



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

armasuisse
Swiss Federal Office of Topography swisstopo



EUREF-TWG Project: Monitoring of official national ETRF coordinates on EPN web

E. Brockmann



Resolution 3 (Firenze, 2009)

- The IAG Reference Frame Sub-commission for Europe (EUREF)
- *Considering*
 - the importance of ETRS89 and its future maintenance
 - and the importance of the national realisations of ETRS89 in use today
- *invites* the member countries of EUREF to submit coordinates of EPN stations in their national realisation of ETRS89 to the TWG before **September 15, 2009**.

14 countries already contributed to a pilot project



Status

- Autumn, 2009: 18 countries contributed
- Reminder H. Hornik February, 13 to answer resolutions
- Reminder E. Brockmann April, 20 to answer resolutions
- 22 countries contributed
- All counties agreed to publish their coordinates on the EPN web page



Number of EPN sites with official national ETRF coordinates

- Not yet asked (EPN sites)
- Ok: (xx CRD delivered / EPN sites)
- No EPN sites used: (xx CRD delivered / EPN sites)

Greenland: 4
Israel: 2
Jordan: 1
Morocco: 2
Armenia: 1

Official ETRF coordinates:
22 countries
149 sites

plus more site coordinates
(additional national +
outside of the country)

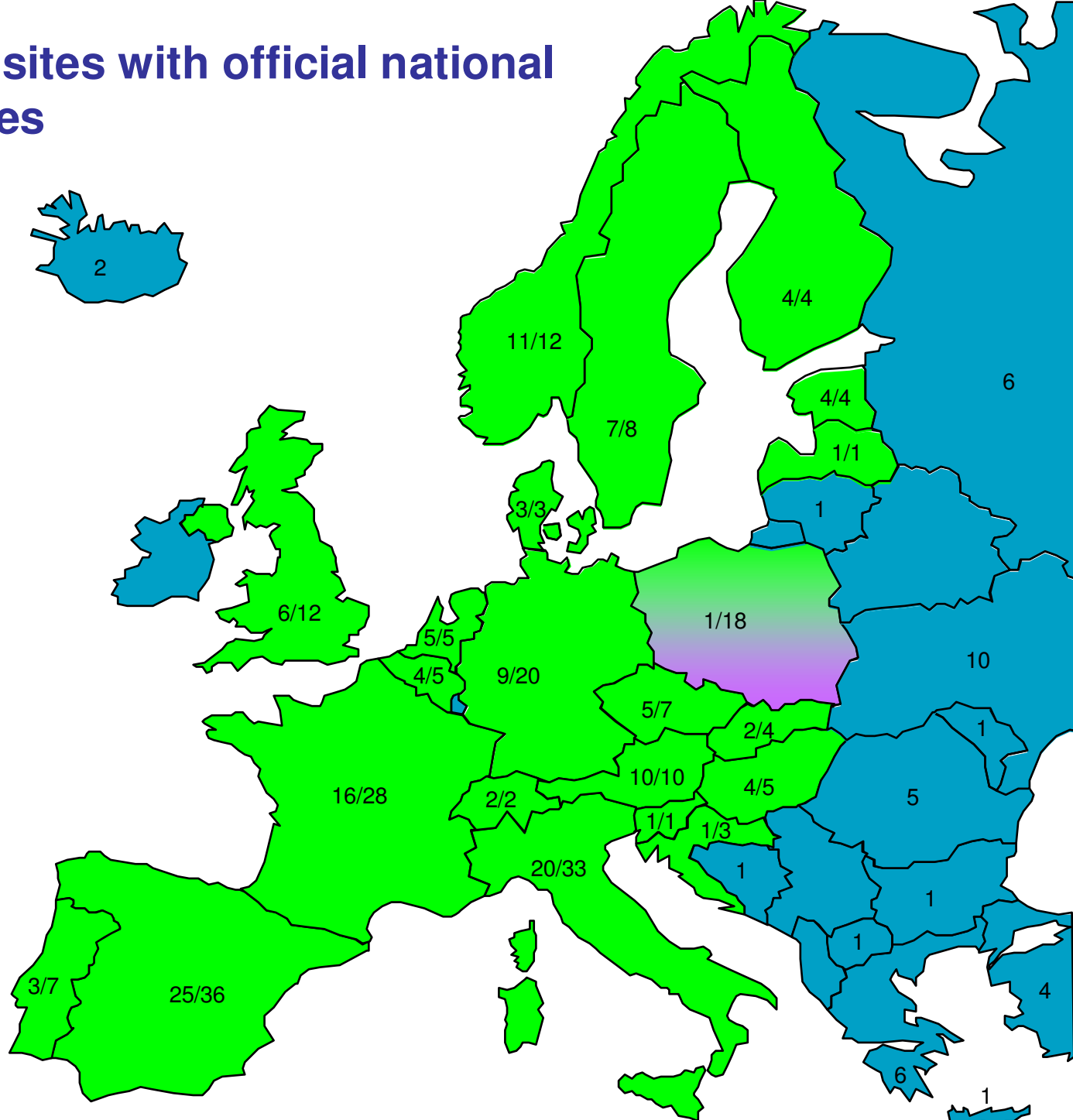
EPN: 40 countries
243 active sites

Status National: 10.5.2010

EPN: 10.5.2010

Monitoring of official national ETRF coordinates on EPN web

Swiss Federal Office of Topography swisstopo





Missing countries

Country	(#ETRF / #EPN)
UKRAINE	(0 / 10)
RUSSIAN FEDERATION	(0 / 6)
GREECE	(0 / 6)
ROMANIA	(0 / 5)
TURKEY	(0 / 4)
GREENLAND	(0 / 4)
ISRAEL	(0 / 2)
ICELAND	(0 / 2)
MOROCCO	(0 / 2)
MOLDOVA, REPUBLIC OF	(0 / 1)
CYPRUS	(0 / 1)
ARMENIA	(0 / 1)
JORDAN	(0 / 1)
MACEDONIA	(0 / 1)
LATVIA	(0 / 1)
BULGARIA	(0 / 1)
BOSNIA AND HERZEGOWINA	(0 / 1)
LITHUANIA	(0 / 1)
countries	Total number of not yet provided stations
17	50

Status: 10.5.2010

Submitted 22 countries:

83 EPN sites without official national ETRF coordinates (yet) or scientific stations



Coordinate web page (beta):

**EUREF Permanent Network**
EUREF HOME
EPN CB HOME

ORGANISATION	TRACKING NETWORK	DATA & PRODUCTS	NEWS & MAILS	FTP & WEB ACCESS
Creation, Management, Structure, Relation to IGS, Projects, Guidelines, FAQ	Maps, Stations, Equipment & calibration, Station coordinates, Site log validation & submission	Data access, Analysis centres, Products, Time series, ETRS89/ITRS transformation, Formats	News, Mails, Calendar, Papers, Workshops, Web site history	Anonymous FTP, Web site index, Related links

[TRACKING NETWORK](#) > [STATIONS](#) > [SITE INFORMATION](#) > MAR6_10405M002

MAR6_10405M002

Site Description

LOCATION

Maartsbo, Sweden



Karte Satellit Gelände

LOG FILE

mar6_20080508.log (current) View

PICTURES



OPERATIONAL CENTRE

LMV

OTHER NETWORKS

IGS, IGS, ECGN

EPN INCLUSION

Since 308/1996 (GPSweek No 0878).

INACTIVITY PERIODS

None

COORDINATES

Published positions/velocities in ITRS and ETRS89

COORDINATES Published positions/velocities in ITRS and ETRS89

http://www.epncb.oma.be/_trackingnetwork/coordinates/stationcoordinates4onestation_elmar.php?station=XXXX



Example page MAR6 (next EPN site to Gävle)

EPN densif.
solution →

1. POSITIONS/VELOCITIES PUBLISHED BY EUREF

EUREF has classified MAR6 (Maartsbo, Sweden) as a **class A station** which means that it can be used as fiducial station for EUREF densifications.

Latest release

EPN_A_ETRF2000_C1570.SSC - EPN_A_ITSF2005_C1570.SSC (March 23, 2010)

ETRF2000	epoch t_0	Position (m)			Velocity (m/y)		
		X	Y	Z	V_X	V_Y	V_Z
308/1996 - 044/2010	001/2005	2998189.743 ± 0.000	931451.611 ± 0.000	5533398.522 ± 0.000	0.0044 ± 0.0000	0.0007 ± 0.0000	0.0066 ± 0.0001

2. POSITIONS/VELOCITIES PUBLISHED BY THE IERS

3. POSITION PUBLISHED WEEKLY IN THE EPN COMBINED SOLUTION

4. POSITIONS PUBLISHED BY THE COUNTRY

The official ETRS89 coordinates used in Sweden are maintained by **LM**. This agency is fully responsible for the information (frame name and coordinates) kindly provided to the EPN:

new →

Frame	Valid (from - to)	epoch t_0	Position (m)			Velocity (m/y)		
			X	Y	Z	V_X	V_Y	V_Z
ETRF97	213/1993 - now	182/1999	2998189.713	931451.589	5533398.474	NA	NA	NA

Following a recent initiative of the EUREF Technical Working Group ([Monitoring of official national ETRF coordinates on EPN web](#)), the differences between the national coordinates and the latest cumulative EPN solutions (section 1) are regularly monitored. They are given in two maps: [[horizontal differences](#)] and [[vertical differences](#)].



Reference solution

1. POSITIONS/VELOCITIES PUBLISHED BY EUREF

EPN reference solutions with frequent updates are provided (Kenyeres, 2009):

- every 15 weeks
- [relative before week 1400] + absolute PCVs
- actually combination is week 1570 (March 23, 2010);
EPN_A_ITRF_C1570.SNX (latest release)

Remarks:

- ITRF2005 -> ETRF2000 using ETRF2000(R05) transformation parameters
- only class-A stations are compared; only most recent station setup is compared; comparison at reference epoch specified by the country



Comparison with EPN reference solution

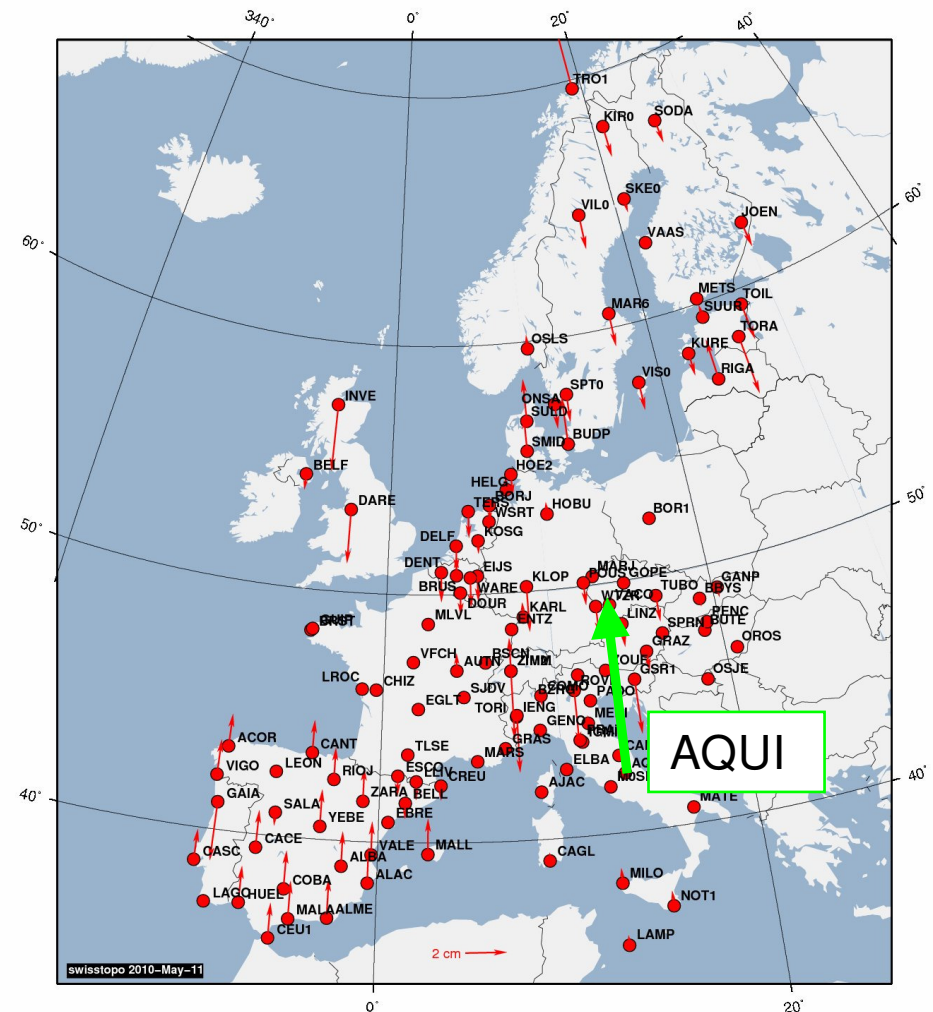
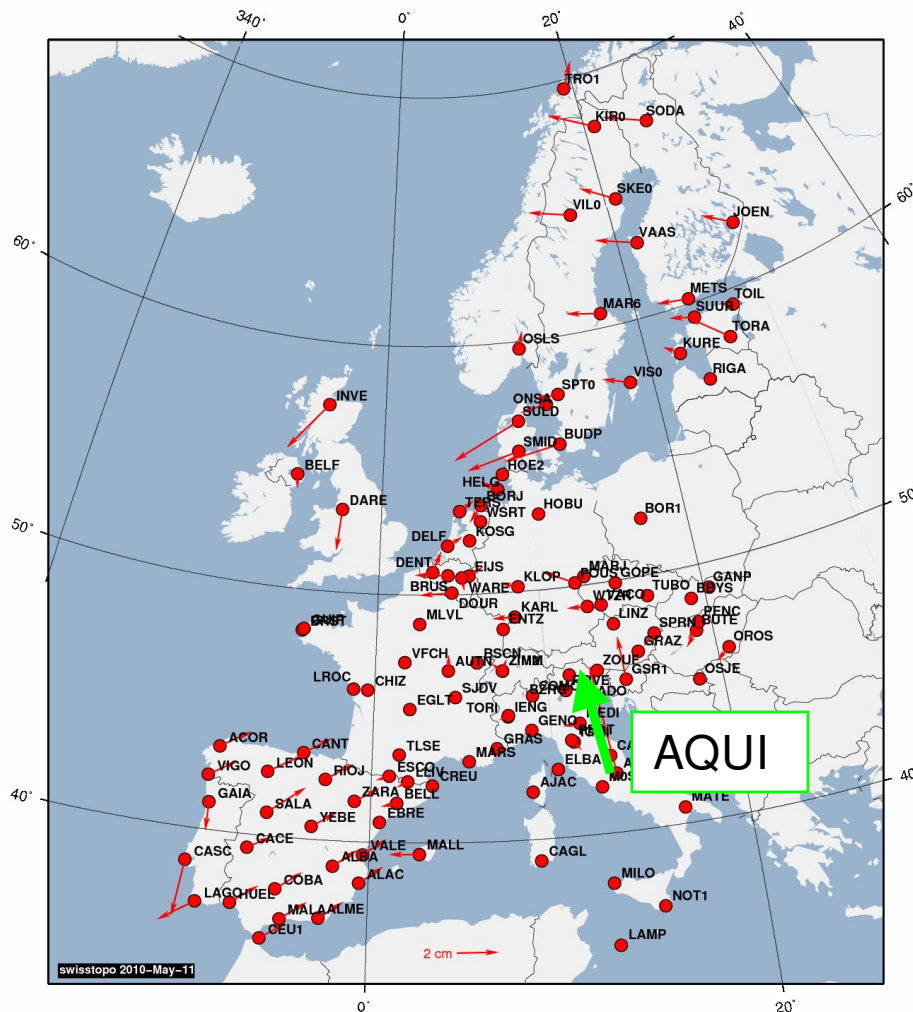
121 stations

22 countries

horizontally

at country
specified epoch

vertically



Results

- Different ETRF realizations very homogeneous realized (1-2 cm horizontally, 1-4 cm vertically)
- AQUILA (Aquila): Abruzzo Earthquake April 2009:
~6 cm horizontally; ~8 cm vertically
 - nice example that EUREF/EPN gives feedback to the countries!
 - official national ETRF coordinates updated May, 21
- Countries with movements w.r.t stable part of Europe:
reference epoch is important (e.g. Scandinavian postglacial rebound; Italy; Greece; ...)



Realized activities

- ✓ • Resolution 3 regarded as completed (Europe almost covered; bigger part of East Europe missing)
 - Countries not yet submitted: please contact us and send information
- ✓ • Beta coordinate web pages are available on the EPN
- ✓ • All countries got a feedback and request to check carefully the information in section 4 (responsible institution, station names, coordinates, reference frame name, epoch).

Countries are responsible for information in section 4



Planned activities

- Activation of the beta web page on the EPN web
- Development of an update mechanism of coordinate changes (e.g. as established with station log). Update feedback at the moment manually.
- Coordinate Monitoring: At present automated check of the coordinates every 15 weeks. In future possibly automated e-mailing in case of bigger differences.



Thanks for your attention

- Acknowledgment
 - 22 contributing countries and national agencies
 - EPN web team for the support

4. POSITIONS PUBLISHED BY THE COUNTRY

The official ETRS89 coordinates used in Sweden are maintained by **LM**. This agency is fully responsible for the information (frame name and coordinates) kindly provided to the EPN:

Frame	Valid (from - to)	epoch t_0	Position (m)			Velocity (m/y)		
			X	Y	Z	V_X	V_Y	V_Z
ETRF97	213/1993 - now	182/1999	2998189.713	931451.589	5533398.474	NA	NA	NA

Following a recent initiative of the EUREF Technical Working Group ([Monitoring of official national ETRF coordinates on EPN web](#)), the differences between the national coordinates and the latest cumulative EPN solutions (section 1) are regularly monitored. They are given in two maps: [[horizontal differences](#)] and [[vertical differences](#)].





Frame names

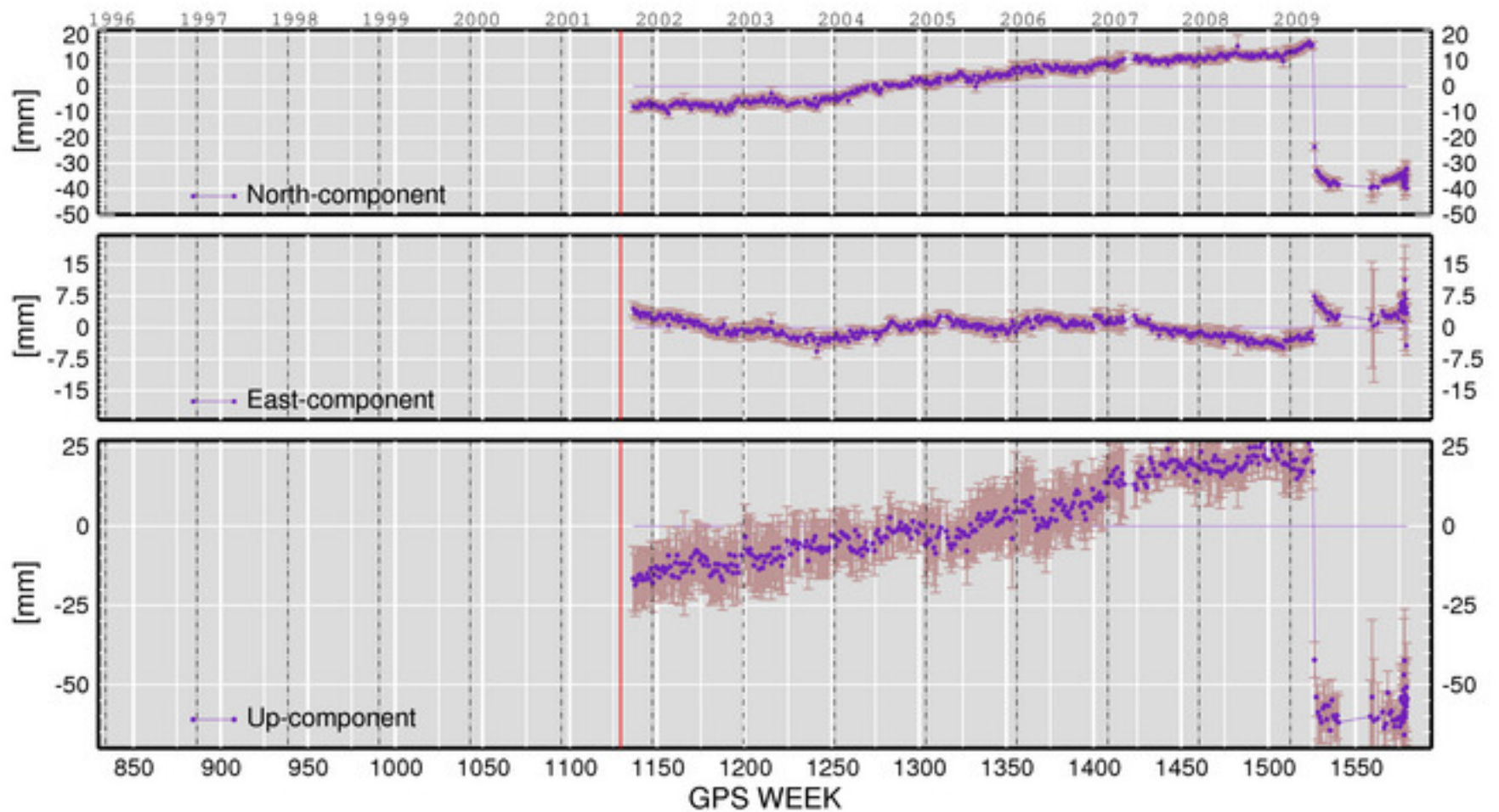
COU	Frame Name

AUT	ETRF00
BEL	ETRF2000
CHE	ETRF93
CZE	ETRF2000(R05), ETRF89
DEU	ETRS89
DNK	ETRF92
ESP	ETRF2005
EST	ETRF96
FIN	ETRF96
FRA	ETRF2000(R05)
GBR	ETRF97
HRV	ETRF2000(R05)
HUN	ETRF00
ITA	ETRF2000
LVA	ETRF2000
NLD	ETRF2000
NOR	ETRF97
POL	ETRF2000(R05)
PRT	ETRF97
PRT	ETRF97
SVK	ETRF2000
SVN	ETRF05
SWE	ETRF97

```
$countryframes = array(  
    'ETRF2000(R05)' => 'ETRF2000(R05)',  
    'ETRF2000' => 'ETRF2000',  
    'ETRF00' => 'ETRF00',  
    'ETRF2005' => 'ETRF05',  
    'ETRF05' => 'ETRF05',  
    'ETRF92' => 'ETRF92',  
    'ETRF93' => 'ETRF93',  
    'ETRF96' => 'ETRF96',  
    'ETRF97' => 'ETRF97',  
    'ETRS89' => 'ETRS89',  
    'ETRF89' => 'ETRF89',  
    'ETRF05(R05)' => 'ETRF05(R05)',  
);
```

No “translation”, because
responsibility is by the countries

AQUI_12757M001 (RAW)

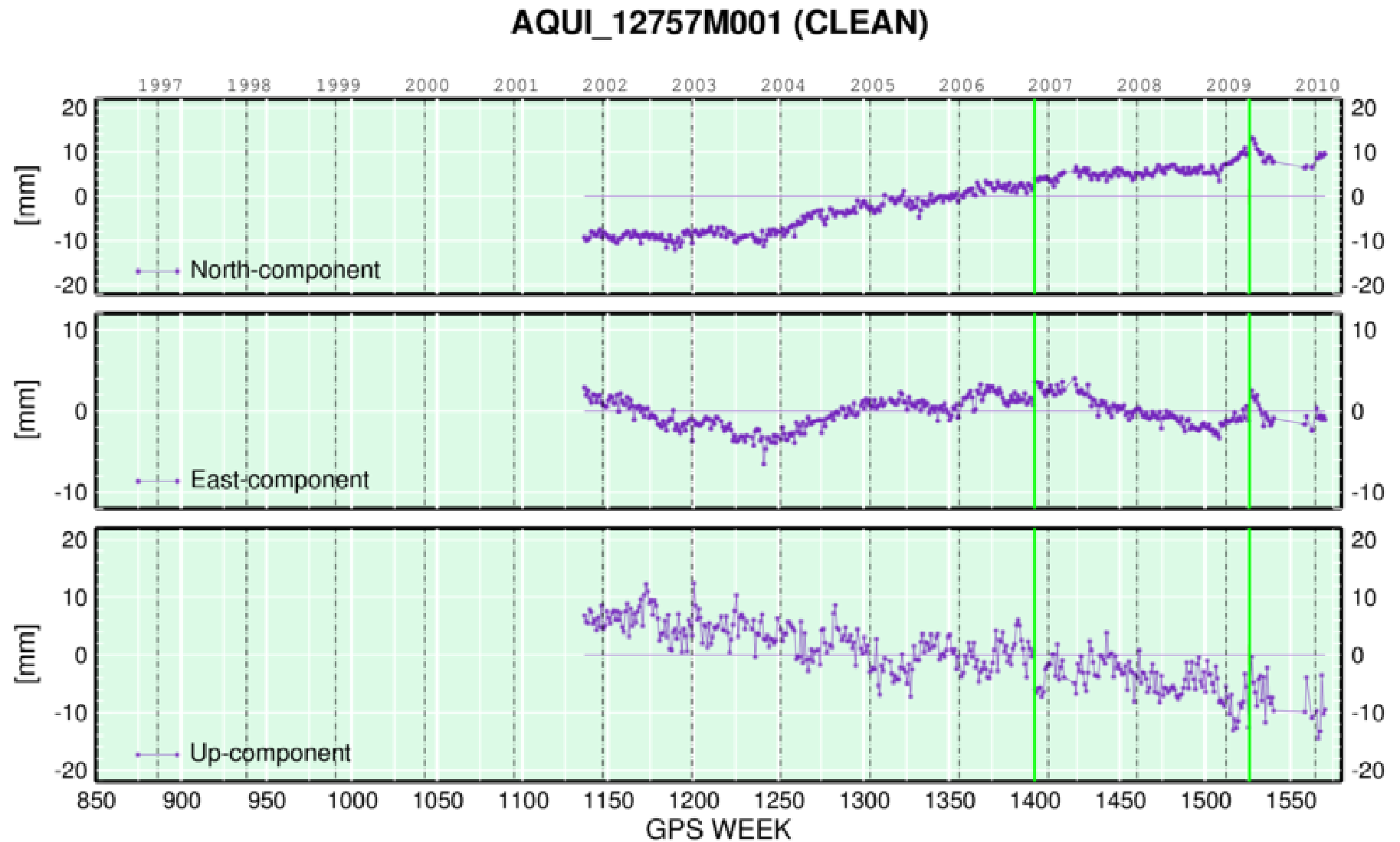


EPN CB

Wed May 12 04:12:07 2010



AQUI (cleaned)



EPN_C1570_weekly

Mon Mar 22 22:00:02 2010



“Instructions” for national representatives

National ETRF coordinates for EPN stations of ALL countries desirable (if no objection against publication):

- **Send country file CCC_YYYYMMDD.ETRF** (CCC: national 3-character ISO 3166 code, YYYYMMDD: year, month and day of the information update to:
elmar.brockmann@swisstopo.ch
- Example file:
http://www.swisstopo.admin.ch/swisstopo/geodesy/pnac/divers/etrf_monitor/CCC_YYYYMMDD.ETRF
- Thanks to your kind cooperation !

Paper copies of the present status and all necessary information are available



File format for information exchange



File name: CHE_200810021.ETRF

Station DOMEs	X	Y	Z	Frame	Epoch	valid from	to
-----*-----**-----**-----**-----**-----**							
							yyyy*mm*ddyyyy*mm*dd**yyyy*mm*dd
ZIM2 14001M008	4331300.1443	567537.0824	4633133.4977	ETRF93	1993 01 01	2007 11 09	
ZIMM 14001M004	4331297.3388	567555.6380	4633133.7174	ETRF93	1993 01 01	1988 01 01	



File name: SWE_200903013.ETRF

Station DOMEs	X	Y	Z	Frame	Epoch	valid from	to
-----*-----**-----**-----**-----**-----**							
							yyyy*mm*ddyyyy*mm*dd**yyyy*mm*dd
KIRO 10422M001	2248123.5038	865686.5326	5886425.5943	ETRF97	1999 07 01	1993 08 01	
MAR6 10405M002	2998189.7132	931451.5886	5533398.4735	ETRF97	1999 07 01	1993 08 01	
ONSA 10402M004	3370658.8318	711876.9387	5349786.7450	ETRF97	1999 07 01	1999 02 02	
SKE0 10426M001	2534031.1978	975174.4040	5752078.3436	ETRF97	1999 07 01	1993 08 01	
SPT0 10425M001	3328984.8136	761910.0660	5369033.4748	ETRF97	1999 07 01	1995 12 01	2007 06 08
SPT0 10425M001	3328984.8211	761910.0677	5369033.4857	ETRF97	1999 07 01	2007 06 08	
VIL0 10424M001	2620258.8912	779137.9797	5743799.2762	ETRF97	1999 07 01	1993 08 01	
VIS0 10423M001	3246470.5614	1077900.3132	5365277.9025	ETRF97	1999 07 01	1993 08 01	