A contribution to ETRS89 in Central Europe: results from the CEGRN Activity

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Motivation and Goals (extract from the EUREF CEGRN MoU signed in Chisinau, 2011)

3. Objectives

- The objective of this Memorandum of Understanding is, in general, to create the conditions to facilitate the data exchange and to promote the increase in the co-operation between the two parties, for the benefit of both, and in particular, to facilitate the densification of the European GNSS network for reference frame definition and geokinematical applications.
- It is expected that a closer co-operation between EUREF and CEGRN will increase the level of support to the IAG Dense Velocity Field Project, and the availability of a combined solution with respect to a denser network.
- Moreover, the co-operation will contribute to:

✓ provide better and more consistent data for geokinematics, by the optimization of guidelines for approval of networks with position and velocities and the improvement of offset treatment in time series;

✓ stimulate reprocessing of old EPN data, taking into account the foreseen realization of CEGRN 2011 and the completion of the reprocessing of the EPN;

✓ involve more nations into the INSPIRE initiative, in particular with the CRS (Coordinate Reference Systems) Implementing Rules.

CEGRN overview

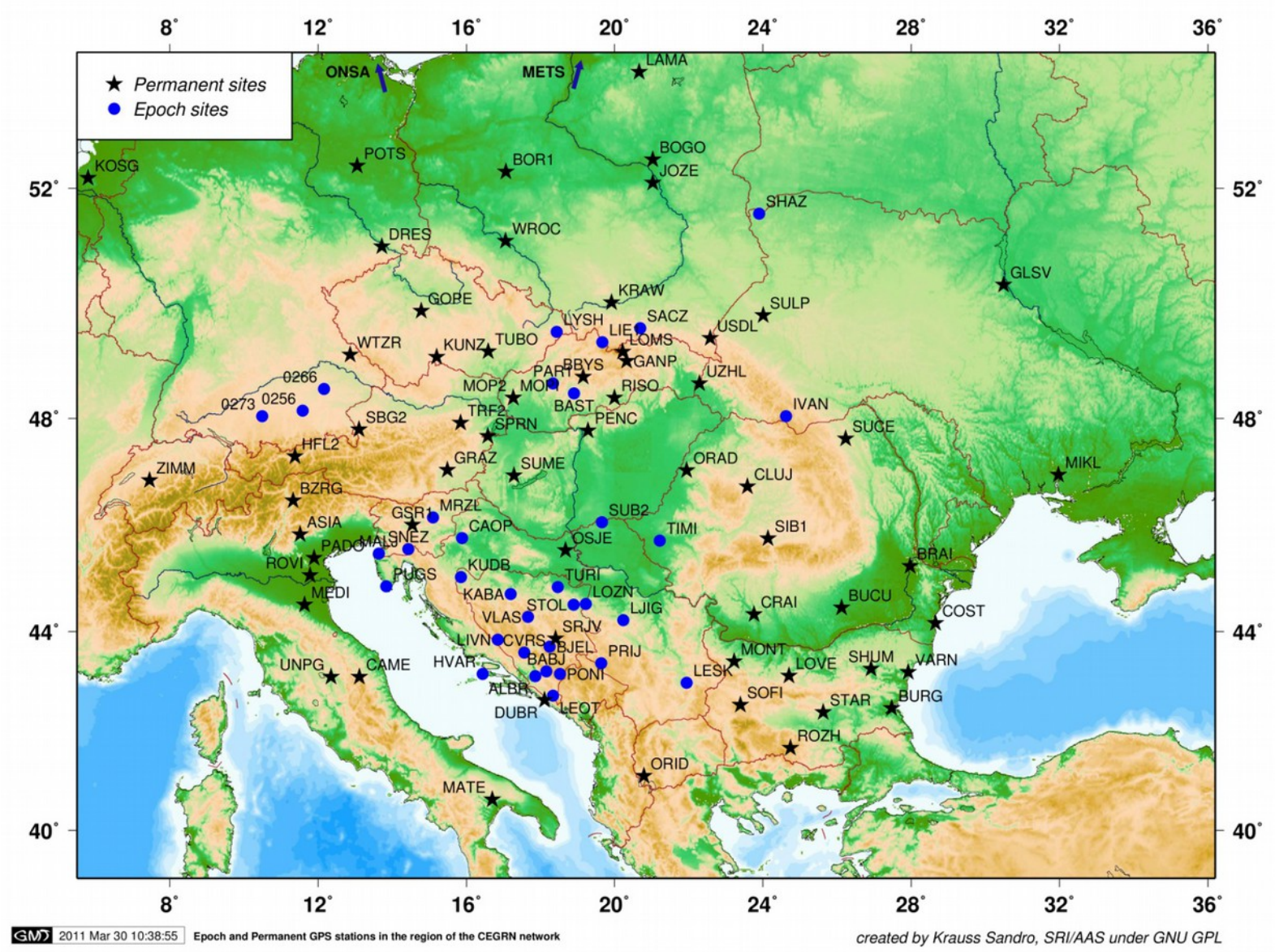
CEGRN 2013

Country	Total	EPN	CEGRN	SAPOS
AUT	4	3	1	
BIH	24	1	23	
BUL	7		7	
CRO	5	5		
CZE	3	3		
GER	6	3		3
HUN	4	4		
ITA	7	5	2	
POL	8	7	1	
ROM	9	2	7	
SRB	9		9	
SVK	6	4	2	
SLO	1	1		
UKR	3	3		

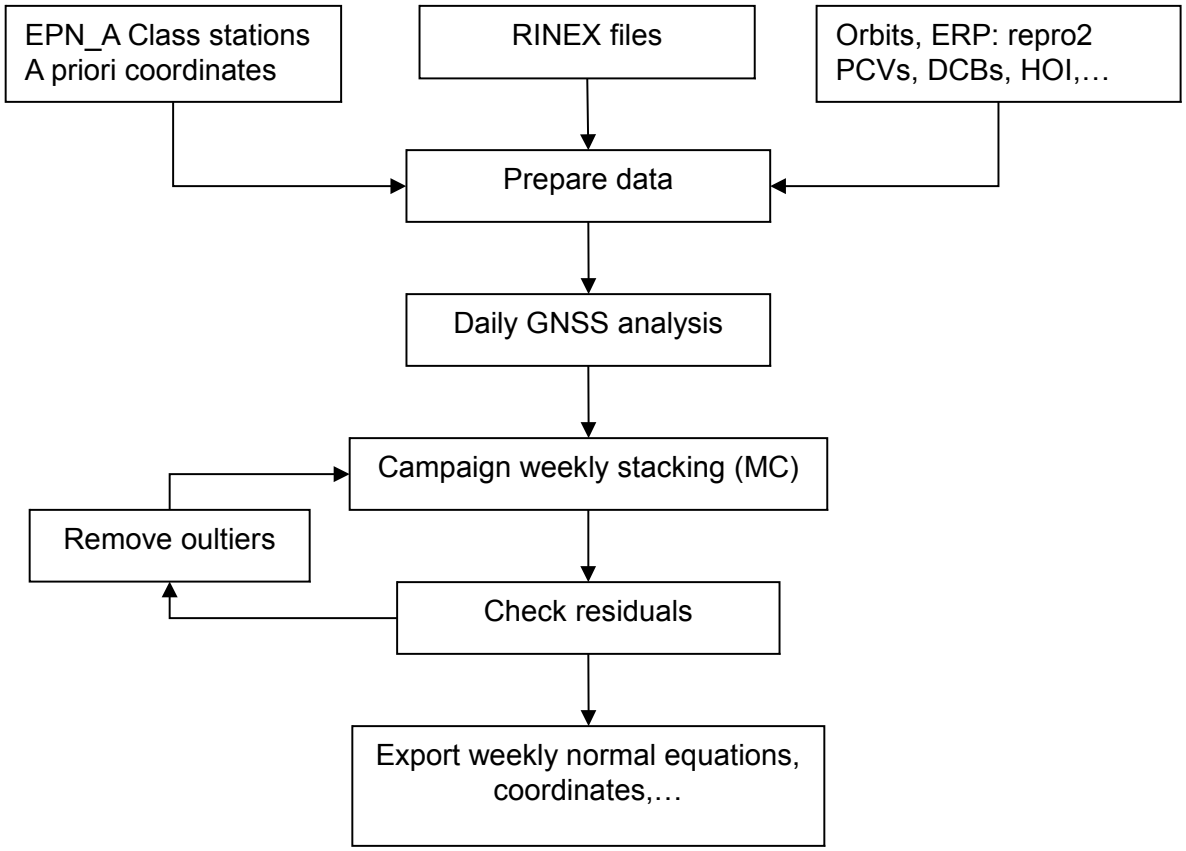
SUMMARY

CAMPAIGN			
CEGRN'94			
CEGRN'95	291		
CEGRN'96			
CEGRN'97			
CEGRN'99			

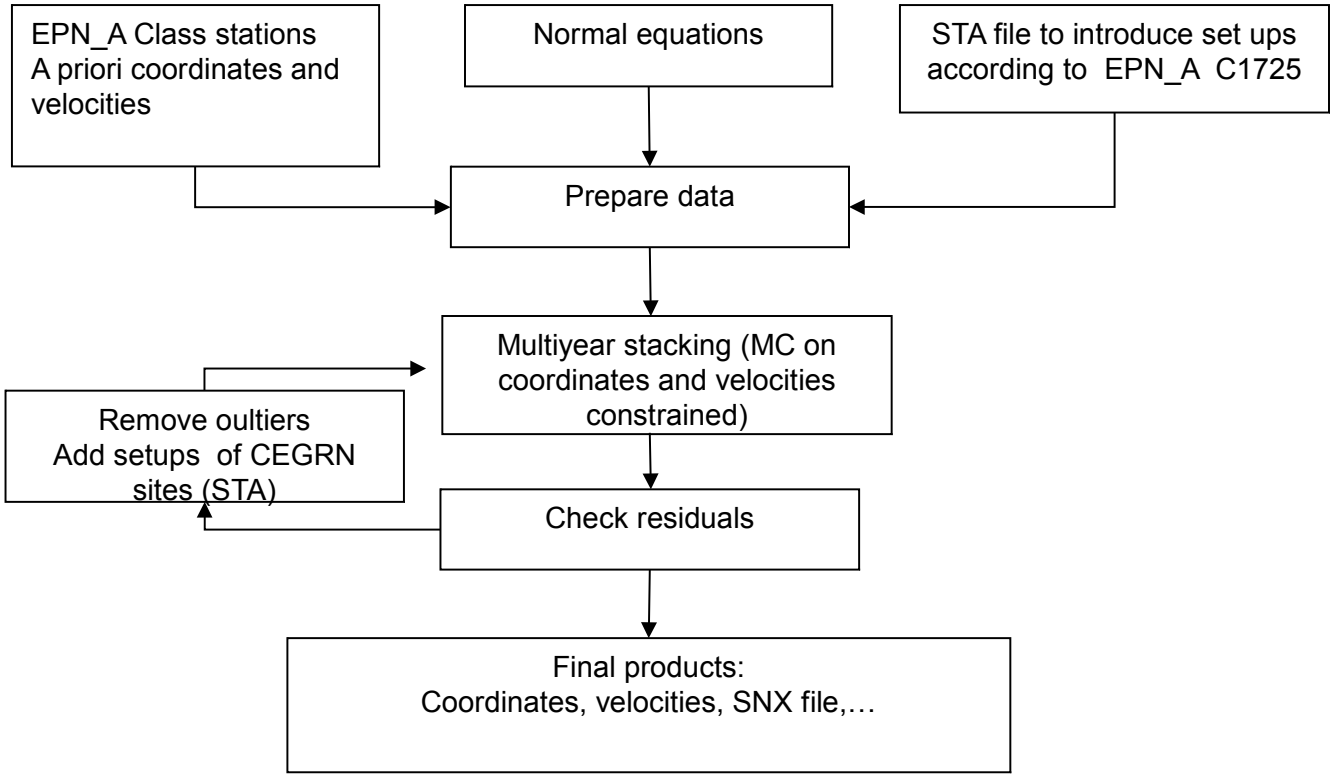
CEGRN overview: 35 EPN_A sites, 55 long term sites, 80 epoch sites, 10 campaigns across 17 years



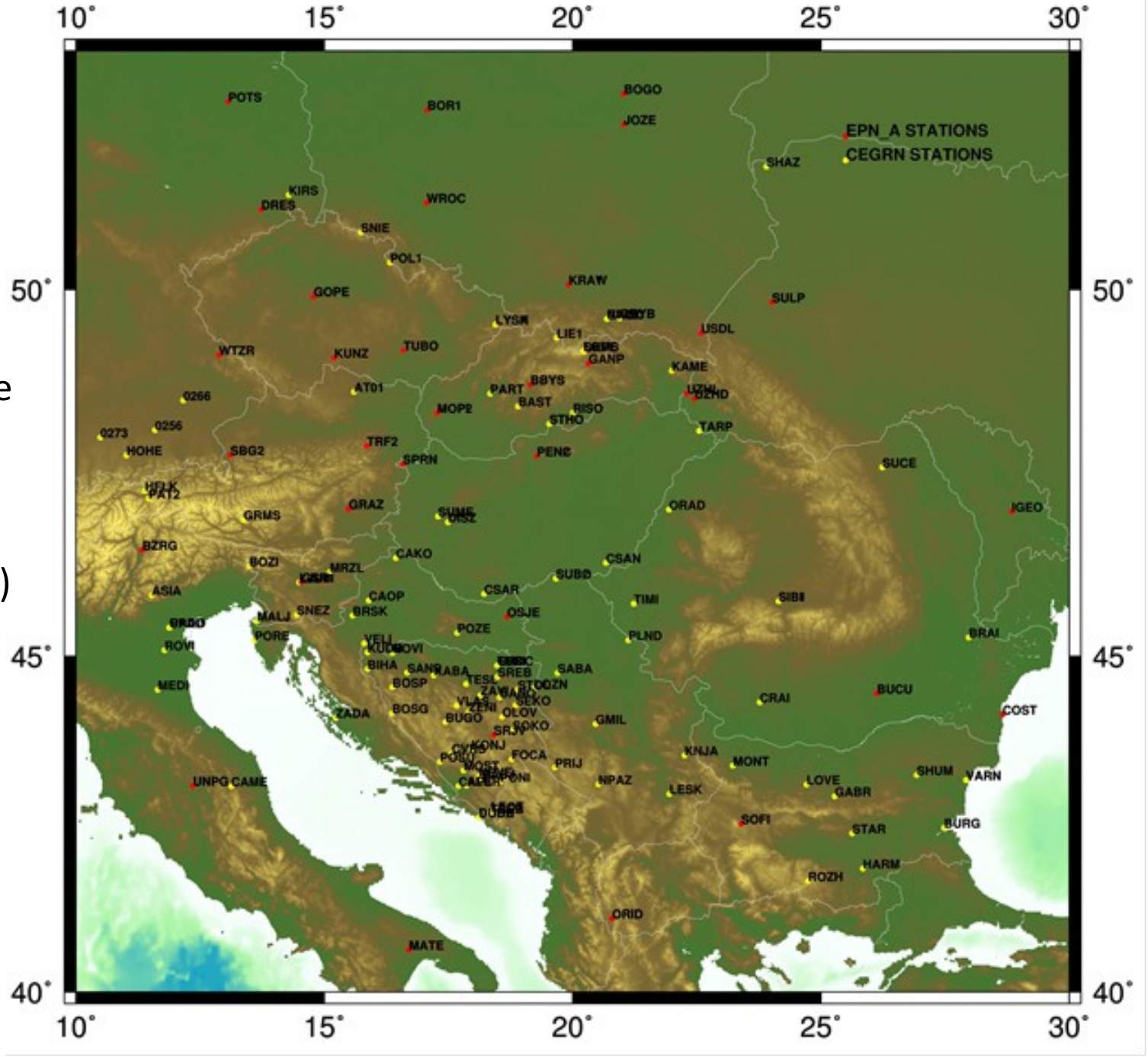
Processing of a weekly campaign (EUREF guidelines)



Stacking of weekly campaigns (EUREF guidelines)



CEGRN sites in the context of the EPN_A sites used for alignment to ETRF2000 (C1725)



Weekly results (repeatibilities)

	Repeatibility (mm)			
Computed Sites	N	E	U	
50	1.54	1.16	3.82	CEGRN 1996
44	1.34	1.01	3.40	CEGRN 1997
62	1.46	0.97	3.73	CEGRN 1999
57	1.16	0.83	3.77	CEGRN 2001
77	1.20	0.93	3.19	CEGRN 2003
105	1.14	0.91	3.74	CEGRN 2005
95	1.37	1.23	4.06	CEGRN 2007
85	1.18	0.98	3.83	CEGRN 2009
60	0.82	0.90	3.24	CEGRN 2011
101	1.02	1.15	3.90	CEGRN 2013

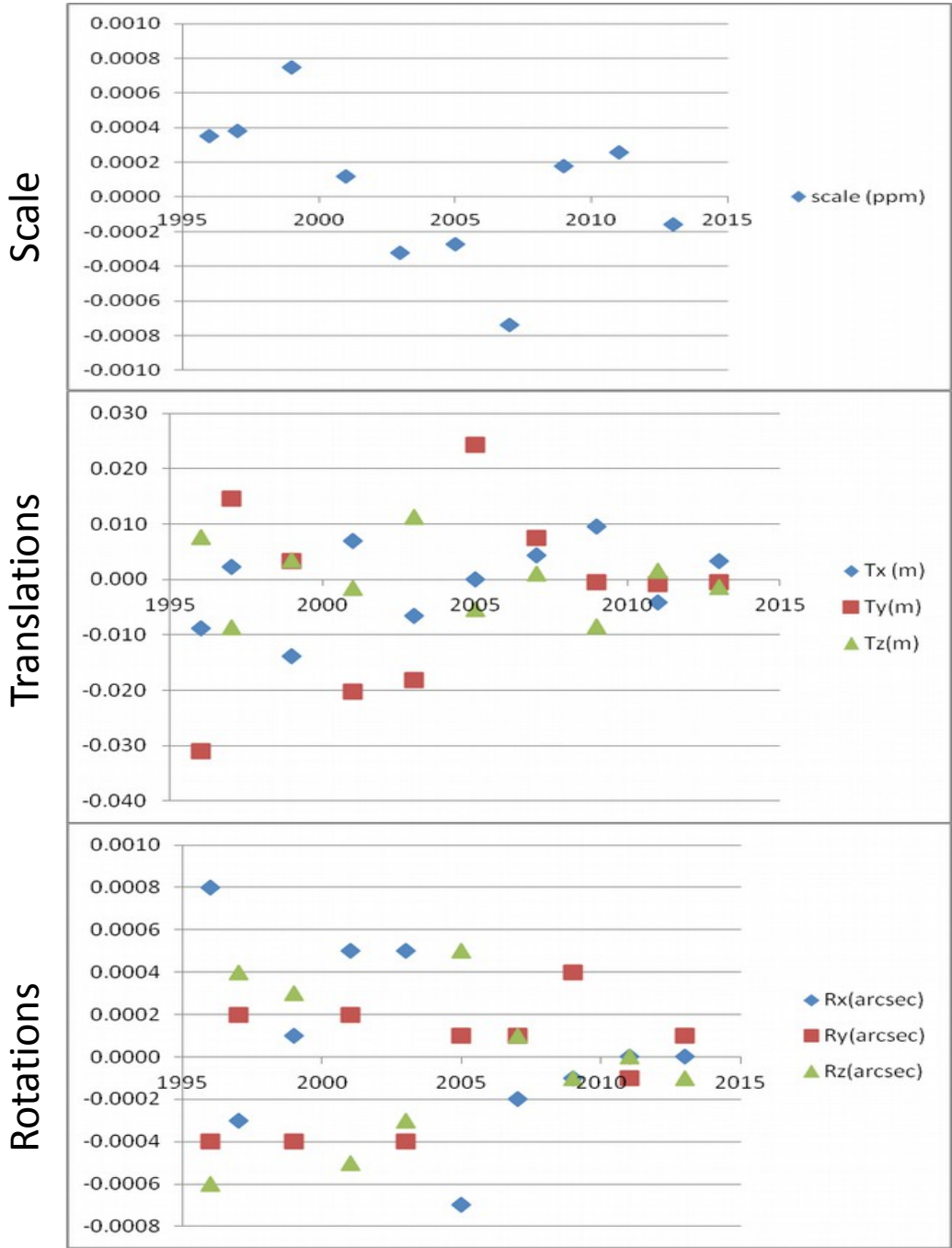
-REPRO2 implies consistent quality across 17 years
-GLONASS was included
-Guidelines for densification strictly implemented
-Class A EPN sites for datum definition; solution numbers of EPN_A and B sites implemented

The above gives an idea of the quality of the 10 individual solutions. Now let us consider the stacking across the 17 years

Time series of the 7 Helmert parameters of the 10 transformations of the CEGRN frame to the EPN_A frame, for common sites (ca 30 EPN_A sites in common, on average)

The temporal changes of the 7 parameters are minimal and very nearly random

The recovered coordinates of the 38 common EPN_A sites differ from the C1725 valuse by less than 10 mm at all epochs



Proposed Class A and B CEGRN sites

Coordinates and velocities of 55 sites repeatidly present in 3 or more campaigns: specifications for daily repeatibility within each campaign and across the time span of the 10 campaigns are met

Coordinates of 80 sites present in 2 or less campaigns: specifications on daily repeatibilities within each campaign are met

Horizontal Velocities of proposed class A sites

Vertical Velocities of proposed class A sites

Last remarks

- AI 10 of TWG67: for 12 CEGRN sites continuous time series are available for comparison with the CEGRN discrete (1/every 2 yrs) time series, thanks to the work of A. Kenyeres and G. Stangl
- For 10 out of 12, the velocities (campaign/continuous) agree within 1 mm/yr (horizontal) and 4 mm/yr (vertical)
- For 2 sites out of 12, the vertical velocities differ by 5 mm/yr (campaign – continuous; vertical only)
- One site (ASIA) has probably incorrect Soln's
- As to the other site (SUCE) we do not know at this time.