

ARA-DAC Weekly Analysis Result: 1908 (GFA)

Technical Report

GPS Week: 1908 (GFA)

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

ARA-DAC details:

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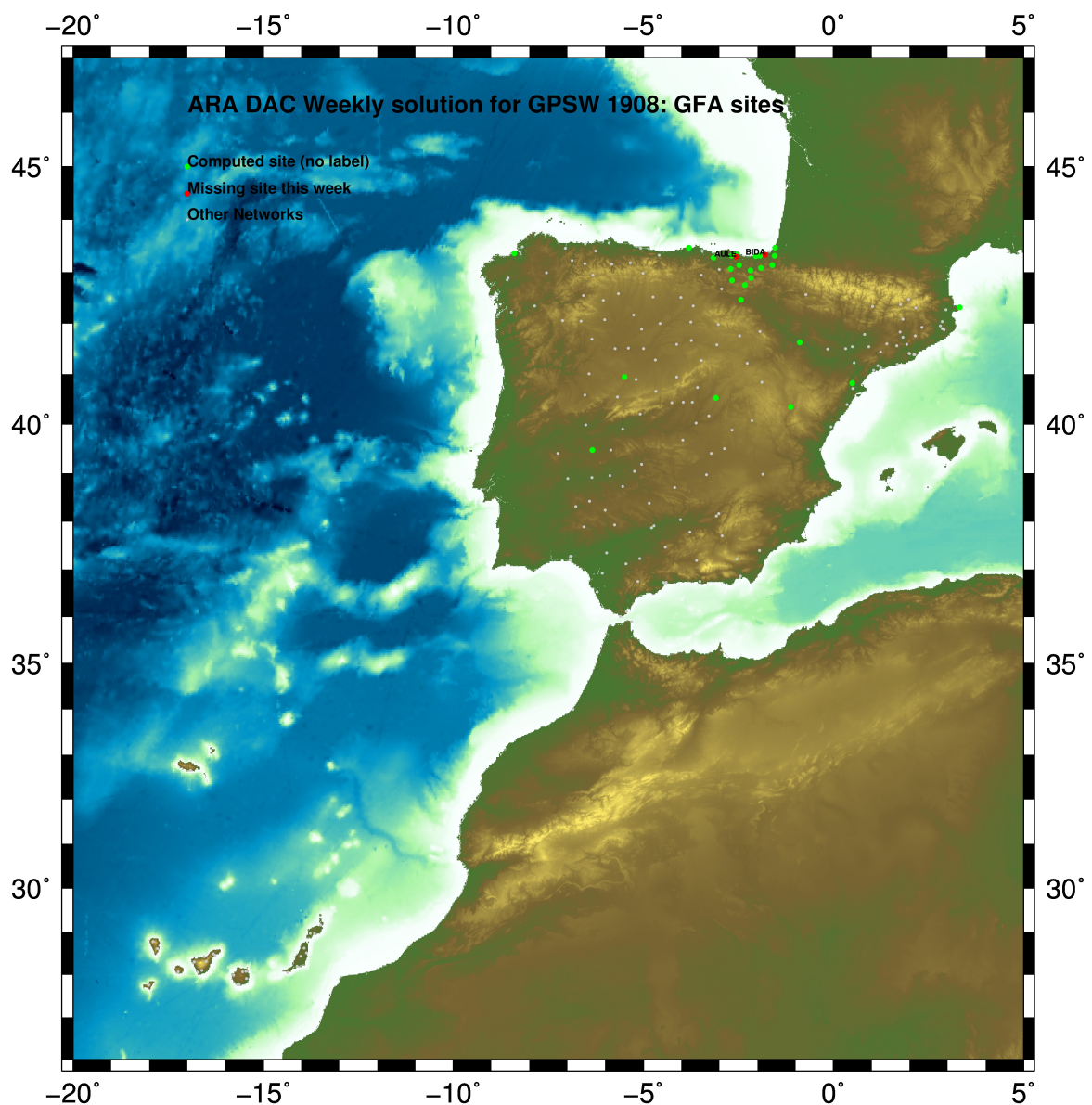
Report generated on 2016/08/14 at 13:09:31



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 2016 Aug 14 13:09:22

Fig.1: Computed Sites for GPS Week1908 (GFA)

3 Main Computation Parameters

The main parameters considered in the ARA analysis follow strictly the EPN recommendations.

- Reprocessing: 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
- Modelled observable: Double differences of carrier phase in QIF or L_3 combinations (respectively for ambiguity resolution in baseline mode, and final network solution). In the final network solution the double differenced data are sampled at 180 sec. intervals.
- Ground antenna phase center calibrations: Group APCV used from the PCV_COD.I08 file and individual calibrations from EPNC_08.ATX. EPN_A class sites (CRD + VEL) IGB08 used to define the reference frame. If individual calibrations, other from these, are available, they are also included in the analysis.
- Troposphere:
 - 3 deg elev. cutoff; elevation dependent weighting
 - VMF1_DRY mapping function. ZPD parameters are estimated using WET 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: 3σ 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 Wideline (WL) AR for baselines shorter than 6000km, a Melbourne-Wuebbena wide-lane and narrow-lane AR is computed.
 - Phase-Based Wideline (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 IGB08

The Reference Frame considered in this section is IGB08, release C1890.

```

ARA LAC 1908 WEEK COMBINATION: PRECISE ORBITS                               14-AUG-16 12:01
-----
LOCAL GEODETIC DATUM: IGB08                EPOCH: 2016-08-03 12:00:00
-----
NUM STATION NAME      X (M)      Y (M)      Z (M)      FLAG
-----
 1 ACDR 13434M001     4594489.58960  -678367.50804  4357066.25731  W
 22 ALDA 19383M001     4687280.19137  -190876.62080  4308106.92603  A
 28 ALSA 19419M001     4677250.87426  -176770.44950  4319079.84588  A
 51 BIAZ 10074M002     4634456.09656  -124345.03370  4365785.43208  A
 54 BRZR 19387M001     4662221.02134  -220769.95420  4333309.40701  A
 7 CACE 13447M001     4899866.52940  -544567.09009  4033770.17206  W
 8 CANT 13438M001     4625924.34581  -307096.28826  4365771.52694  W
 69 CHER 00000M000     4645880.35549  -125721.98065  4353624.34490  A
 11 CREU 13432M001     4715420.16509  273178.00502  4271946.80995  A
 12 EBRE 13410M001     4833520.02019  41537.33773  4147461.68407  W
 77 ELGE 19353S001     4657557.43546  -202241.52792  4338991.84135  A
 87 GERN 19389M001     4642811.34163  -217222.98789  4353278.85486  A
 101 IGEL 19352S001     4645951.46383  -165574.55660  4352550.39121  A
 105 ISPS 19484M001     4640596.51732  -206963.83046  4356391.88463  A
 109 LAZK 19354S001     4666098.37634  -178186.24585  4330463.64597  A
 112 LEIT 19428M001     4663520.96803  -155858.77145  4334519.85176  A
 141 ORDN 19427M001     4659695.62383  -130864.78973  4338948.85994  A
 146 PAS2 19351S001     4644909.09234  -156645.12291  4353623.04856  A
 147 PASA 19351S001     4644909.09391  -156645.12292  4353623.04947  A
 27 RID1 13448M002     4708446.85869  -199490.33818  4284089.70879  W
 28 SALA 13469M001     4803054.51050  -462131.12338  4158379.04555  W
 172 SOPU 19386M001     4643997.94042  -255913.96079  4350063.11284  A
 31 TERU 13487M001     4867391.35051  -95523.40825  4108341.65394  W
 204 VITO 19385M001     4679397.73195  -218436.56039  4314898.33391  A
 35 YEBE 13420M001     4848724.59484  -261631.98439  4123094.29767  W
 36 ZARA 13462M001     4773803.20025  -73506.03627  4215454.06726  W
    
```

5.2 ETRS89 Coordinates

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

```

ETRF2000 COORD. wk 1908                               14-AUG-16 12:01
-----
LOCAL GEODETIC DATUM: ETRF2000            EPOCH: 2016-08-03 12:00:00
-----
NUM STATION NAME      X (M)      Y (M)      Z (M)      FLAG
-----
 1 ACDR 13434M001     4594489.86923  -678367.99324  4357065.87207  W
 22 ALDA 19383M001     4687280.51968  -190877.11400  4308106.53986  A
 28 ALSA 19419M001     4677251.20476  -176770.94172  4319079.46055  A
 51 BIAZ 10074M002     4634456.43556  -124345.52175  4365785.05025  A
 54 BRZR 19387M001     4662221.34807  -220770.44510  4333309.02223  A
 7 CACE 13447M001     4899866.80283  -544567.60378  4033769.76739  W
 8 CANT 13438M001     4625924.66543  -307096.77590  4365771.14369  W
 69 CHER 00000M000     4645880.69358  -125722.46978  4353623.96227  A
 11 CREU 13432M001     4715420.54027  273177.51047  4271946.42687  A
 12 EBRE 13410M001     4833520.36298  41536.83140  4147461.29040  W
 77 ELGE 19353S001     4657557.76451  -202242.01834  4338991.45709  A
 87 GERN 19389M001     4642811.66999  -217223.47694  4353278.47144  A
 101 IGEL 19352S001     4645951.79762  -165575.04584  4352550.00814  A
 105 ISPS 19484M001     4640596.84697  -206964.31928  4356391.50147  A
 109 LAZK 19354S001     4666098.70740  -178186.73702  4330463.26139  A
 112 LEIT 19428M001     4663521.30172  -155859.26233  4334519.46760  A
 141 ORDN 19427M001     4659696.16045  -130865.28018  4338948.47631  A
 146 PAS2 19351S001     4644909.42715  -156645.61202  4353622.66566  A
 147 PASA 19351S001     4644909.42872  -156645.61203  4353622.66657  A
 27 RID1 13448M002     4708447.18457  -199490.83339  4284089.32108  W
 28 SALA 13469M001     4803054.80057  -462131.62795  4158378.64845  W
 172 SOPU 19386M001     4643998.26448  -255914.45003  4350062.72891  A
 31 TERU 13487M001     4867391.67631  -95523.91811  4108341.25647  W
 204 VITO 19385M001     4679398.05777  -218437.05290  4314897.94798  A
 35 YEBE 13420M001     4848724.90396  -261632.49288  4123093.89966  W
 36 ZARA 13462M001     4773803.53515  -73506.53732  4215453.67644  W
    
```

5.3 Mean and Daily Repeatabilities

In this section, the mean and daily repeatabilities of the sites are shown. Repeatabilities refer to the IGB08 solution and are given with respect the Local fram (North-East-Up).

```

ARA LAC 1908 WEEK COMBINATION: PRECISE ORBITS                               14-AUG-16 12:01
-----
Station      #Days  Weekday  Repeatability (mm)
-----
ACDR 13434M001  7  XXXXXXX  1.41  1.17  3.93
    
```


LOCAL GEODETIC DATUM: Igb08
 RESIDUALS IN LOCAL SYSTEM (NORTH, EAST, UP)

NUM	NAME	FLG	RESIDUALS IN MILLIMETERS		
1	ACOR 13434M001	I W	-1.99	-0.20	-0.79
2	ALAC 13433M001	I W	1.08	1.27	0.66
3	ALBA 13452M001	I W	-0.29	1.34	-0.03
4	ALME 13437M001	I W	-0.47	0.46	5.11
6	BRST 10004M004	I W	1.22	-1.38	0.60
7	CACE 13447M001	I W	0.28	0.47	1.11
8	CANT 13438M001	I W	-0.52	-0.10	-2.62
9	CEU1 13449M002	I W	1.79	2.38	8.48
10	COBA 13453M001	I W	1.02	-0.50	-4.39
12	EBRE 13410M001	I W	1.22	-1.43	1.98
14	FUNC 13911S001	I W	-0.81	1.66	1.36
16	HUEL 13451M001	I W	0.12	0.58	1.26
17	IZAN 31309M002	I W	-3.43	1.67	2.79
18	LLIV 13436M001	I W	3.88	-2.18	-3.87
19	LPAL 81701M001	I W	-2.77	0.05	-0.52
20	LROC 10023M001	I W	1.85	-2.03	-2.06
21	MALA 13443M001	I W	-2.97	1.81	-2.36
22	MALL 13444M001	I W	0.07	-0.97	-1.53
24	MELI 19379M001	I W	-0.78	-1.18	-4.11
25	PDEL 31906M004	I W	-1.02	-2.81	4.23
26	RABT 35001M002	I W	0.31	1.00	0.96
27	RIO1 13448M002	I W	-0.33	0.97	-5.49
28	SALA 13469M001	I W	-0.49	-0.77	0.66
29	SCOA 10088M002	I W	0.47	-1.12	-5.55
30	SONS 13446M001	I W	-1.94	-1.11	-3.87
31	TERU 13487M001	I W	2.42	0.97	-0.69
32	VALE 13439M001	I W	-1.22	0.40	0.89
33	VIGO 13450M001	I W	-0.09	0.25	0.18
34	VILL 13406M001	I W	0.31	1.90	0.50
35	YEBE 13420M001	I W	0.97	0.54	3.50
36	ZARA 13462M001	I W	0.51	-2.06	-0.59
37	ZIMM 14001M004	I W	1.62	0.11	4.19
	RMS / COMPONENT		1.58	1.35	3.18
	MEAN		-0.00	-0.00	0.00
	MIN		-3.43	-2.81	-5.55
	MAX		3.88	2.38	8.48

NUMBER OF PARAMETERS : 3
 NUMBER OF COORDINATES : 96
 RMS OF TRANSFORMATION : 2.19 NM

5.5 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          8796550
NUMBER OF UNKNOWN               134083
NUMBER OF DEGREES OF FREEDOM    8662467
PHASE MEASUREMENTS SIGMA        0.00100
SAMPLING INTERVAL (SECONDS)      180
VARIANCE FACTOR                  2.264358228909288

Helmert Transformation Parameters With Respect to Combined Solution:
-----
Sol  Rms (m)      Translation (m)      Rotation (")      Scale (ppm)
      X          Y          Z          X          Y          Z
-----
 1  0.00216    -0.0107 -0.0028  0.0141  -0.0001 -0.0006 -0.0002  -0.00017
 2  0.00219     0.0027  0.0015 -0.0009  0.0000  0.0001  0.0001  -0.00026
 3  0.00242    -0.0122 -0.0054  0.0129  0.0001 -0.0006 -0.0002  0.00021
 4  0.00332     0.0001 -0.0339 -0.0005  0.0007  0.0000 -0.0009  -0.00038
 5  0.00180     0.0129 -0.0139 -0.0095  0.0003  0.0005 -0.0003  -0.00078
 6  0.00227    -0.0212 -0.0410  0.0294  0.0007 -0.0012 -0.0011  -0.00055
 7  0.00240    -0.0218 -0.0515  0.0254  0.0010 -0.0011 -0.0014  -0.00012
```

```
Statistics of individual solutions:
-----
File  RMS (m)      DOF  Chi**2/DOF  #Observations authentic / pseudo  #Parameters explicit / implicit / singular
-----
 1  0.00154    1240567    2.36          1260097      3          573      18960      0
 2  0.00145    1249713    2.10          1269389      3          576      19103      0
 3  0.00147    1250566    2.17          1270952      3          576      19813      0
 4  0.00154    1231060    2.37          1250365      3          570      18738      0
 5  0.00157    1231034    2.45          1250934      3          570      19333      0
 6  0.00150    1220898    2.24          1239966      3          567      18504      0
 7  0.00145    1235227    2.11          1254847      3          567      19056      0
```

6 Equipment

6.1 Receiver List

Serial numbers not shown.

```
*SITE PT SOLN T DATA_START__ DATA_END____ DESCRIPTION_____ S/N__ FIRMWARE__
ACOR  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200PRO -----
ALDA  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
ALSA  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200GGPRO -----
BIAZ  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200GGPRO -----
BRZR  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
CACE  A  1 P 16:213:00000 16:219:86370 TRIMBLE NETR9 -----
CANT  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
CHER  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200+GNSS -----
CREU  A  1 P 16:213:00030 16:219:86370 LEICA GR25 -----
EBRE  A  1 P 16:213:00000 16:219:86370 TRIMBLE NETR9 -----
ELGE  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
GERN  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
IGEL  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
ISPS  A  1 P 16:213:00000 16:219:86370 TRIMBLE NETR9 -----
LAZK  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
LEIT  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200+GNSS -----
ORON  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200GGPRO -----
PAS2  A  1 P 16:213:00000 16:219:86370 TPS NET-G3A -----
PASA  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
RIO1  A  1 P 16:213:00000 16:219:86370 LEICA GR25 -----
SALA  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200+GNSS -----
SOPU  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
TERU  A  1 P 16:213:00000 16:219:86370 LEICA GRX1200GGPRO -----
VITO  A  1 P 16:213:00000 16:219:86370 LEICA GR10 -----
YEBE  A  1 P 16:213:00000 16:219:86370 TRIMBLE NETR9 -----
ZARA  A  1 P 16:213:00000 16:219:86370 TRIMBLE NETR9 -----
```

6.2 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 16:213:00000 16:219:86370 LEIAT504      LEIS -----
ALDA  A  1 P 16:213:00000 16:219:86370 LEIAS10       NONE -----
ALSA  A  1 P 16:213:00000 16:219:86370 LEIAX1202GG  NONE -----
BIAZ  A  1 P 16:213:00000 16:219:86370 LEIAR25      LEIT -----
BRZR  A  1 P 16:213:00000 16:219:86370 LEIAS10       NONE -----
CACE  A  1 P 16:213:00000 16:219:86370 TRM29659.00  NONE -----
CANT  A  1 P 16:213:00000 16:219:86370 LEIAR25.R4   LEIT 25066
CHER  A  1 P 16:213:00000 16:219:86370 LEIAX1203+GNSS NONE -----
CREU  A  1 P 16:213:00030 16:219:86370 LEIAR25.R4   NONE 26357
EBRE  A  1 P 16:213:00000 16:219:86370 TRM57971.00  NONE 25503
```



```

ELGE A 1 P 16:213:00000 16:219:86370 LELAR25_R4 LEIT -----
GERN A 1 P 16:213:00000 16:219:86370 LELAS10 NONE -----
IGEL A 1 P 16:213:00000 16:219:86370 LELAR20 LEIM -----
ISPS A 1 P 16:213:00000 16:219:86370 TRM59900.00 SCIS -----
LAZK A 1 P 16:213:00000 16:219:86370 LELAR25_R4 LEIT -----
LEIT A 1 P 16:213:00000 16:219:86370 LELAX1203+GNSS NONE -----
ORON A 1 P 16:213:00000 16:219:86370 LELAX1202GG NONE -----
PAS2 A 1 P 16:213:00000 16:219:86370 LELAR20 LEIM 73034
PASA A 1 P 16:213:00000 16:219:86370 LELAR20 LEIM 73034
RIO1 A 1 P 16:213:00000 16:219:86370 LELAR25_R4 LEIT 25138
SALA A 1 P 16:213:00000 16:219:86370 LELAR25 NONE -----
SOPU A 1 P 16:213:00000 16:219:86370 LELAS10 NONE -----
TERU A 1 P 16:213:00000 16:219:86370 LELAT504GG LEIS -----
VITO A 1 P 16:213:00000 16:219:86370 LELAS10 NONE -----
YEBE A 1 P 16:213:00000 16:219:86370 TRM29659.00 NONE -----
ZARA A 1 P 16:213:00000 16:219:86370 TRM29659.00 NONE -----

```

6.3 Eccentricities

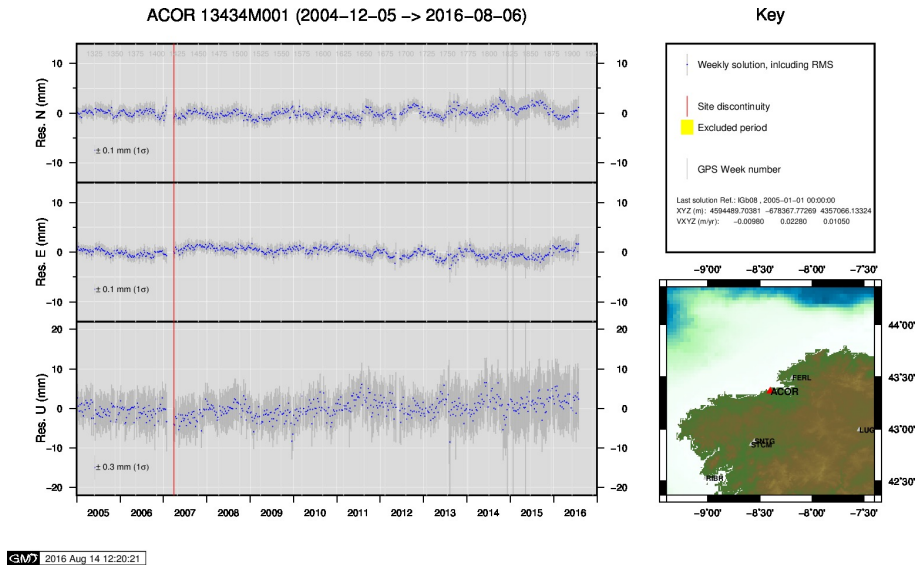
```

*
*SITE PT SOLN T DATA_START__ DATA_END_____ UP_____ NORTH___ EAST_____
*AXE ARP->BENCHMARK(M)-----
ACOR A 1 P 16:213:00000 16:219:86370 UNE 3.0460 0.0000 0.0000
ALDA A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
ALSA A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
BIAZ A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
BRZR A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
CACE A 1 P 16:213:00000 16:219:86370 UNE 0.0600 0.0000 0.0000
CANT A 1 P 16:213:00000 16:219:86370 UNE 3.0490 0.0000 0.0000
CHER A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
CREU A 1 P 16:213:00030 16:219:86370 UNE 0.0770 0.0000 0.0000
EBRE A 1 P 16:213:00000 16:219:86370 UNE 0.0770 0.0000 0.0000
ELGE A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
GERN A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
IGEL A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
ISPS A 1 P 16:213:00000 16:219:86370 UNE 0.0350 0.0000 0.0000
LAZK A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
LEIT A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
ORON A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
PAS2 A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
PASA A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
RIO1 A 1 P 16:213:00000 16:219:86370 UNE 0.0606 0.0000 0.0000
SALA A 1 P 16:213:00000 16:219:86370 UNE 0.0600 0.0000 0.0000
SOPU A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
TERU A 1 P 16:213:00000 16:219:86370 UNE 0.0600 0.0000 0.0000
VITO A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
YEBE A 1 P 16:213:00000 16:219:86370 UNE 0.0000 0.0000 0.0000
ZARA A 1 P 16:213:00000 16:219:86370 UNE 3.2590 0.0000 0.0000

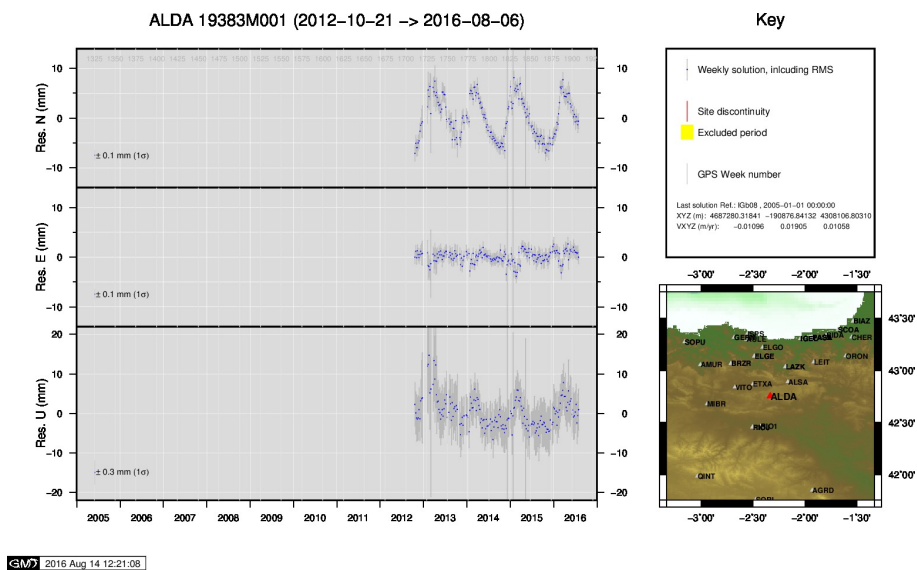
```

7 Cumulative Time Series

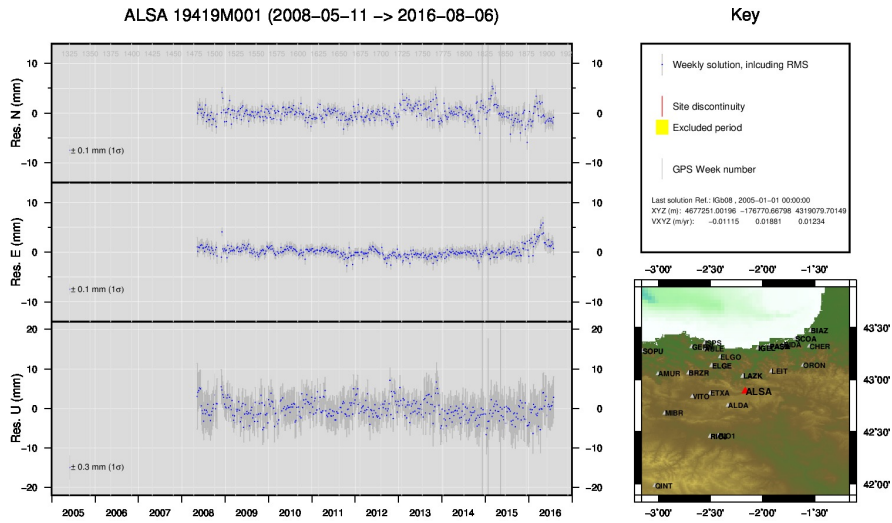
Time series of stations. Latest plots at: <http://geolabpasaia.org/gnss/ARA-net/TSeries/>, or click on the caption of each image.



1) ACOR

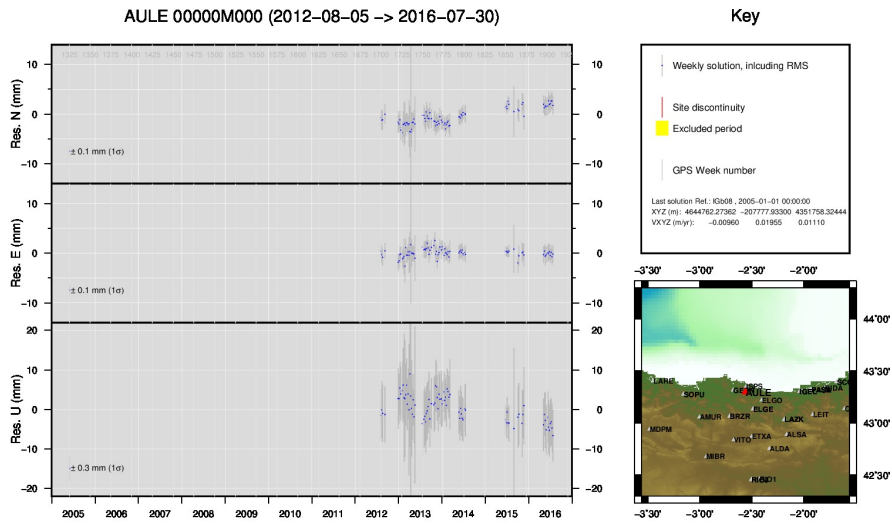


2) ALDA



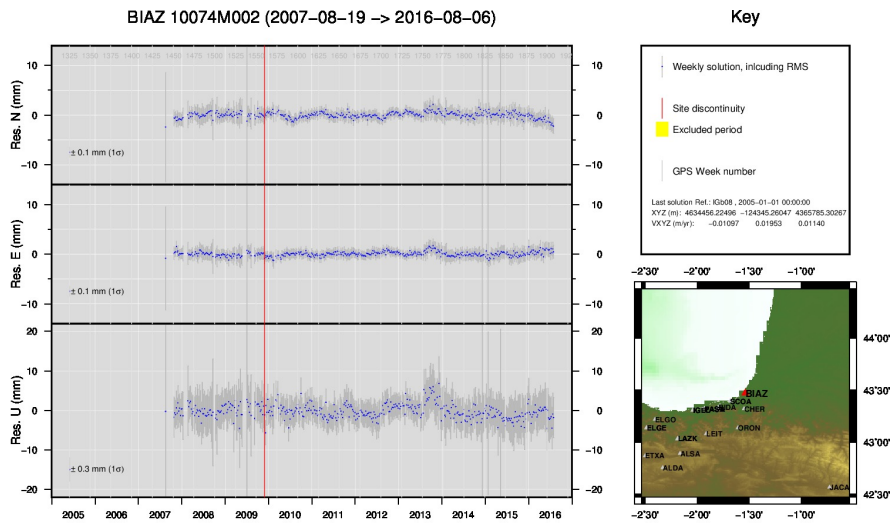
GMW 2016 Aug 14 12:21:48

3) ALSA



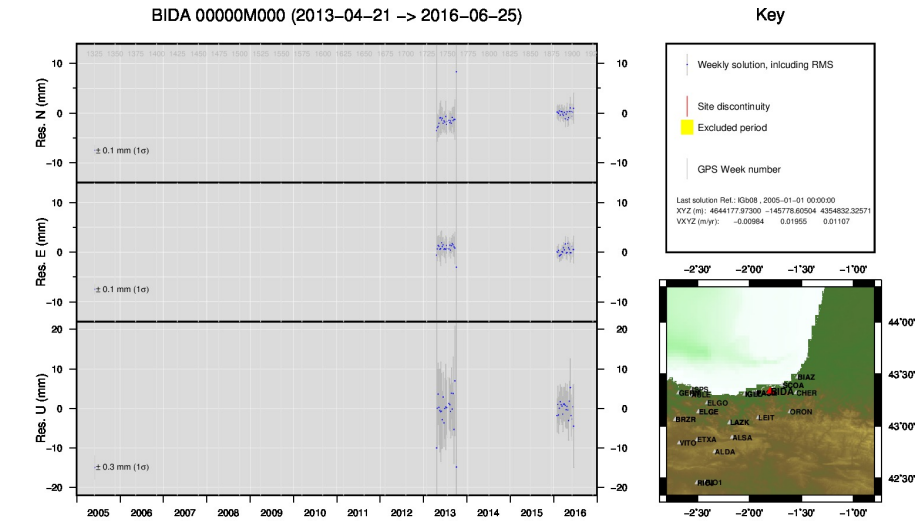
GMW 2016 Aug 14 12:22:52

4) AULE



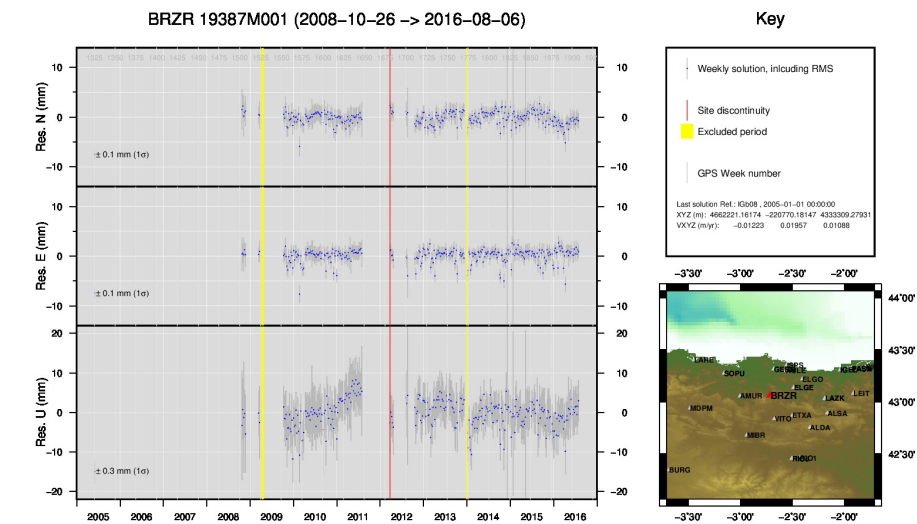
GMW 2016 Aug 14 12:23:54

5) BLAZ



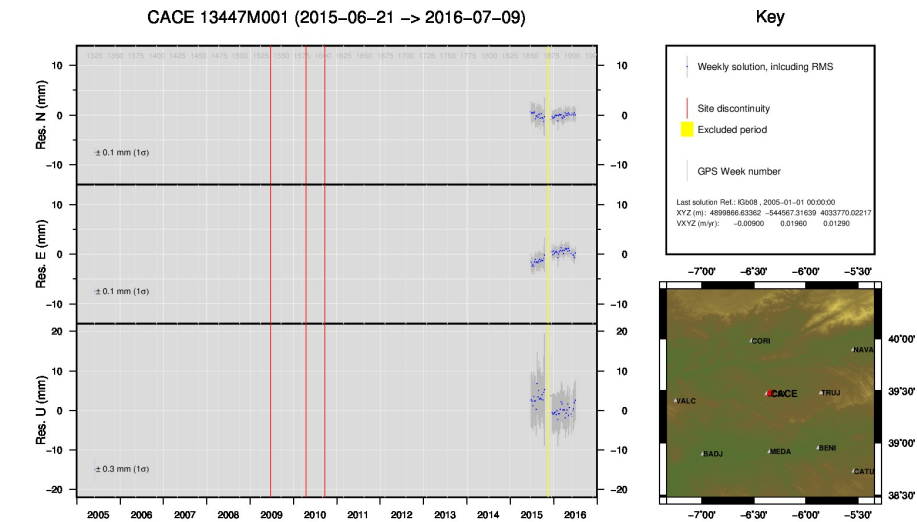
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6) BIDA



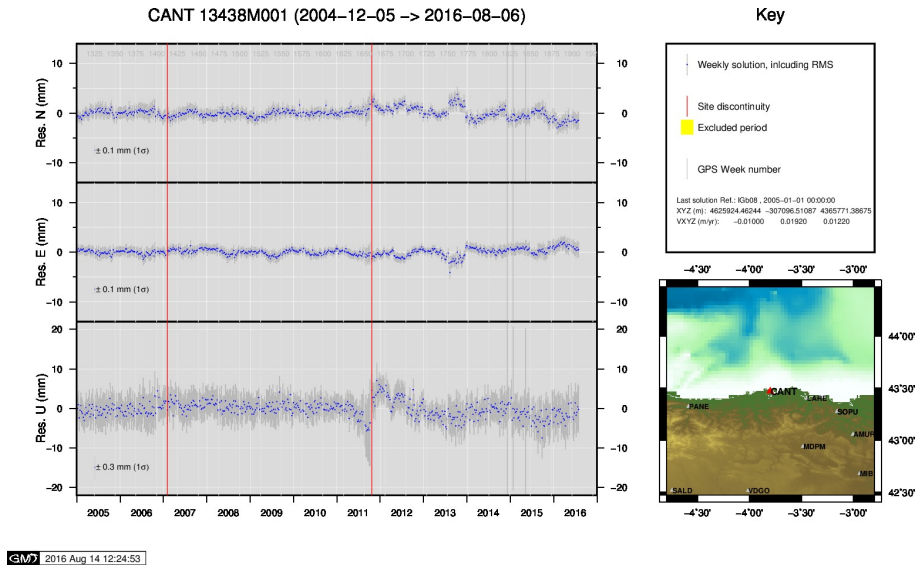
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7) BRZR

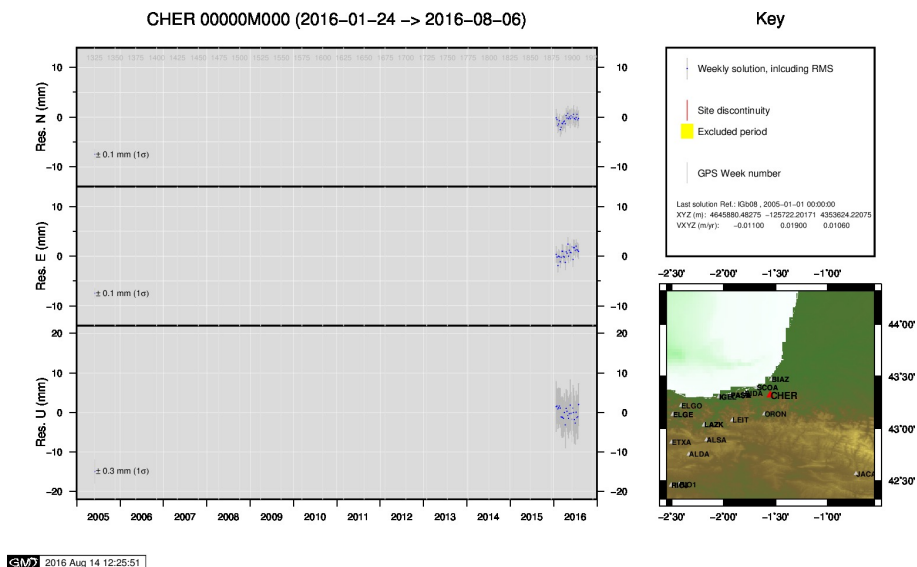


GMW 2016 Jul 18 03:58:15

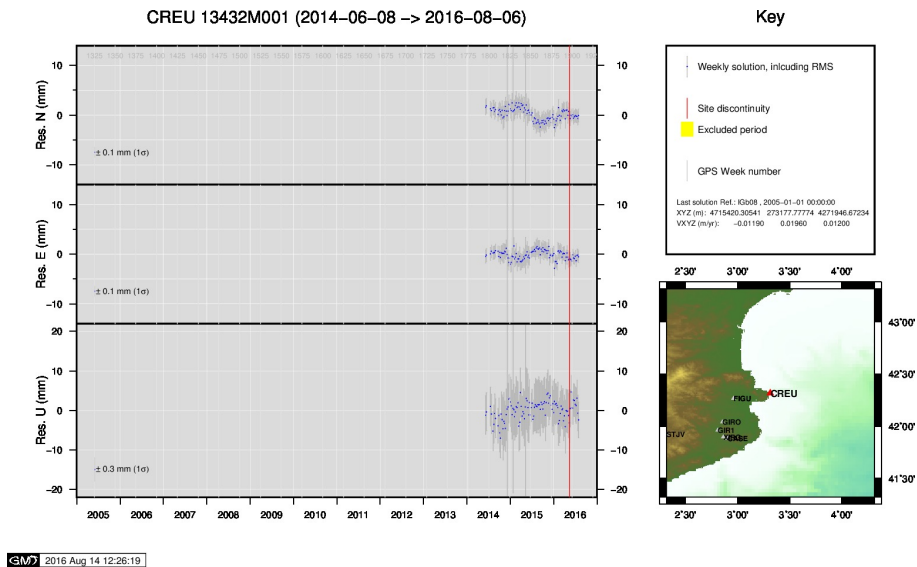
8) CACE



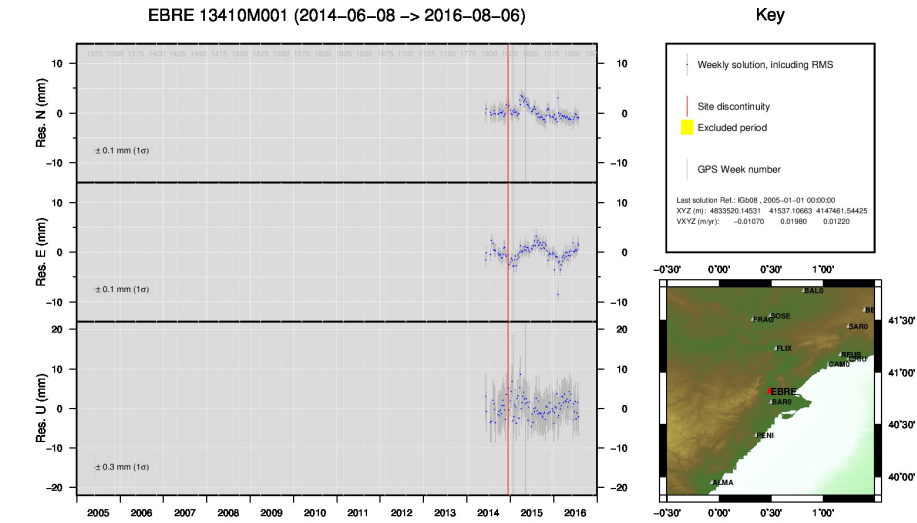
9) CANT



10) CHER

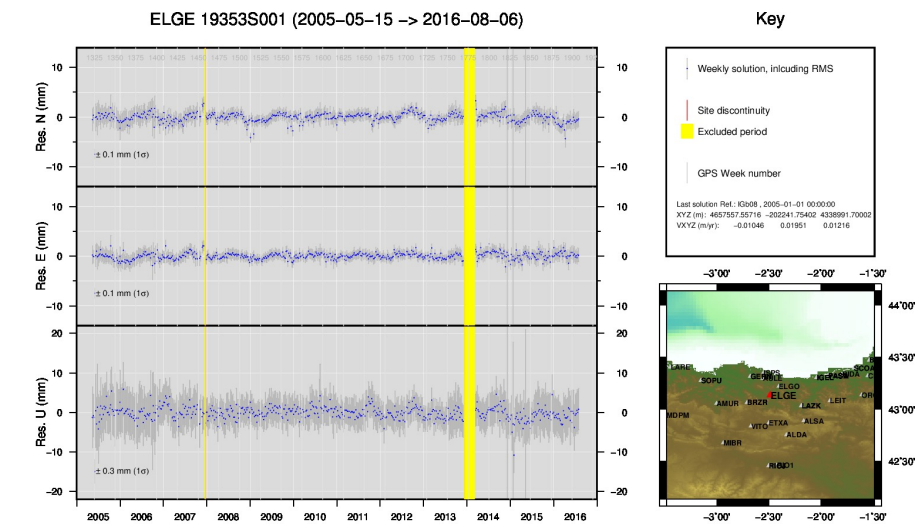


11) CREU



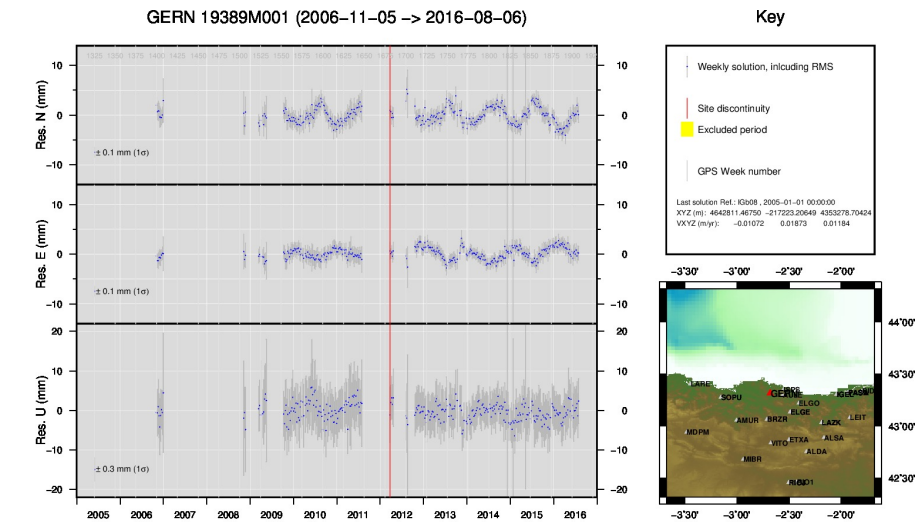
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12) EBRE



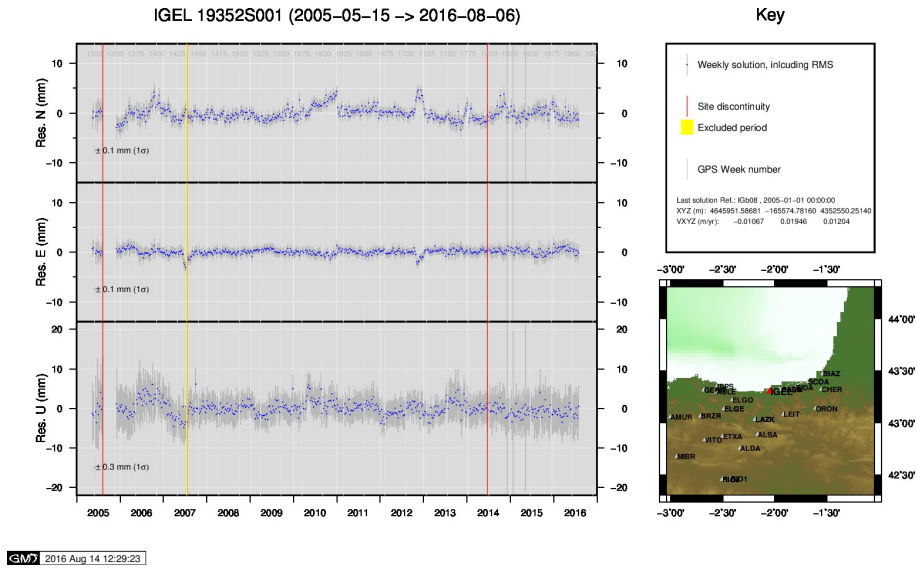
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13) ELGE

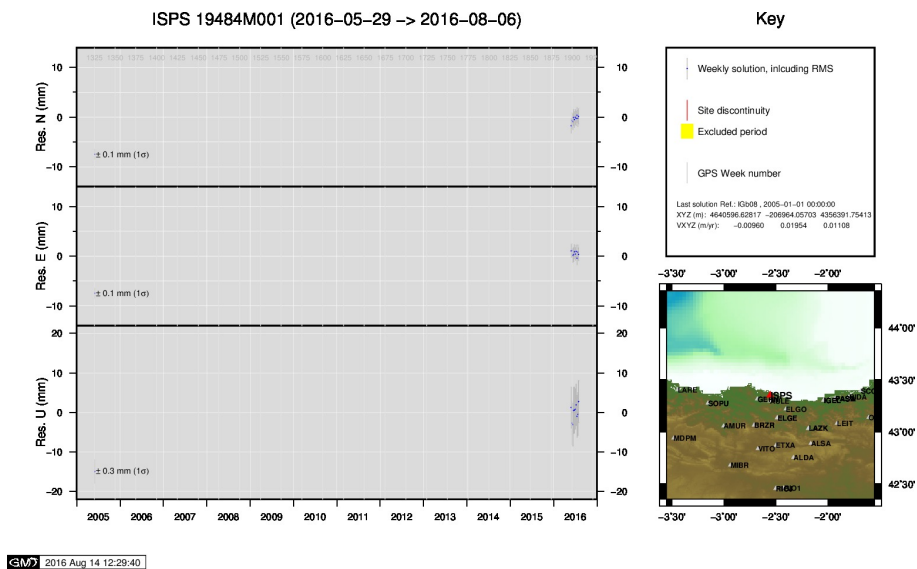


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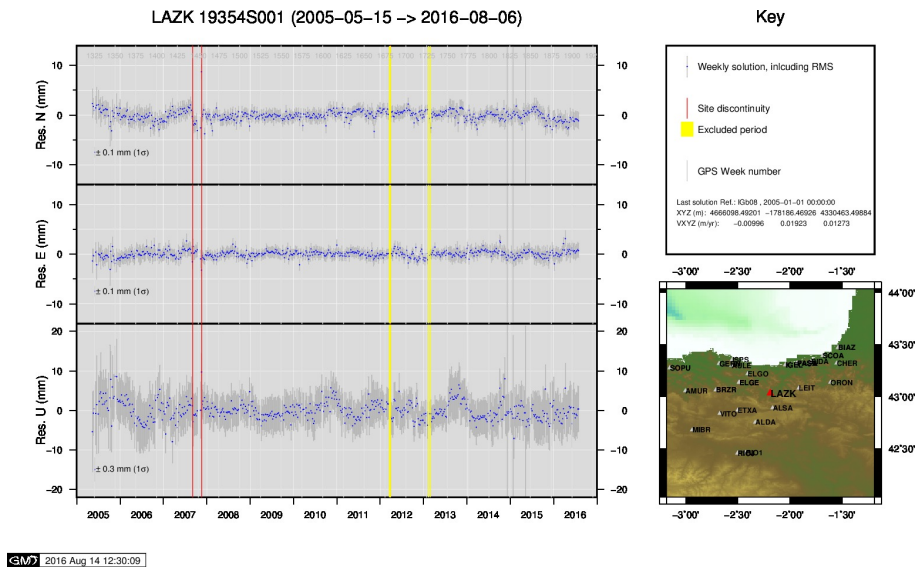
14) GERN



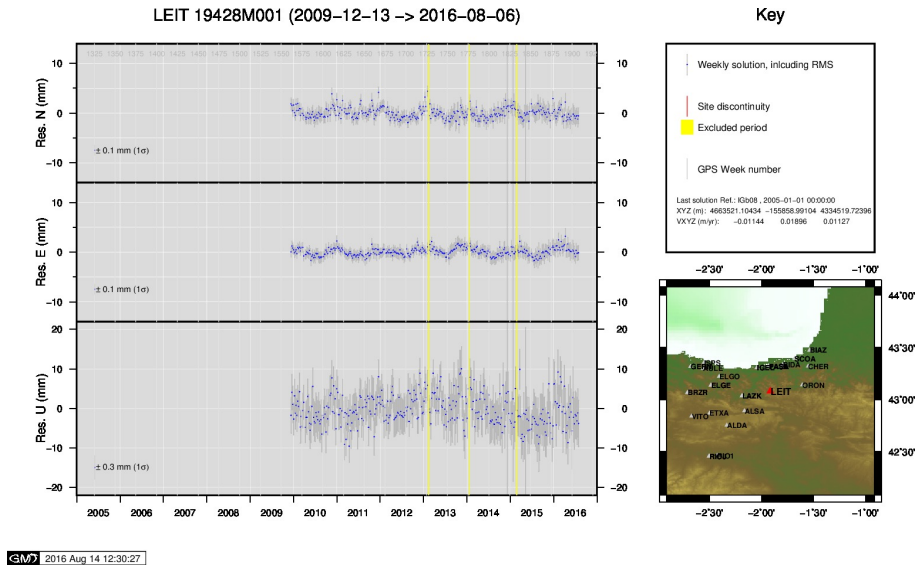
15) IGEL



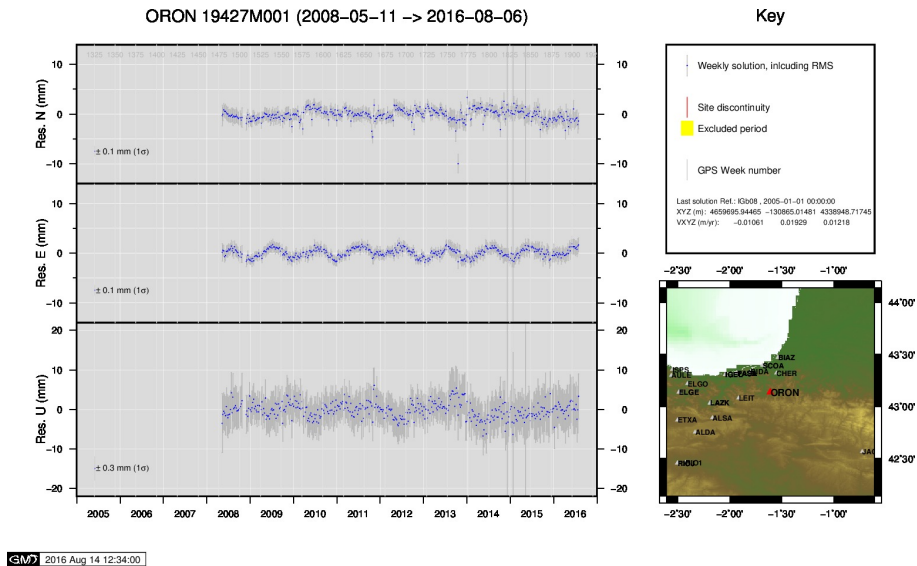
16) ISPS



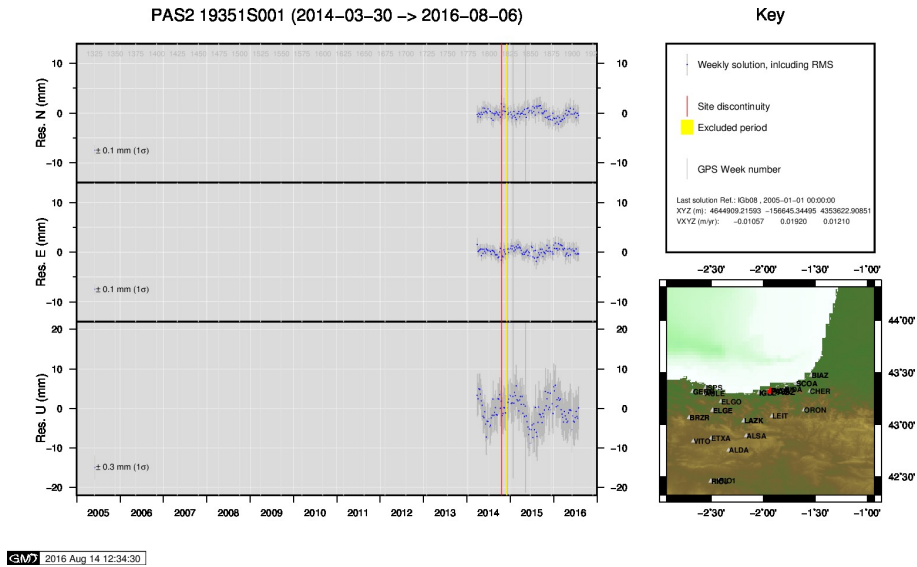
17) LAZK



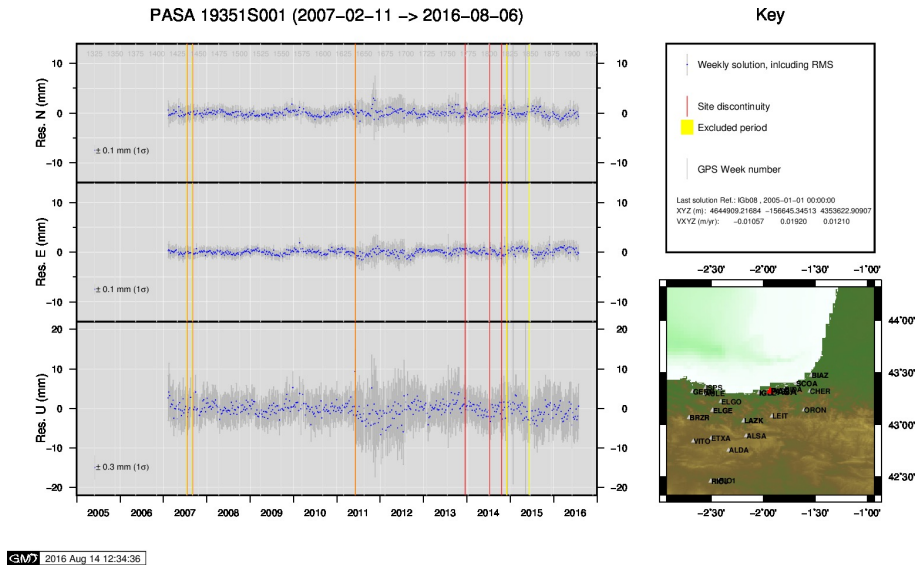
18) LEIT



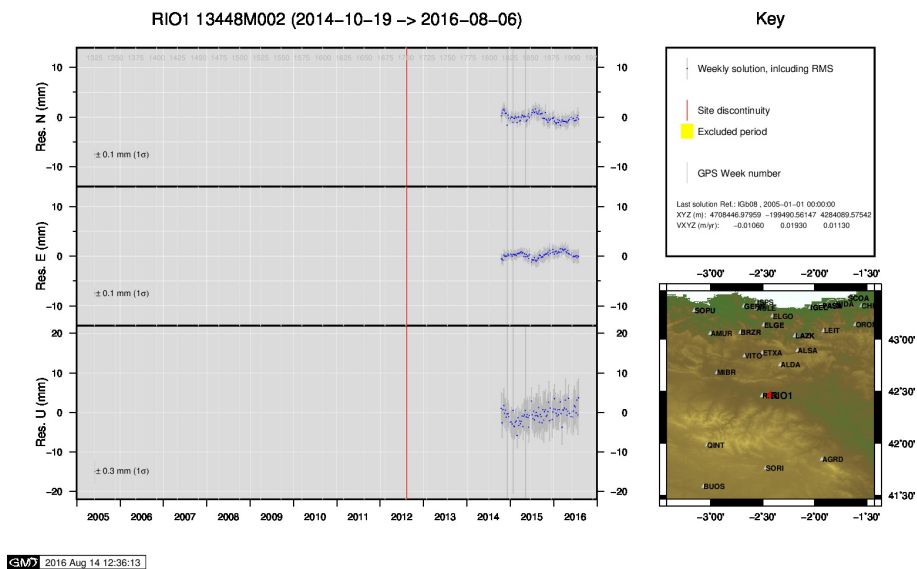
19) ORON



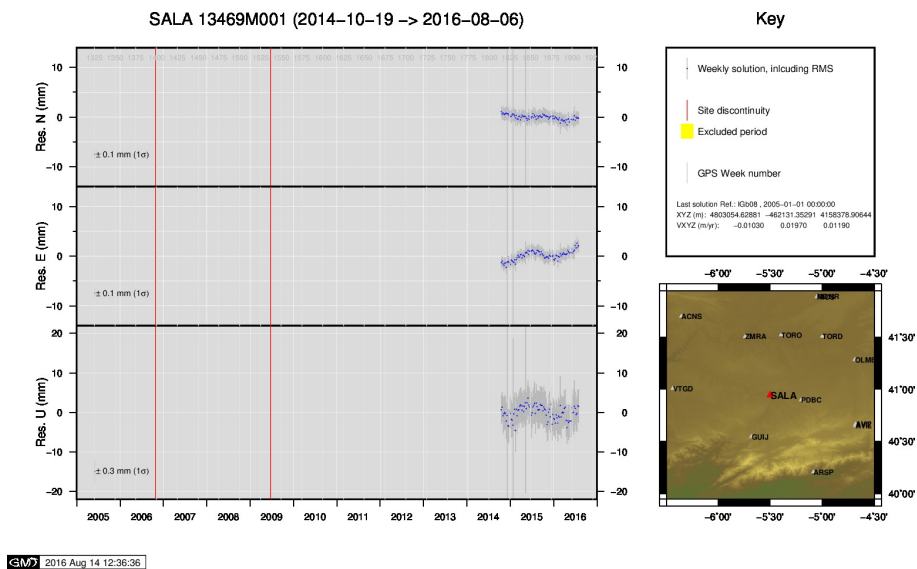
20) PAS2



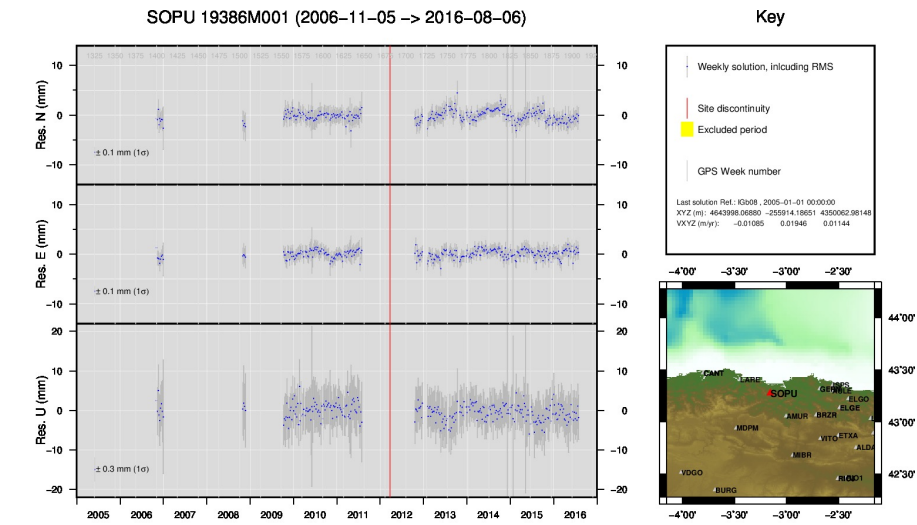
21) PASA



22) RIO1

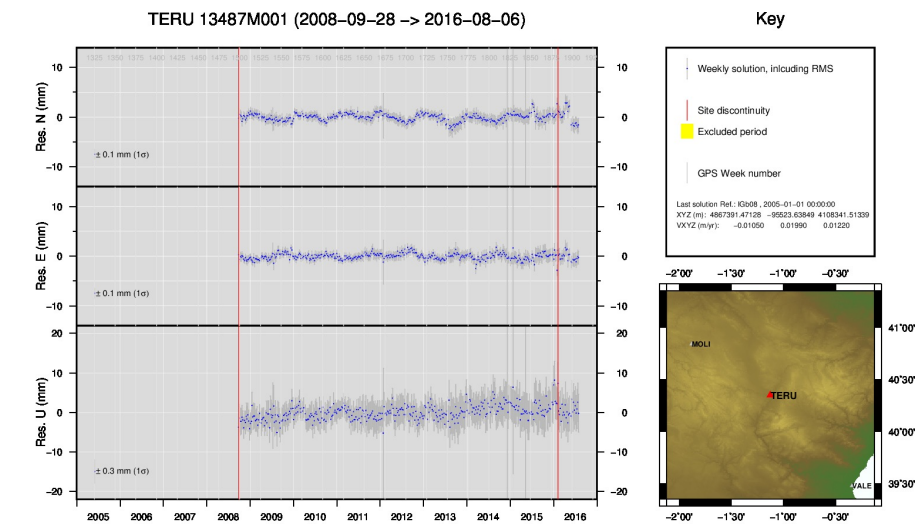


23) SALA



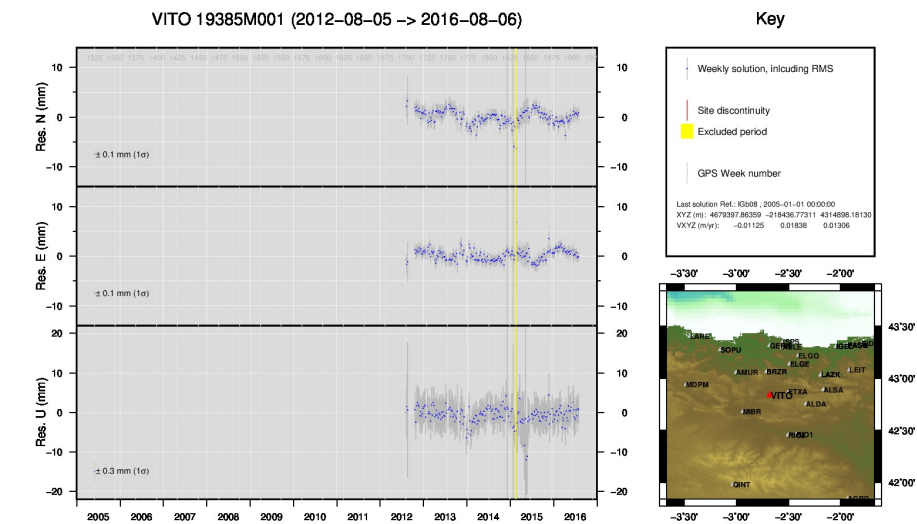
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24) SOPU



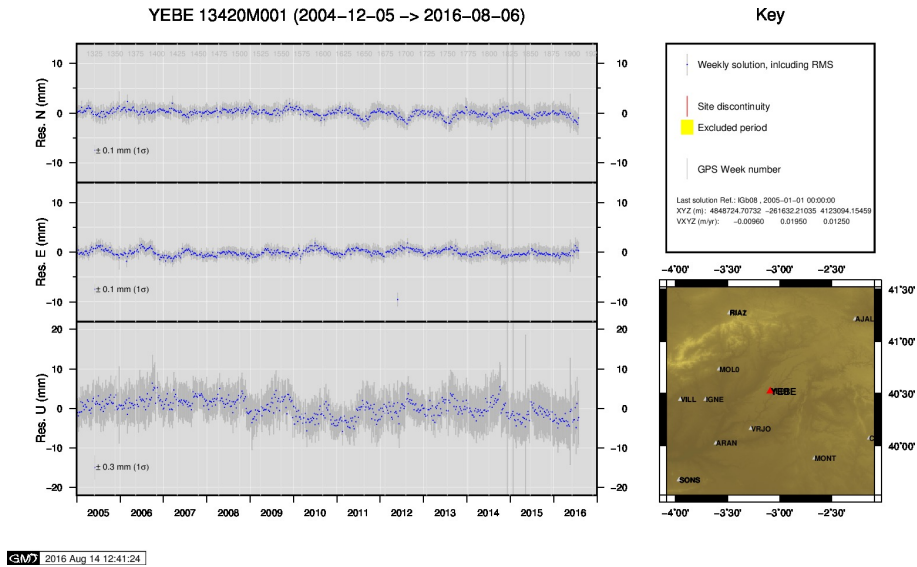
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25) TERU

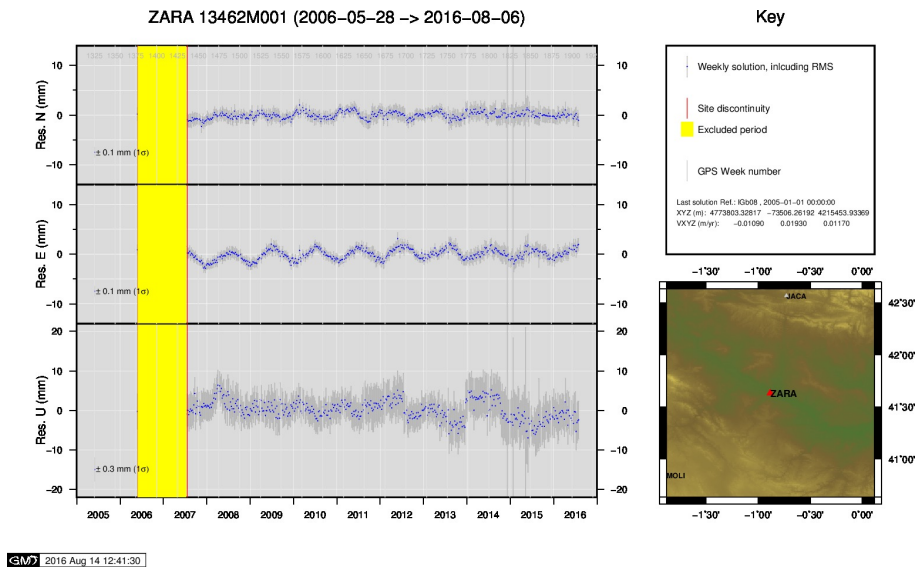


GMW 2016 Aug 14 12:40:50

26) VITO



27) YEBE



28) ZARA