
SOPU 19386M001	7	XXXXXX	1.56	2.11	5.64
TERU 13487M001	7	XXXXXX	0.72	0.81	1.33
VITO 19385M001	7	XXXXXX	1.98	1.29	5.56
YEBE 13420M001	7	XXXXXX	0.99	0.47	3.17
ZARA 13462M001	7	XXXXXX	0.91	0.83	1.74

Comparison of individual solutions:

ACOR 13434M001	N	0.54	-1.27	-0.13	0.17	-0.15	-0.21	-0.14	-0.07
ACOR 13434M001	E	0.73	0.34	0.28	-0.46	-0.38	-1.28	0.98	-0.04
ACOR 13434M001	U	2.36	1.57	-3.19	-2.65	-1.29	3.30	0.19	1.07
ALDA 19383M001	N	2.43	-1.76	1.11	-1.14	-3.68	-3.57	-1.95	-0.75
ALDA 19383M001	E	1.38	-1.28	-0.73	-2.62	-0.29	-0.23	1.49	-0.18
ALDA 19383M001	U	5.74	2.75	-5.97	0.63	0.11	4.06	0.10	-11.72
ALSA 19419M001	N	2.51	1.12	2.06	-0.15	-3.23	-4.39	1.49	0.48
ALSA 19419M001	E	0.59	0.46	0.39	-0.34	0.92	-0.25	0.82	-0.23
ALSA 19419M001	U	2.94	2.03	-1.00	3.20	3.14	-0.02	-2.60	-4.45
AMUR 19388M001	N	4.05	2.53	1.46	-0.13	-0.96	2.82	-8.72	2.24
AMUR 19388M001	E	3.01	1.69	1.34	0.93	0.95	3.62	-5.79	1.09
AMUR 19388M001	U	5.05	-2.12	0.70	-0.66	6.95	6.03	-7.92	0.36
BLAZ 10074M002	N	0.95	0.33	-0.76	-0.37	-0.70	-0.01	1.69	-1.10
BLAZ 10074M002	E	1.32	2.38	-0.29	0.33	0.03	0.93	-1.12	1.58
BLAZ 10074M002	U	2.85	4.62	-1.79	2.74	-2.28	0.78	-2.82	-1.73
BRZR 19387M001	N	1.83	2.94	0.44	1.64	-0.62	-2.53	1.27	-0.26
BRZR 19387M001	E	1.88	-0.13	1.13	1.78	3.13	0.37	-2.59	0.27
BRZR 19387M001	U	11.76	11.42	15.06	8.12	-2.16	-10.26	-17.03	-2.68
CACE 13447M001	N	0.67	-0.93	-0.40	-0.64	-0.29	-0.45	0.62	0.78
CACE 13447M001	E	0.50	0.03	0.25	-0.73	0.42	0.13	-0.28	0.78
CACE 13447M001	U	1.73	0.25	0.88	0.41	-0.99	-1.67	-2.12	-2.95
CANT 13438M001	N	1.66	-1.22	-1.10	-0.93	0.27	1.11	2.86	1.89
CANT 13438M001	E	0.97	1.48	0.44	0.85	-0.48	1.15	-0.92	0.34
CANT 13438M001	U	2.29	-0.57	1.74	0.68	3.13	1.84	0.83	-3.70
CHER 00000M000	N	1.04	-0.15	-0.70	-0.46	0.48	1.13	1.42	-1.52
CHER 00000M000	E	2.21	-0.89	0.32	1.15	4.79	1.64	1.09	-0.56
CHER 00000M000	U	7.85	5.39	0.07	4.30	7.28	-2.53	-15.89	-3.26
CREU 13432M001	N	0.67	-0.35	-0.67	0.41	0.62	0.50	0.73	-0.87
CREU 13432M001	E	0.94	0.17	-0.55	-0.36	-1.71	-0.86	0.59	0.88
CREU 13432M001	U	1.68	1.50	-0.02	-0.39	-0.92	0.18	1.41	-3.41
EBRE 13410M001	N	1.06	-1.82	1.51	-0.16	0.26	0.56	0.79	0.21
EBRE 13410M001	E	1.90	1.54	-1.67	0.12	0.32	0.61	1.47	-3.71
EBRE 13410M001	U	3.26	3.73	-1.87	1.61	3.24	1.46	-2.93	-4.75
ELGE 19353S001	N	1.36	1.47	-0.80	-0.48	2.20	0.68	-1.49	0.75
ELGE 19353S001	E	3.14	1.90	2.41	1.30	-0.66	1.92	-5.97	2.90
ELGE 19353S001	U	2.77	-3.30	-2.47	-0.46	3.39	2.83	3.04	-0.11
EMAZ 17001M001	N	2.95	-1.08	-0.40	-0.21	-0.55	0.62	6.96	-1.34
EMAZ 17001M001	E	1.29	0.60	0.33	0.84	0.77	2.22	0.12	-1.81
EMAZ 17001M001	U	1.29	1.67	-0.59	-0.94	1.00	-1.28	0.57	-1.73
GERN 19389M001	N	1.74	0.27	-0.67	0.67	2.78	1.84	-2.48	0.10
GERN 19389M001	E	2.59	-2.77	-1.48	0.96	3.63	2.81	2.40	-1.55
GERN 19389M001	U	5.37	2.77	-0.26	1.93	1.43	-4.91	-6.96	9.33
IGEL 19352S001	N	1.90	0.37	-1.53	-0.55	0.49	1.68	3.62	-1.61
IGEL 19352S001	E	1.08	0.15	0.62	0.68	0.84	-1.13	1.86	0.86
IGEL 19352S001	U	2.89	2.28	-1.54	-0.80	1.25	-4.35	3.24	3.30
ISPS 19484M001	N	2.56	-0.26	0.46	0.17	-2.52	-0.62	5.36	-1.92
ISPS 19484M001	E	1.50	-0.21	0.53	0.36	0.08	-0.42	3.34	1.30
ISPS 19484M001	U	1.85	0.32	1.47	-0.60	-2.62	1.03	-0.47	3.12
KAST 19499M001	N	1.45	1.02	2.67	1.55	-0.08	-0.76	-0.06	-1.20
KAST 19499M001	E	1.58	-0.12	1.99	1.72	0.25	1.83	0.33	-2.15
KAST 19499M001	U	12.28	5.40	19.86	7.84	-1.58	-9.43	-17.95	-2.41
LARE 19440M001	N	0.88	-0.03	0.02	1.03	-0.35	1.82	0.32	-0.00
LARE 19440M001	E	1.19	0.67	-0.24	0.67	1.12	1.44	1.12	-1.71
LARE 19440M001	U	2.74	-0.98	-0.38	-0.29	0.63	1.41	5.59	-3.17
LAZK 19354S001	N	1.83	2.25	1.23	0.13	-1.69	-0.92	-1.43	2.78
LAZK 19354S001	E	1.77	-0.08	-0.66	0.16	-0.70	0.92	4.13	0.10
LAZK 19354S001	U	4.01	-5.06	-3.05	2.97	3.21	5.66	2.36	-2.25
LEIT 19428M001	N	3.49	-0.16	-0.75	-1.43	-3.23	-2.33	7.14	-1.89
LEIT 19428M001	E	2.16	-1.53	-0.57	-1.09	1.03	0.33	4.71	-0.80
LEIT 19428M001	U	7.74	-2.77	-4.05	-0.87	0.50	-5.53	16.95	-4.07
ORDN 19427M001	N	3.34	2.39	0.77	0.54	-0.32	0.31	-7.60	1.48

ORDN 19427M001	E	1.63	1.65	-0.04	-0.16	0.23	1.01	-2.39	2.54
ORDN 19427M001	U	3.54	3.54	-1.96	-3.84	3.15	3.51	-4.25	1.97
PASA 19351S001	N	1.31	1.81	-0.56	-0.14	-0.69	-0.48	2.43	0.05
PASA 19351S001	E	0.78	1.05	0.24	0.25	0.42	-0.27	1.23	0.81
PASA 19351S001	U	3.31	1.10	-1.07	-0.50	3.60	-2.62	-3.15	5.78
RIO1 13448M002	N	1.62	-0.31	-1.93	-0.89	-0.67	0.78	1.66	2.72
RIO1 13448M002	E	0.47	0.06	0.33	-0.04	0.54	0.29	0.74	0.54
RIO1 13448M002	U	2.84	3.06	-2.87	0.87	-0.66	-4.06	3.51	0.83
SALA 13469M001	N	0.44	-0.75	-0.18	-0.28	0.45	0.19	-0.48	-0.20
SALA 13469M001	E	0.41	-0.18	0.72	-0.33	-0.36	0.17	0.40	0.12
SALA 13469M001	U	1.79	-3.02	-1.17	0.51	-1.13	0.98	1.51	1.96
SCDA 10088M002	N	1.59	-0.54	-1.49	-1.40	-0.34	1.62	2.33	
SCDA 10088M002	E	0.92	0.20	0.63	0.54	0.62	1.77	0.12	
SCDA 10088M002	U	4.91	-4.81	0.14	4.62	4.68	2.07	-7.08	
SOPU 19386M001	N	1.56	2.15	0.72	-0.60	-0.45	-0.60	2.74	-1.02
SOPU 19386M001	E	2.11	-1.46	1.22	2.45	2.09	-1.36	2.78	-1.78
SOPU 19386M001	U	5.64	4.21	5.39	8.14	-1.34	-3.07	-7.72	-2.64
TERU 13487M001	N	0.72	1.02	1.03	-0.17	0.20	0.06	-0.79	0.57
TERU 13487M001	E	0.81	0.18	-0.66	0.26	-0.29	-0.83	0.03	-1.62
TERU 13487M001	U	1.33	-0.54	2.15	0.14	1.19	1.57	1.31	-0.18
VITO 19385M001	N	1.98	1.91	1.03	0.91	1.02	0.39	-4.00	-0.87
VITO 19385M001	E	1.29	1.17	2.03	1.20	0.51	-0.20	-1.36	0.91
VITO 19385M001	U	5.56	0.46	6.43	0.05	2.90	0.40	-10.78	4.38
YEBE 13420M001	N	0.99	-0.74	-0.68	-0.80	-0.51	-0.59	0.63	1.78
YEBE 13420M001	E	0.47	-0.13	-1.02	-0.10	-0.04	0.35	-0.41	0.00
YEBE 13420M001	U	3.17	-1.76	-3.64	-0.87	-0.97	-1.23	6.20	-1.44
ZARA 13462M001	N	0.91	-0.73	-1.82	-0.48	0.02	0.01	0.95	0.05
ZARA 13462M001	E	0.83	0.12	-0.16	-0.30	-0.57	0.39	-0.36	1.84
ZARA 13462M001	U	1.74	-0.42	-3.84	-0.13	1.47	0.43	0.90	-0.20



## 6.2 Datum verification

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

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

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-1.27	-1.08	-0.43
2	ALAC 13433M001	I W	0.88	-1.26	1.31
3	ALBA 13452M001	I W	-0.57	-0.82	-1.49
4	ALME 13437M001	I W	-0.29	-1.23	-1.79
5	BCLN 13412M001	I W	0.97	-1.32	1.36
6	BELL 13431M001	I W	0.59	1.04	2.77
7	BORR 13480M001	I W	-0.48	-2.21	-1.00
8	BRST 10004M004	I W	-0.33	-0.06	6.22
9	CACE 13447M001	I W	1.34	0.70	-0.87
10	CANT 13438M001	I W	-1.03	0.38	-0.16
11	CARG 19412M001	I W	0.07	-1.74	0.74
13	CEU1 13449M002	I W	0.13	1.46	0.50
14	COBA 13453M001	I W	0.58	0.81	-5.97
15	CREU 13432M001	I W	0.36	0.62	0.33
17	EBRE 13410M001	I W	1.01	1.48	0.14
18	ESCO 13435M001	I W	-0.42	-0.07	-2.19
19	FUNC 13911S001	I W	0.66	-0.09	-0.09
22	HUEL 13451M001	I W	1.00	0.93	-4.55
23	IZAN 31309M002	I W	-0.89	-1.59	-1.43
25	LLIV 13436M001	I W	-0.84	0.04	-1.78
26	LPAL 81701M001	I W	-2.64	0.65	-1.69
27	LROC 10023M001	I W	-0.48	1.06	2.32
28	MALA 13443M001	I W	0.21	-1.85	0.71
29	MAS1 31303M002	I W	-0.81	-0.53	1.15
32	MELI 19379M001	I W	0.28	0.21	1.52
33	PASA 19351S001	I W	-1.92	0.74	-1.14
34	PDEL 31906M004	I W	8.23	0.01	9.60
35	RABT 35001M002	I W	0.48	-0.17	-6.17
36	RID1 13448M002	I W	-1.37	0.08	-2.35
37	SALA 13469M001	I W	-0.92	1.27	-4.60
38	SCOA 10088M002	I W	0.75	2.13	-0.77
39	SFER 13402M004	I W	-1.57	-0.17	-0.33
42	SONS 13446M001	I W	-0.63	-0.67	-4.53
44	TERC 31909M001	I W	0.84	-3.43	4.45
46	VALA 13463M002	I W	-1.36	1.30	-0.76
47	VALE 13439M001	I W	0.10	1.03	-0.08
48	VIGO 13450M001	I W	-0.04	1.01	2.97
49	YEBE 13420M001	I W	-0.59	1.01	-0.81
50	ZARA 13462M001	I W	-0.03	1.12	-0.96
51	ZIMM 14001M004	I W	-0.00	-0.80	9.83
RMS / COMPONENT			1.61	1.20	3.37
MEAN			0.00	-0.00	0.00
MIN			-2.64	-3.43	-6.17
MAX			8.23	2.13	9.83

NUMBER OF PARAMETERS : 3  
NUMBER OF COORDINATES : 120  
RMS OF TRANSFORMATION : 2.27 MM

BARYCENTER COORDINATES:

LATITUDE : 39 34 24.71  
LONGITUDE : - 5 18 10.20  
HEIGHT : -50.642 KM

PARAMETERS:

TRANSLATION IN N : 0.00 +- 0.36 MM  
TRANSLATION IN E : 0.00 +- 0.36 MM  
TRANSLATION IN U : -0.00 +- 0.36 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          16281045
NUMBER OF UNKNOWN(S)            193952
NUMBER OF DEGREES OF FREEDOM    16087093
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  1.978930471895243

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
  1  0.00237      0.0027 -0.0236 -0.0047  0.0006  0.0002 -0.0005  -0.00025
  2  0.00324      -0.0020  0.0036  0.0056  0.0001 -0.0002  0.0002  -0.00037
  3  0.00206      -0.0118 -0.0234  0.0106  0.0005 -0.0005 -0.0006  0.00018
  4  0.00199      0.0066  0.0031  0.0068  -0.0001 -0.0000  0.0001  -0.00125
  5  0.00308      0.0068 -0.0041  0.0017  0.0001  0.0001 -0.0001  -0.00124
  6  0.00278      0.0096 -0.0086 -0.0027  0.0002  0.0003 -0.0002  -0.00104
  7  0.00282      0.0218  0.0013 -0.0254  0.0000  0.0011  0.0001  -0.00003
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
  1  0.00139      2354867  1.92                2383575      3      993      27718      0
  2  0.00135      2220628  1.81                2247592      3      975      25992      0
  3  0.00132      2283834  1.73                2310968      3      999      26138      0
  4  0.00135      2384510  1.82                2413216      3     1008      27701      0
  5  0.00134      2333916  1.79                2362511      3     1005      27593      0
  6  0.00158      2231650  2.48                2261950      3      975      29328      0
  7  0.00149      2271799  2.21                2301233      3      978      28459      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 19:321:00000 19:327:86370 LEICA GR50      -----
ALDA  A   1 P 19:321:00000 19:327:86370 LEICA GR10      -----
ALSA  A   1 P 19:321:00000 19:327:86370 LEICA GR50      -----
AMUR  A   1 P 19:321:00000 19:327:86370 LEICA GR10      -----
BIAZ  A   1 P 19:321:00000 19:327:86370 TRI SP90M      -----
BRZR  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
CACE  A   1 P 19:321:00000 19:327:86370 TRIMBLE NETR9  -----
CANT  A   1 P 19:321:00000 19:327:86370 LEICA GR10      -----
CHER  A   1 P 19:321:00000 19:327:79140 LEICA GRX1200+GNSS -----
CREU  A   1 P 19:321:00000 19:327:86370 LEICA GR50      -----
EBRE  A   1 P 19:321:00000 19:327:86370 LEICA GR50      -----
ELGE  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
EMAZ  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
GERN  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
IGEL  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
ISPS  A   1 P 19:321:00000 19:327:86370 TRIMBLE NETR9  -----
KAST  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
LARE  A   1 P 19:321:00000 19:327:86370 LEICA GRX1200GGPRO -----
LAZK  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
LEIT  A   1 P 19:321:00000 19:327:86370 LEICA GR50      -----
ORON  A   1 P 19:321:00000 19:327:86370 LEICA GR50      -----
PASA  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
RIO1  A   1 P 19:321:00000 19:327:86370 LEICA GR25      -----
SALA  A   1 P 19:321:00000 19:327:86370 LEICA GRX1200+GNSS -----
SCOA  A   1 P 19:321:00000 19:326:86370 LEICA GR25      -----
SOPU  A   1 P 19:321:00000 19:327:86370 LEICA GR30      -----
TERU  A   1 P 19:321:00000 19:327:86370 LEICA GRX1200GGPRO -----
VITO  A   1 P 19:321:00000 19:327:86370 LEICA GR10      -----
YEBE  A   1 P 19:321:00000 19:327:86370 TRIMBLE NETR9  -----
ZARA  A   1 P 19:321:00000 19:327:86370 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 19:321:00000 19:327:86370 LEIAT504      LEIS -----
ALDA  A   1 P 19:321:00000 19:327:86370 LEIAS10      NONE -----
ALSA  A   1 P 19:321:00000 19:327:86370 LEIAR10      NONE -----
AMUR  A   1 P 19:321:00000 19:327:86370 LEIAS10      NONE -----
BIAZ  A   1 P 19:321:00000 19:327:86370 LEIAR25      LEIT -----
BRZR  A   1 P 19:321:00000 19:327:86370 LEIAS10      NONE -----
```

CACE	A	1	P	19:321:00000	19:327:86370	TRM29659.00	NONE	----
CANT	A	1	P	19:321:00000	19:327:86370	LEIAR25_R4	LEIT	25066
CHER	A	1	P	19:321:00000	19:327:79140	LEIAX1203+GNSS	NONE	----
CREU	A	1	P	19:321:00000	19:327:86370	LEIAR25_R4	NONE	26357
EBRE	A	1	P	19:321:00000	19:327:86370	LEIAR25_R4	NONE	26359
ELGE	A	1	P	19:321:00000	19:327:86370	LEIAR25_R4	LEIT	----
EMAZ	A	1	P	19:321:00000	19:327:86370	LEIAS10	NONE	----
GERN	A	1	P	19:321:00000	19:327:86370	LEIAS10	NONE	----
IGEL	A	1	P	19:321:00000	19:327:86370	LEIAR20	LEIM	----
ISPS	A	1	P	19:321:00000	19:327:86370	TRM59900.00	SCIS	----
KAST	A	1	P	19:321:00000	19:327:86370	LEIAS10	NONE	----
LARE	A	1	P	19:321:00000	19:327:86370	LEIAT504	NONE	----
LAZK	A	1	P	19:321:00000	19:327:86370	LEIAR25_R4	LEIT	----
LEIT	A	1	P	19:321:00000	19:327:86370	LEIAR10	NONE	----
ORDN	A	1	P	19:321:00000	19:327:86370	LEIAR10	NONE	----
PASA	A	1	P	19:321:00000	19:327:86370	LEIAR20	LEIM	73034
RID1	A	1	P	19:321:00000	19:327:86370	LEIAR25_R4	LEIT	25138
SALA	A	1	P	19:321:00000	19:327:86370	LEIAR25	NONE	----
SCDA	A	1	P	19:321:00000	19:326:86370	TRM55971.00	NONE	----
SOPU	A	1	P	19:321:00000	19:327:86370	LEIAS10	NONE	----
TERU	A	1	P	19:321:00000	19:327:86370	LEIAT504GG	LEIS	----
VITO	A	1	P	19:321:00000	19:327:86370	LEIAS10	NONE	----
YEBE	A	1	P	19:321:00000	19:327:86370	TRM29659.00	NONE	----
ZARA	A	1	P	19:321:00000	19:327:86370	TRM29659.00	NONE	----

### 7.3 Eccentricities

*SITE	PT	SOLN	T	DATA_START_	DATA_END_	AXE	UP_	NORTH_	EAST_
							ARP->	BENCHMARK(M)	-----
ACOR	A	1	P	19:321:00000	19:327:86370	UNE	3.0460	0.0000	0.0000
ALDA	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
ALSA	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
AMUR	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
BIAZ	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
BRZR	A	1	P	19:321:00000	19:327:86370	UNE	0.0771	0.0000	0.0000
CACE	A	1	P	19:321:00000	19:327:86370	UNE	0.0600	0.0000	0.0000
CANT	A	1	P	19:321:00000	19:327:86370	UNE	3.0490	0.0000	0.0000
CHER	A	1	P	19:321:00000	19:327:79140	UNE	0.0000	0.0000	0.0000
CREU	A	1	P	19:321:00000	19:327:86370	UNE	0.0770	0.0000	0.0000
EBRE	A	1	P	19:321:00000	19:327:86370	UNE	0.0770	0.0000	0.0000
ELGE	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
EMAZ	A	1	P	19:321:00000	19:327:86370	UNE	0.0350	0.0000	0.0000
GERN	A	1	P	19:321:00000	19:327:86370	UNE	0.0771	0.0000	0.0000
IGEL	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
ISPS	A	1	P	19:321:00000	19:327:86370	UNE	0.0350	0.0000	0.0000
KAST	A	1	P	19:321:00000	19:327:86370	UNE	0.0350	0.0000	0.0000
LARE	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
LAZK	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
LEIT	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
ORDN	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
PASA	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
RID1	A	1	P	19:321:00000	19:327:86370	UNE	0.0606	0.0000	0.0000
SALA	A	1	P	19:321:00000	19:327:86370	UNE	0.0600	0.0000	0.0000
SCDA	A	1	P	19:321:00000	19:326:86370	UNE	0.0000	0.0000	0.0000
SOPU	A	1	P	19:321:00000	19:327:86370	UNE	0.0771	0.0000	0.0000
TERU	A	1	P	19:321:00000	19:327:86370	UNE	0.0600	0.0000	0.0000
VITO	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
YEBE	A	1	P	19:321:00000	19:327:86370	UNE	0.0000	0.0000	0.0000
ZARA	A	1	P	19:321:00000	19:327:86370	UNE	3.2590	0.0000	0.0000

## 8 References

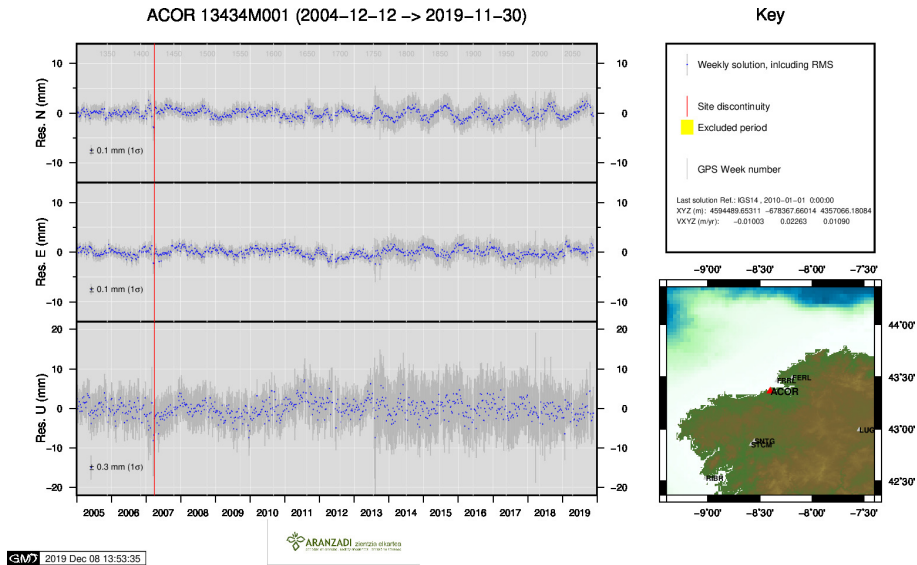
C. Boucher and Z. Altamimi (2011): *Specifications for reference frame fixing in the analysis of a EUREF GPS campaign*. [etrs89.ensg.ign.fr/memo-V8.pdf](http://etrs89.ensg.ign.fr/memo-V8.pdf)

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

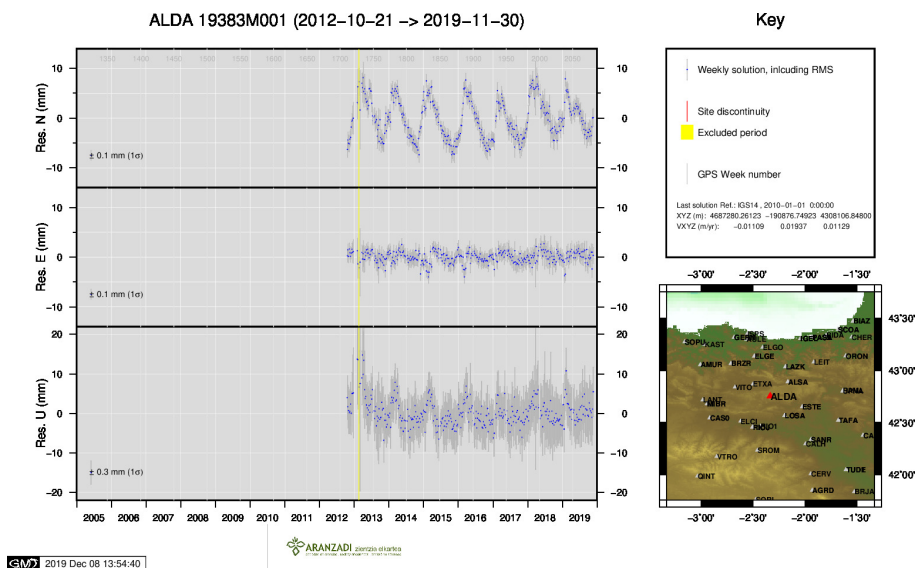
Z. Altamimi (2018): *EUREF Technical Note 1: Relationship and Transformation between the International and the European Terrestrial Reference Systems*. [etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf](http://etrs89.ensg.ign.fr/pub/EUREF-TN-1.pdf)

## 9 Cumulative Time Series

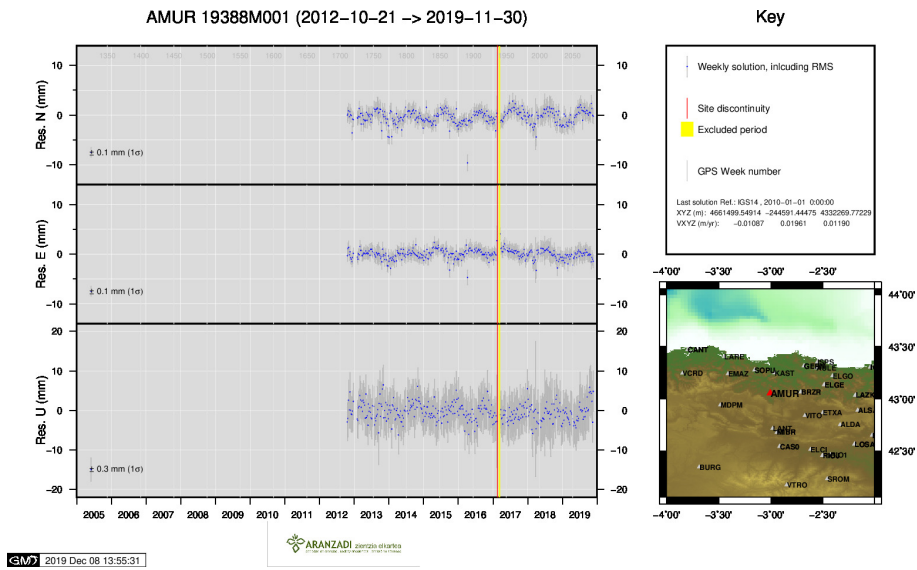
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



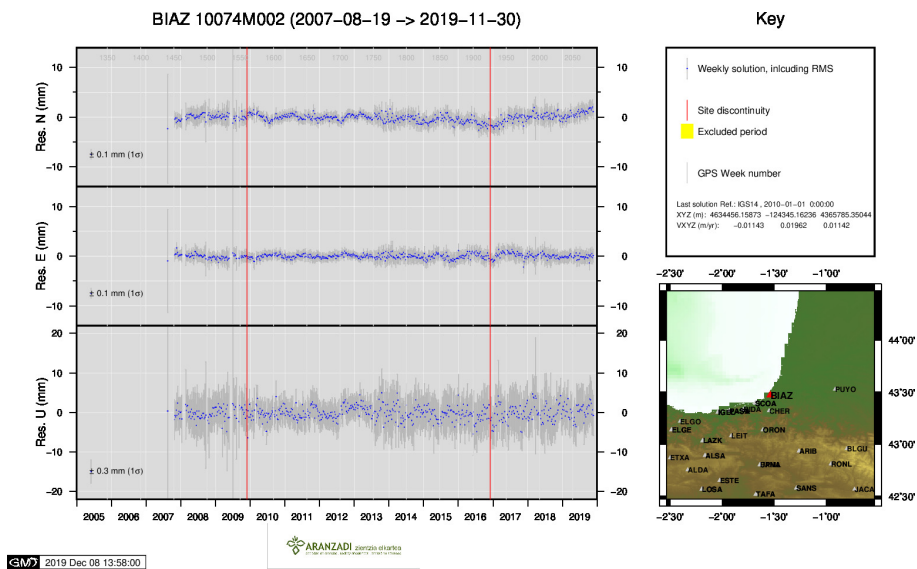
1 ) ACOR



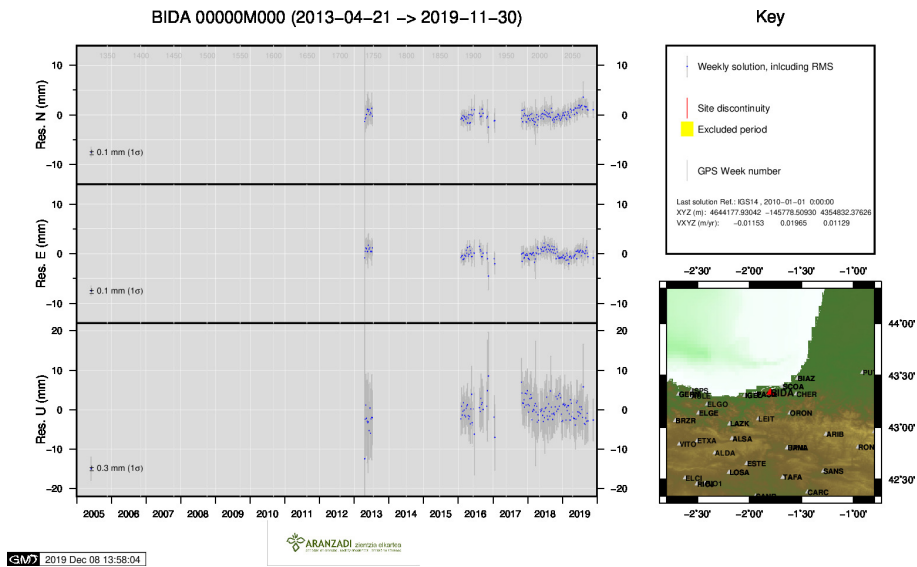
2 ) ALDA



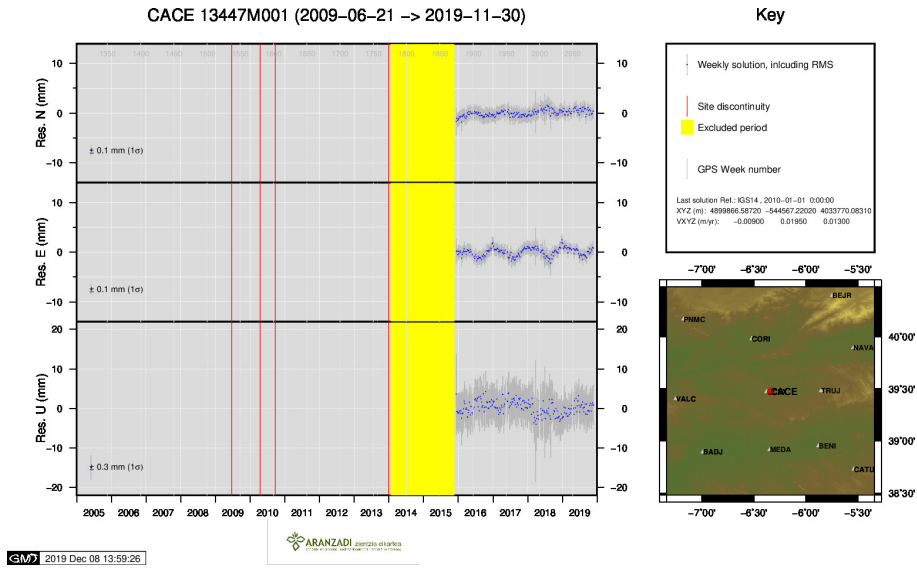
3 ) AMUR



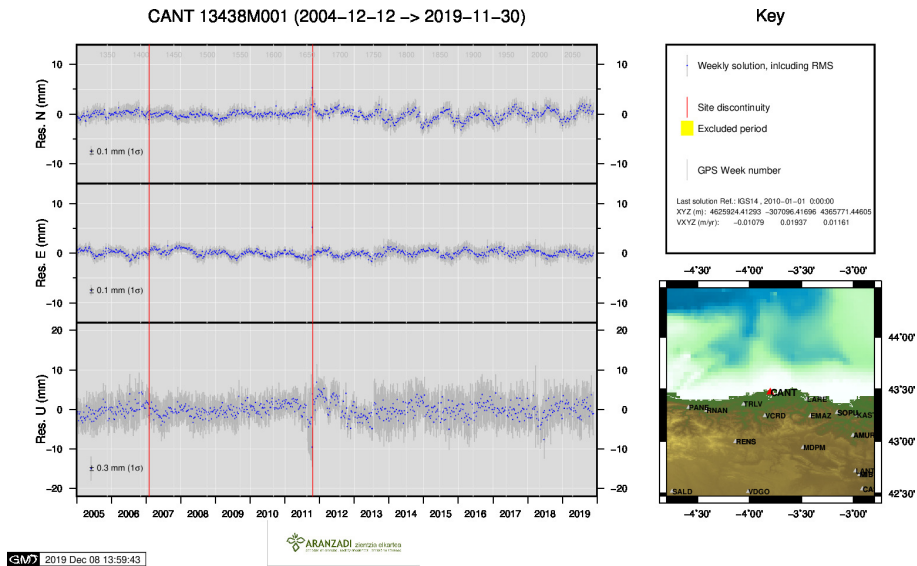
4 ) BIAZ



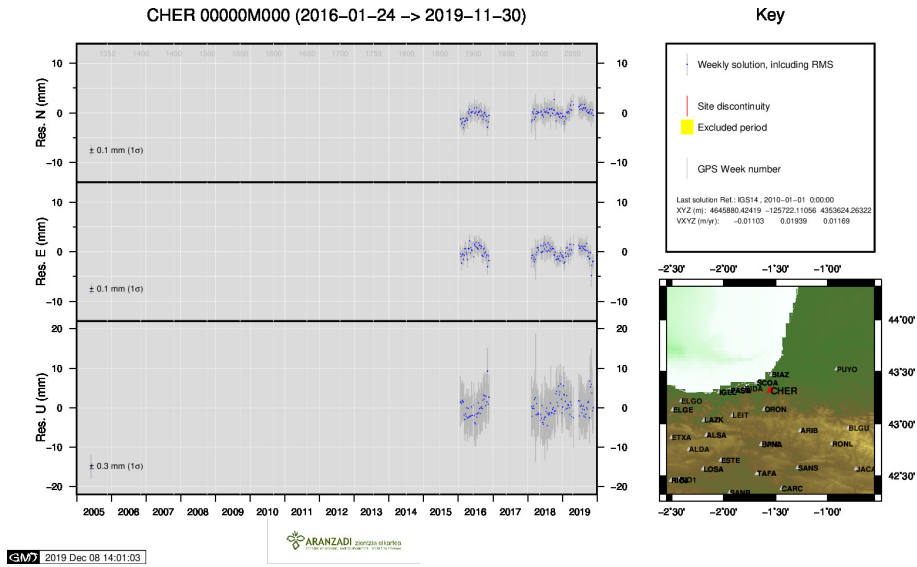
5 ) BIDA



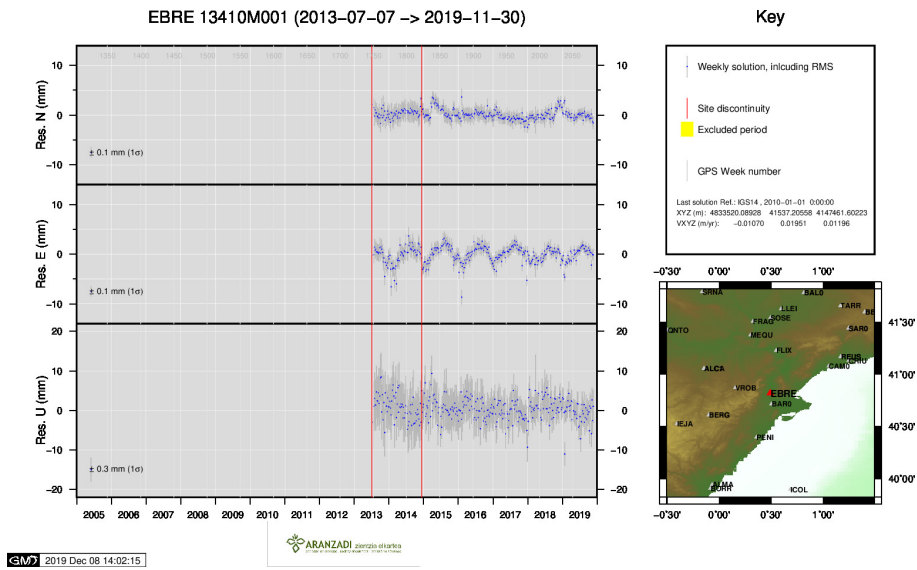
6 ) CACE



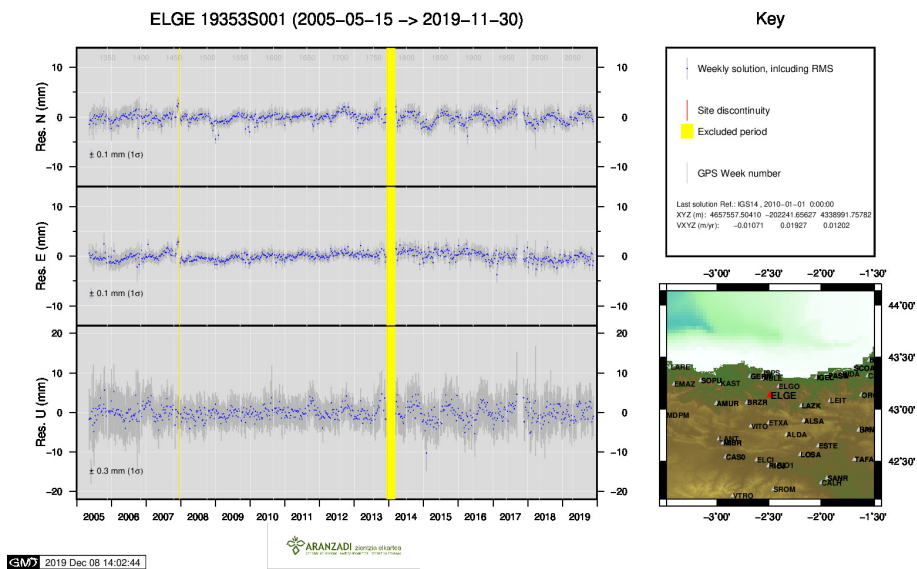
7 ) CANT



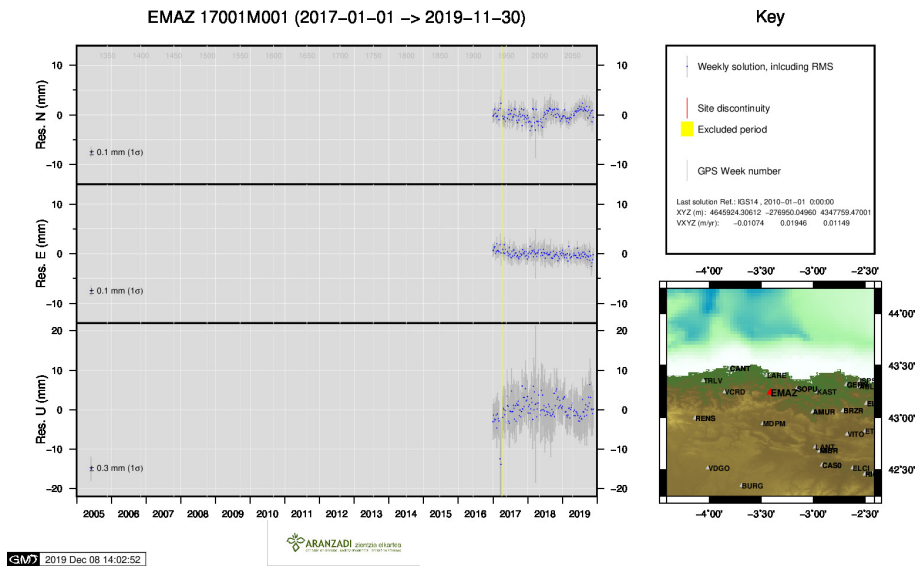
8 ) CHER



9 ) EBRE

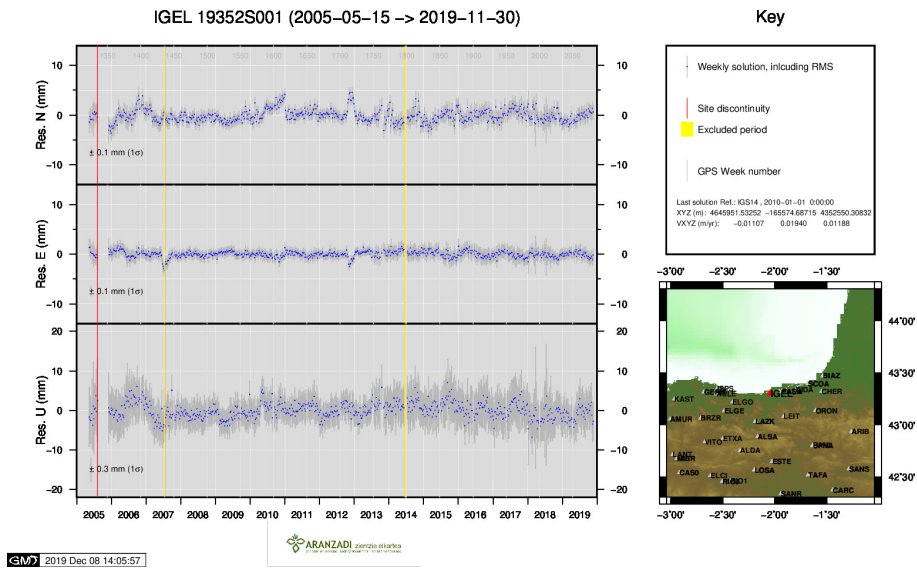


10 ) ELGE

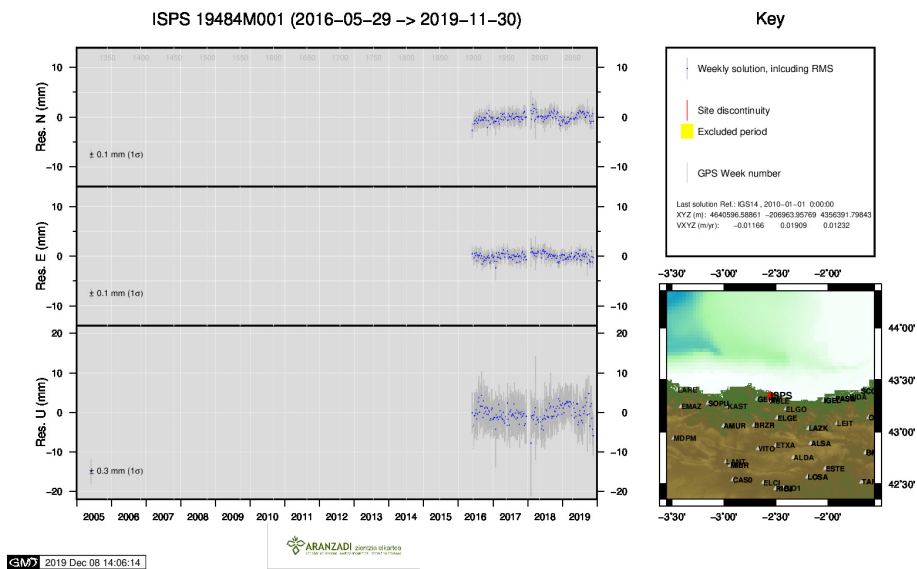


11 ) EMAZ

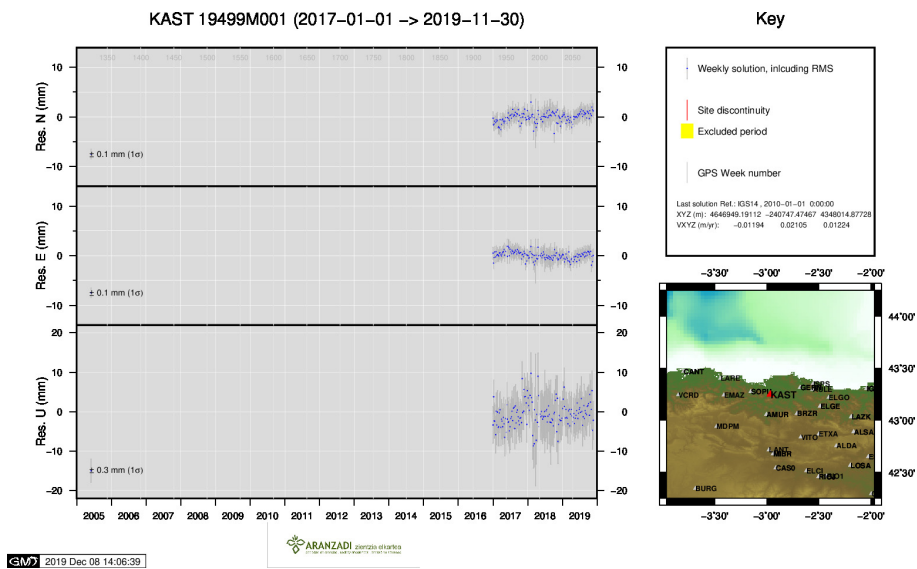




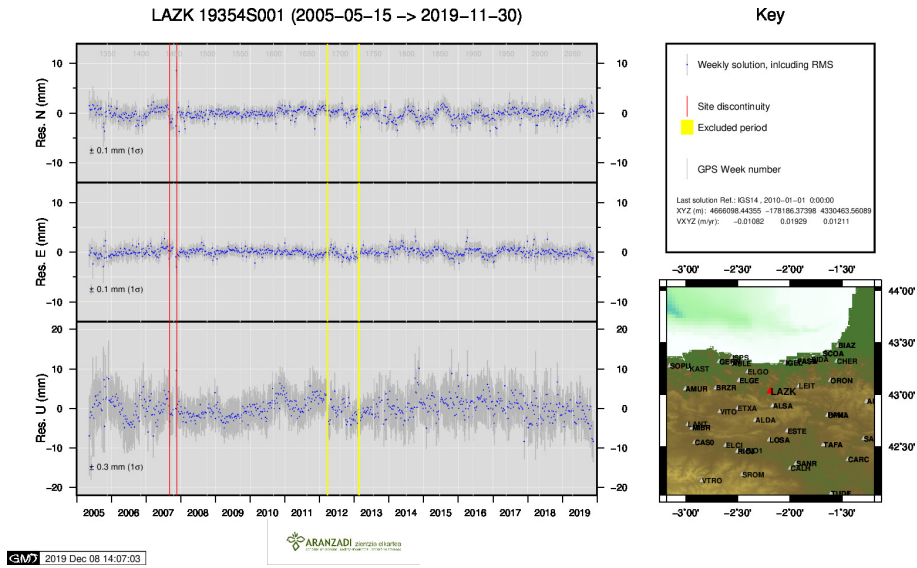
12 ) IGEL



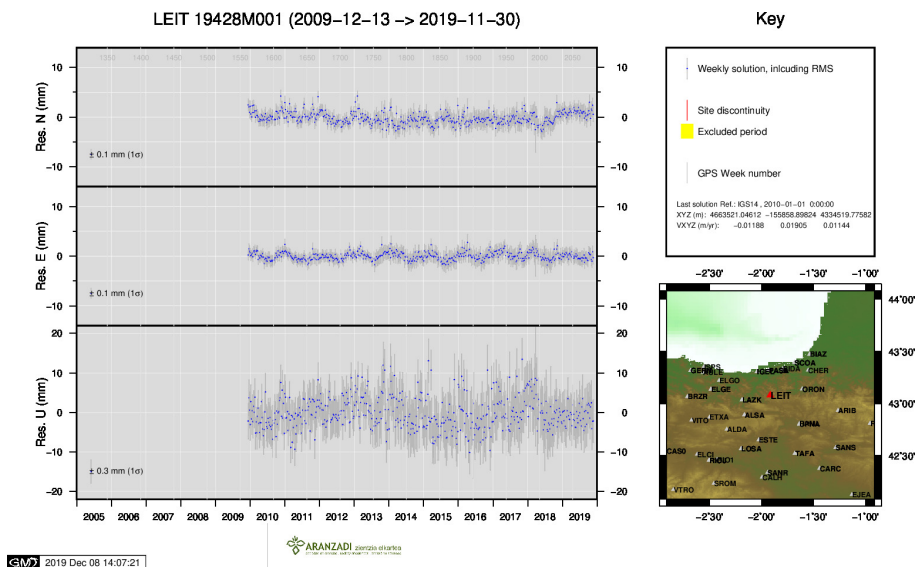
13 ) ISPS



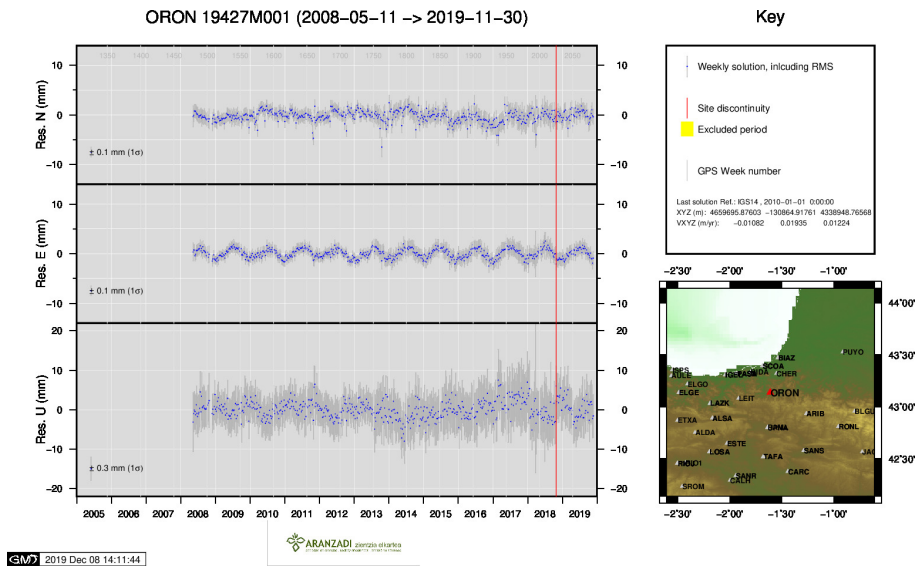
14 ) KAST



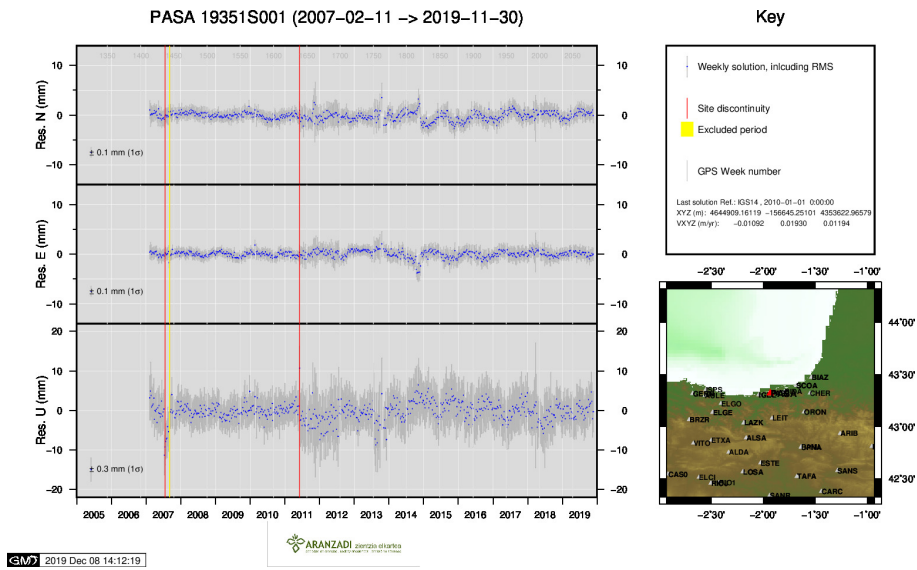
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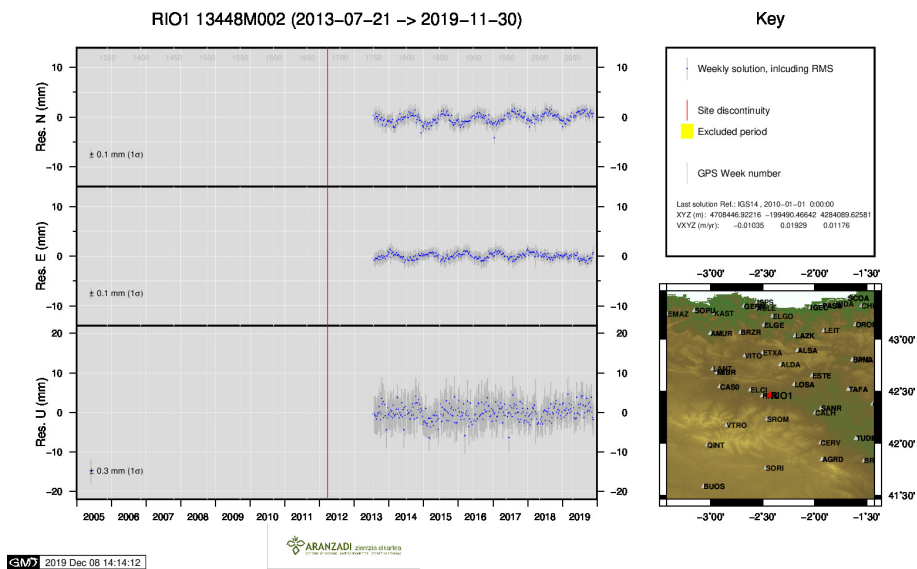
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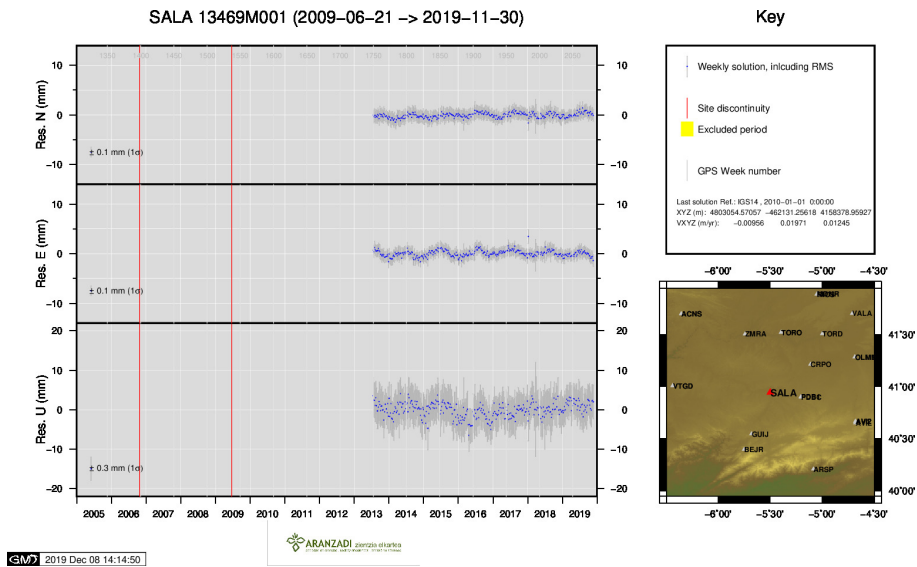
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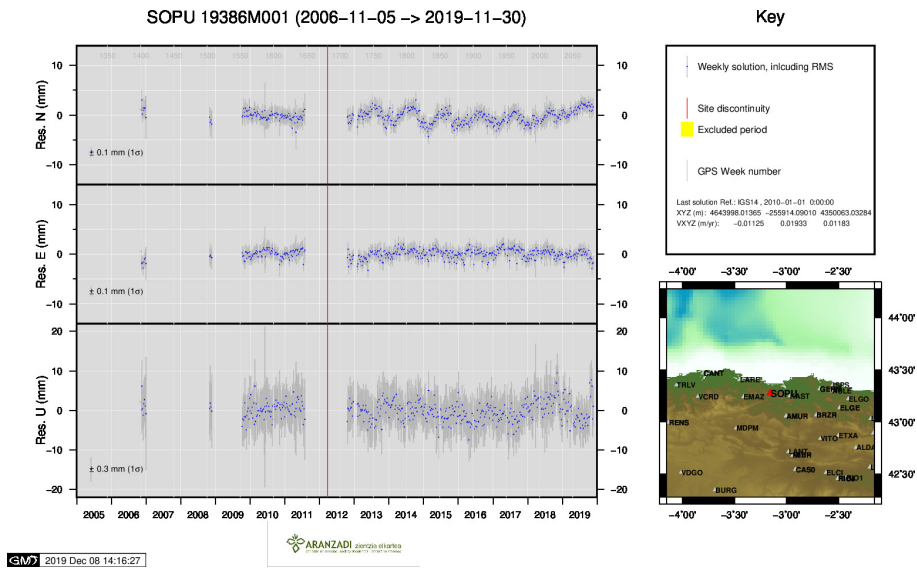
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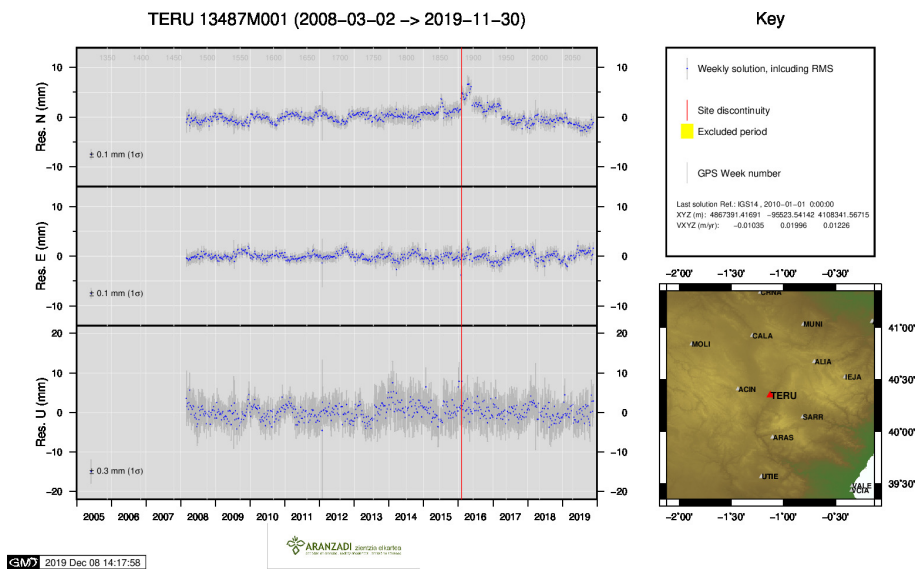
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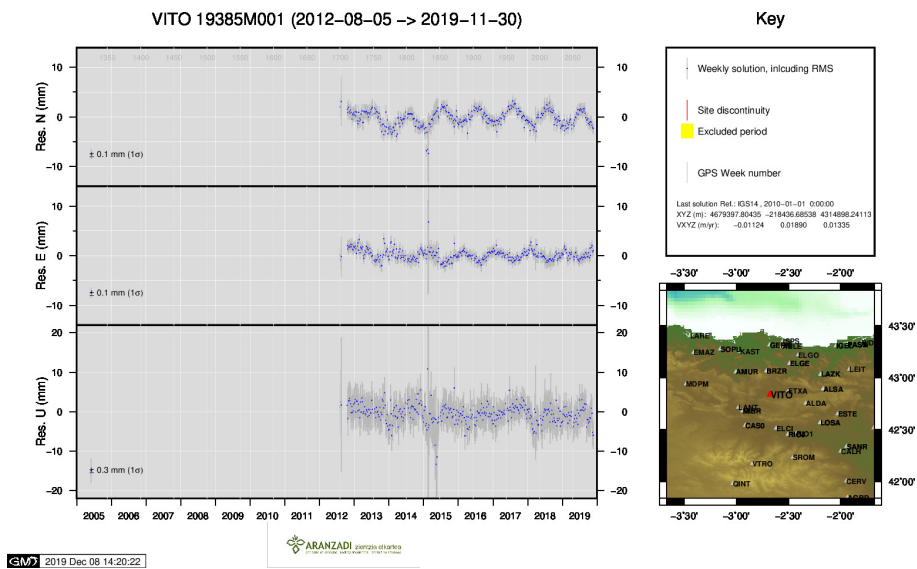
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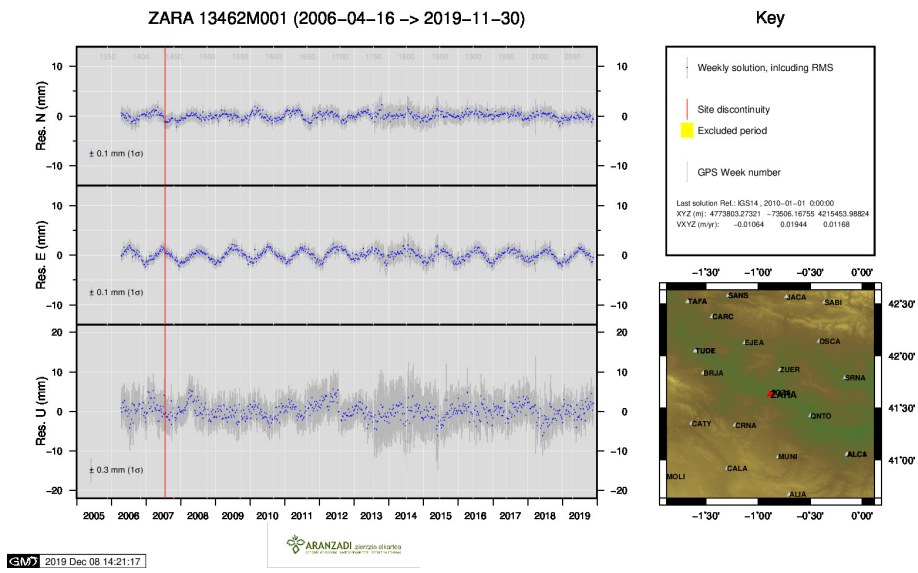
21 ) SOPU



22 ) TERU



23 ) VITO



24 ) ZARA