Final Resuts with the Computation of the new Italian Permanent Network RDN of GPS stations: the Contribution of the University of Padova

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RDN Rete Dinamica Nazionale

- 100 permanent GPS sites
- 69 in Italy but outside EPN (European Permanent Network)
- 31 EPN sites
- 4 weeks ‘observing period’ centered at 2008.0
- Independent analysis at IGMI, Politecnico di Milano and Università di Padova;
- Goal: recognition as EUREF class B network, compliant with ETRS89

La rete Europea EPN

Obbiettivi:

•Densificare regionalmente il sistema ITRF2005

•Realizzare il sistema ETRS89/EVRS in Europa

Metodo:

• ca. 200 stazioni permanenti

•16 Centri di Analisi di sottorete (in Italia: Padova e Matera)

•1 Centro di Combinazione delle sottoreti in unica rete

•Cadenza settimanale

Linee Guida:

•Monumentazione

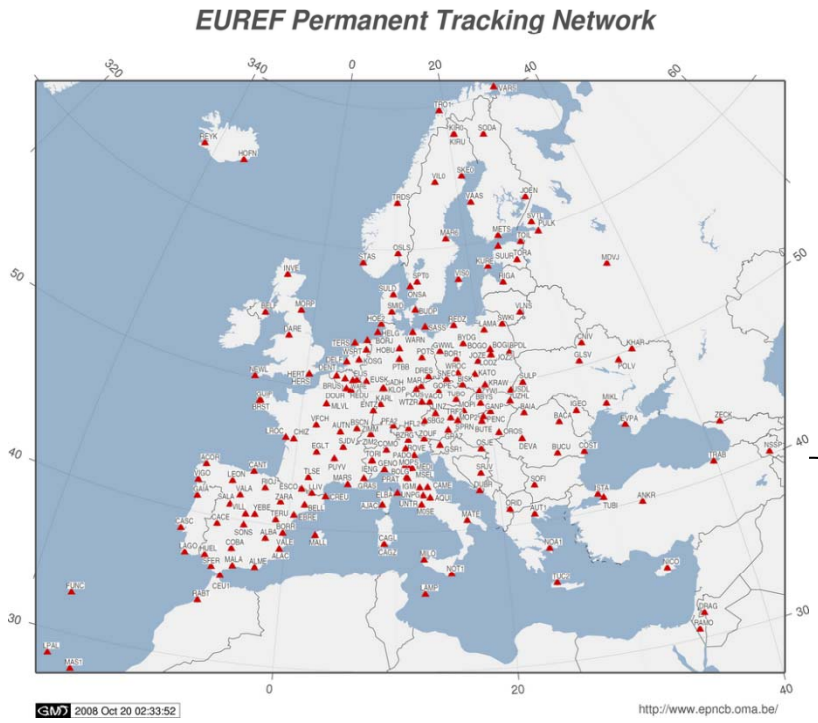
•Analisi dati

•Inserimento rete locale e allineamento

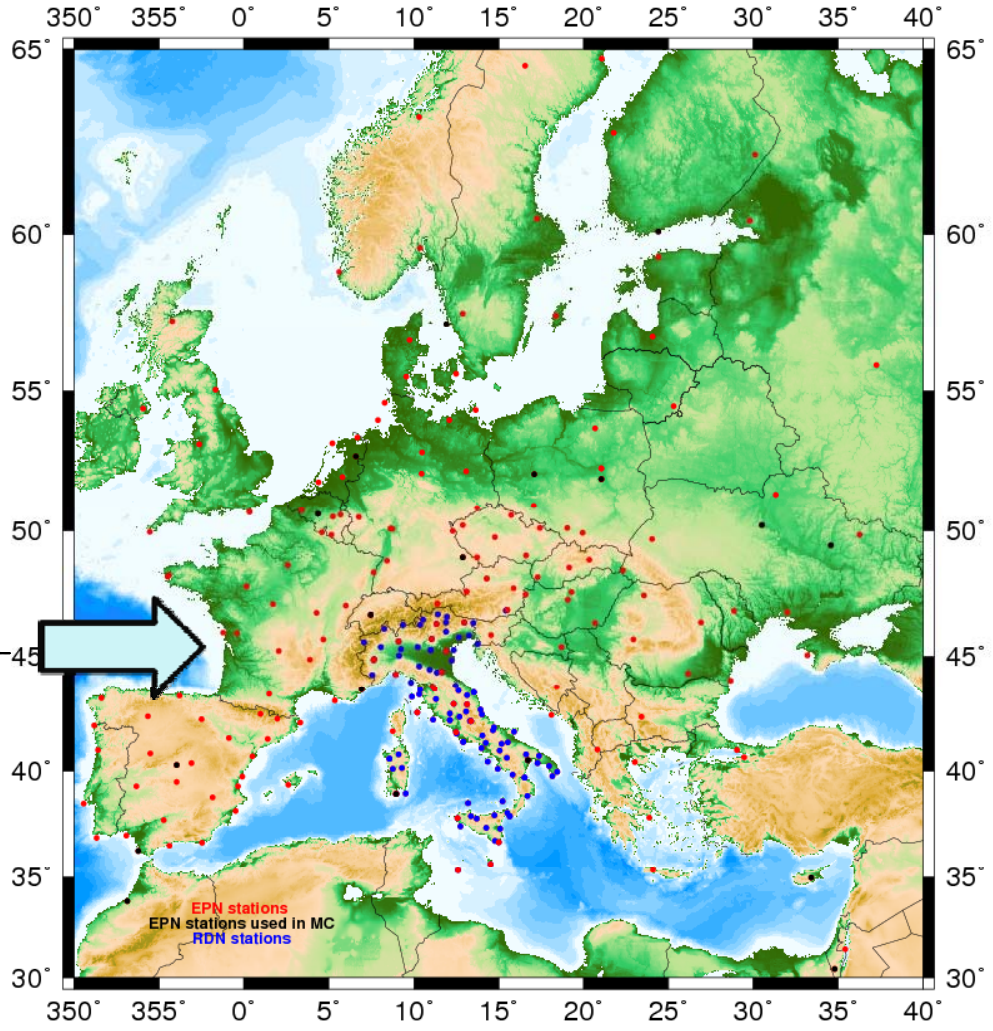
Gestione:

•Technical Working Group

Embed RDN into the EPN



Steps:
- MC daily solutions
- MC stacking
- ITRF2005→ETRF2000

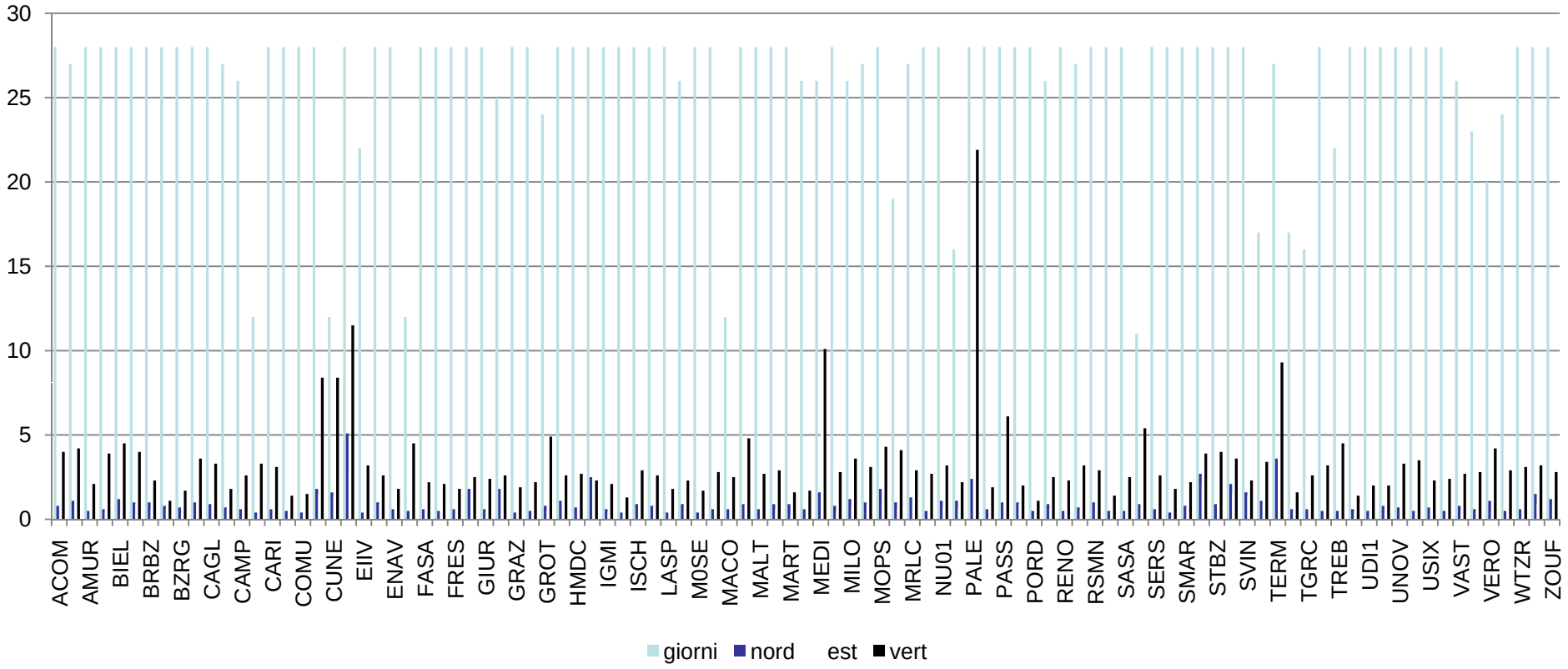


Procedure

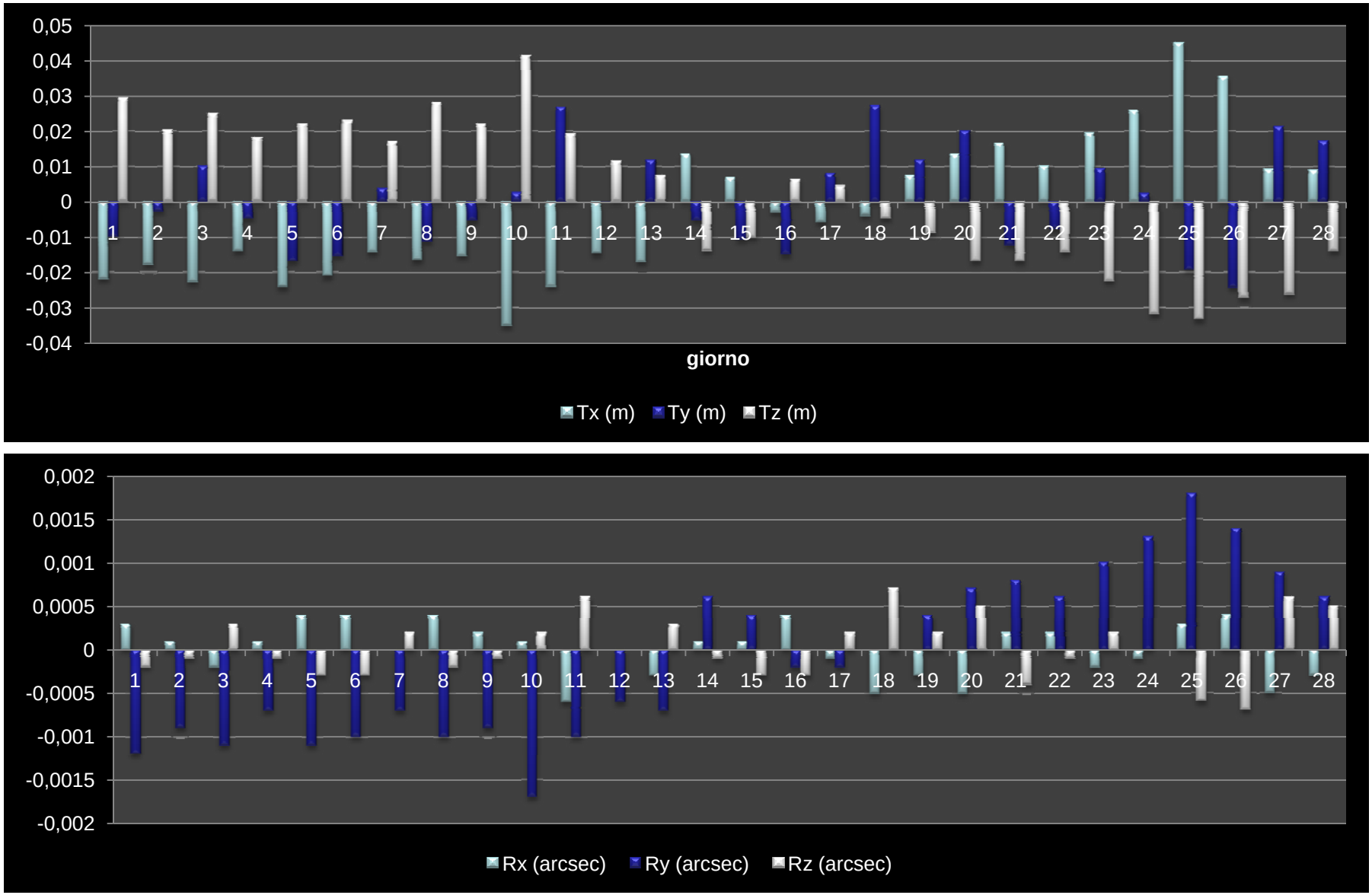
- 28 daily campaigns
  - Absolute antenna models
  - Tides,minimum elev angle, IGS final pole/orbits
  - BPE, procedure RNX2SNX
- Stacking of the 28 diurnal solutions
  - MC on ITRF2005 coordinates of ITRF stations propagated at epoch 2008.0 with their ITRF2005 velocity; consider appropriate solution numbers
- ITRF2005 →ETRF2000
  - Helmert transformation (Memo Altamimi et al. (2008))

Results of daily processing

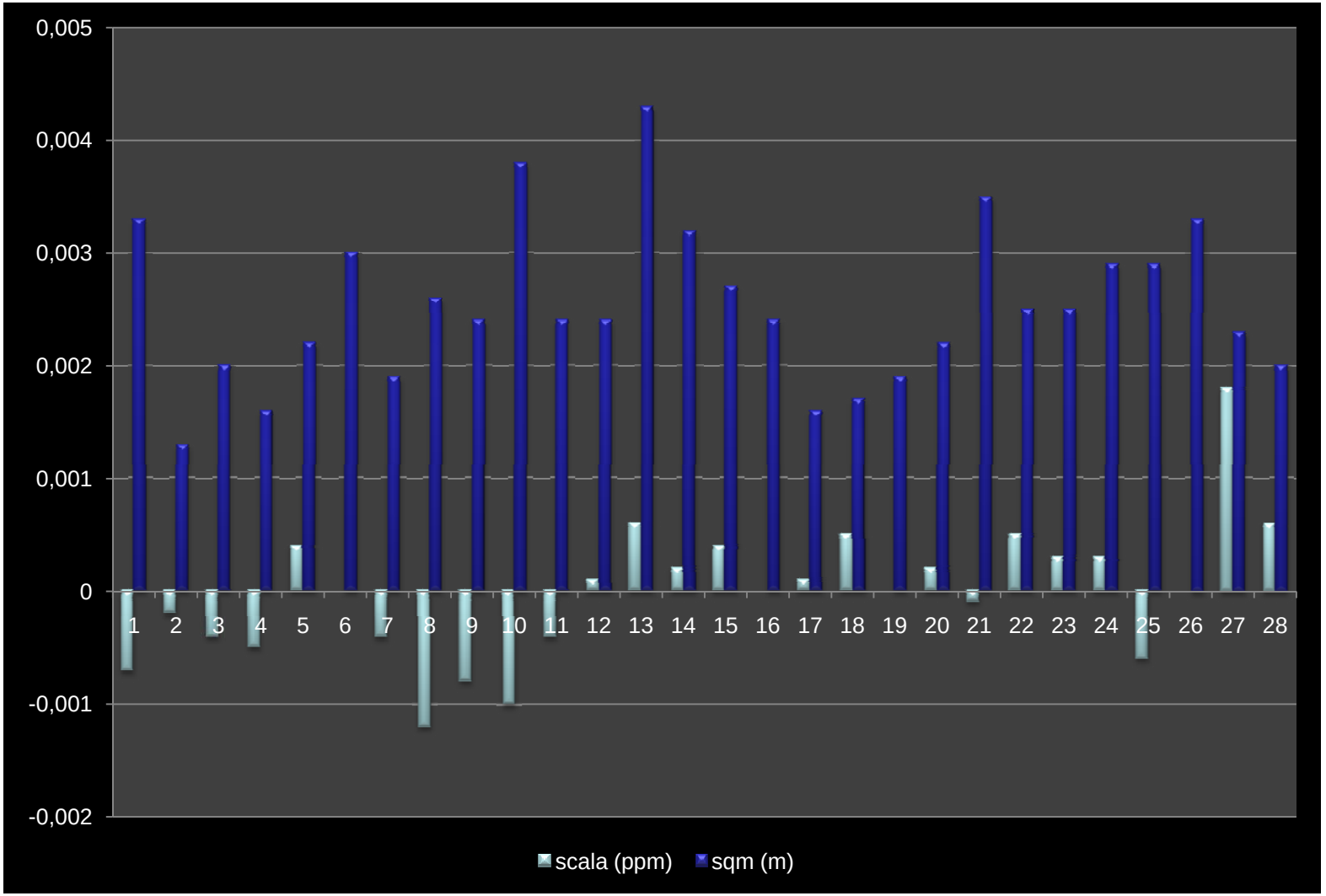
- Daily NEQ's saved with MC
- Repeatibility <10 mm in 3D 100 stations except PALE



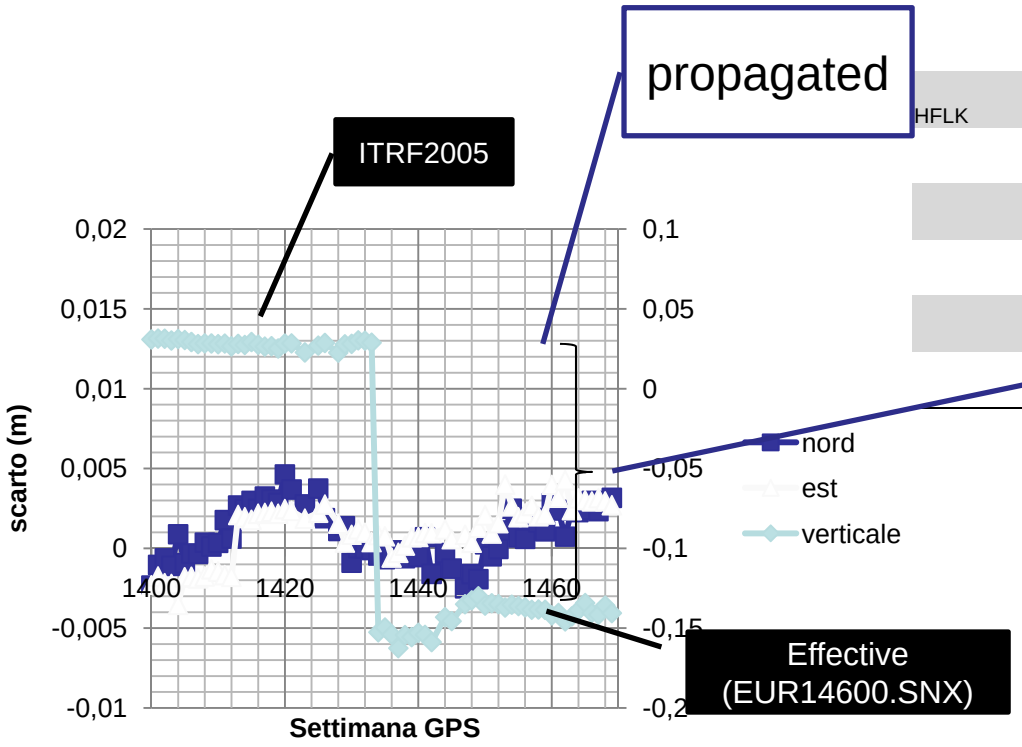
Repeatibility of the daily realizations of the Reference Frame (7 parameter Helmert transformation)



Scale and rms (sqm)



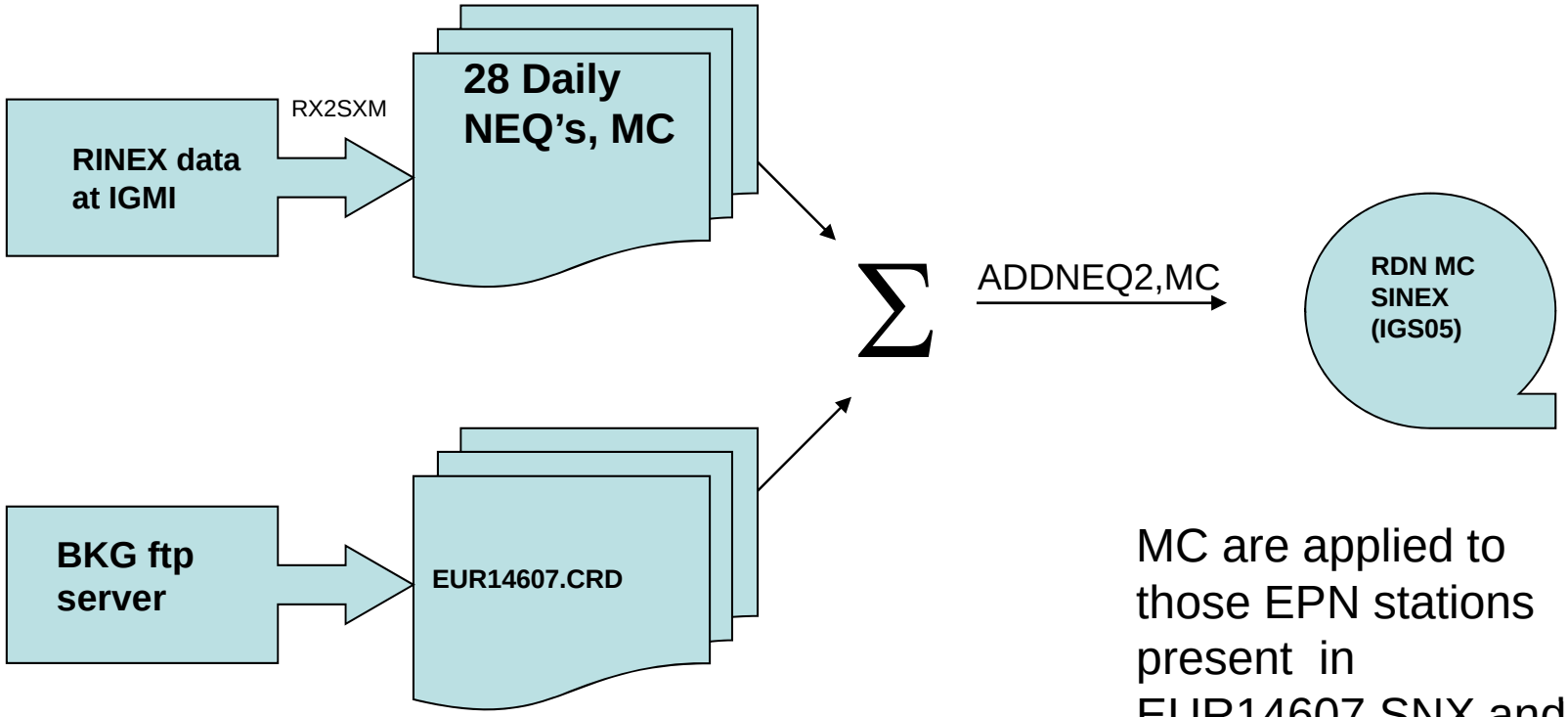
ITRF2005 MC constraints: exclude those stations with coordinates different from their propagated 2000.0-->2008.0 value



HFLK	11006S003	X	4248505.0090	4248504.8794	-0.1296	0.0002
		Y	855575.7970	855575.7721	-0.0249	0.0001
		Z	4667172.3280	4667172.1868	-0.1412	0.0002
		U	2384.1537	2383.9604	-0.1933	0.0002
		N	47 18 46.459381	47 18 46.459420	0.0012	0.0001
		E	11 23 9.934943	11 23 9.934998	0.0012	0.0001

Result: HFLK not used for MC constraints but included in the final adjustment

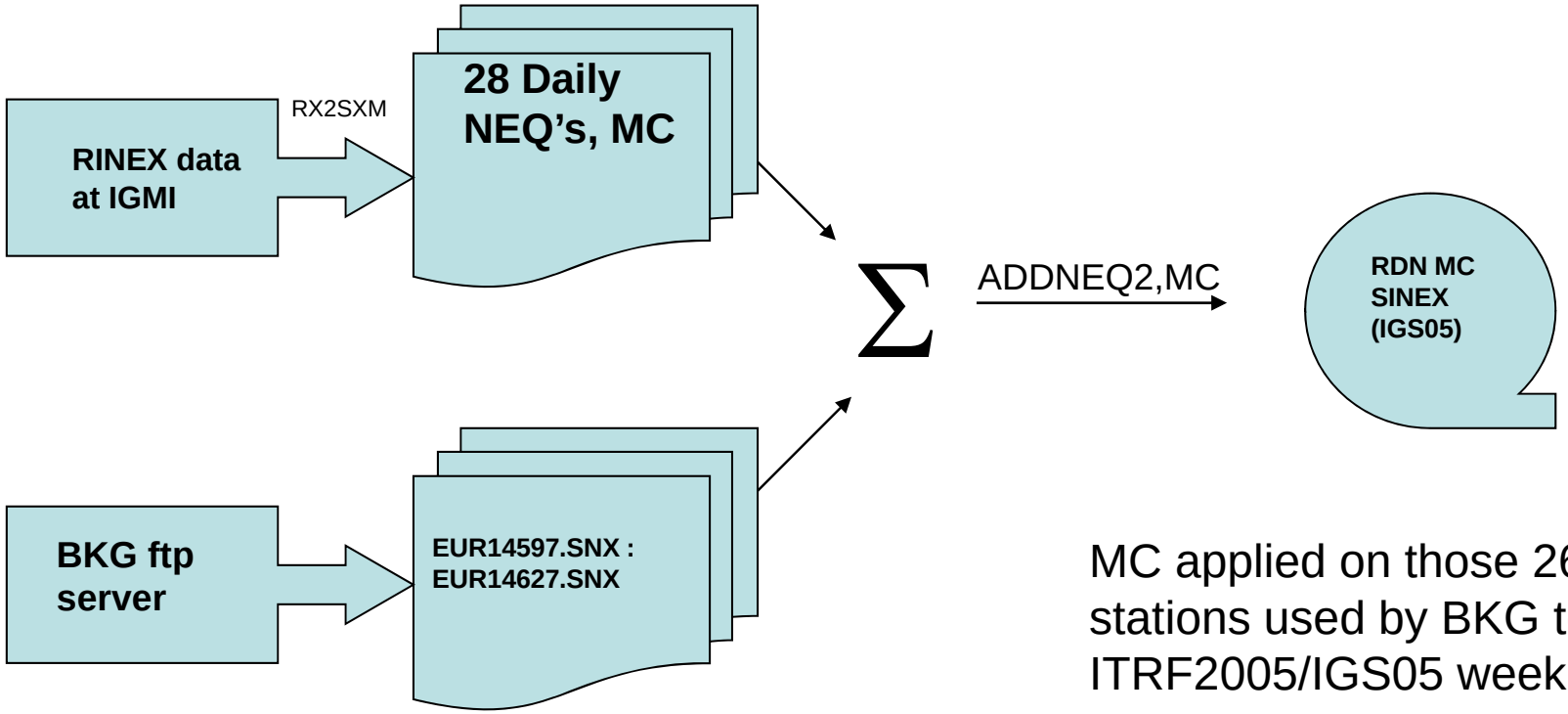
Other combination schemes using EPN products EURwwww7.SNX (1/2)



MC are applied to those EPN stations present in EUR14607.SNX and used by BKG in the weekly combination

Gurtner, W., C. Boucher, C. Bruyninx, H. V.D.Marel (1997), The use of the IGS/EUREF permanent network for EUREF densification campaigns , EUREF Publication No. 6, Veröffentlichungen der Bayerischen Kommission für die Internationale Erdmessung der Bayerischen Akademie der Wissenschaften, pp. 50-51, Sofia, Bulgaria, June 2-5 1997.

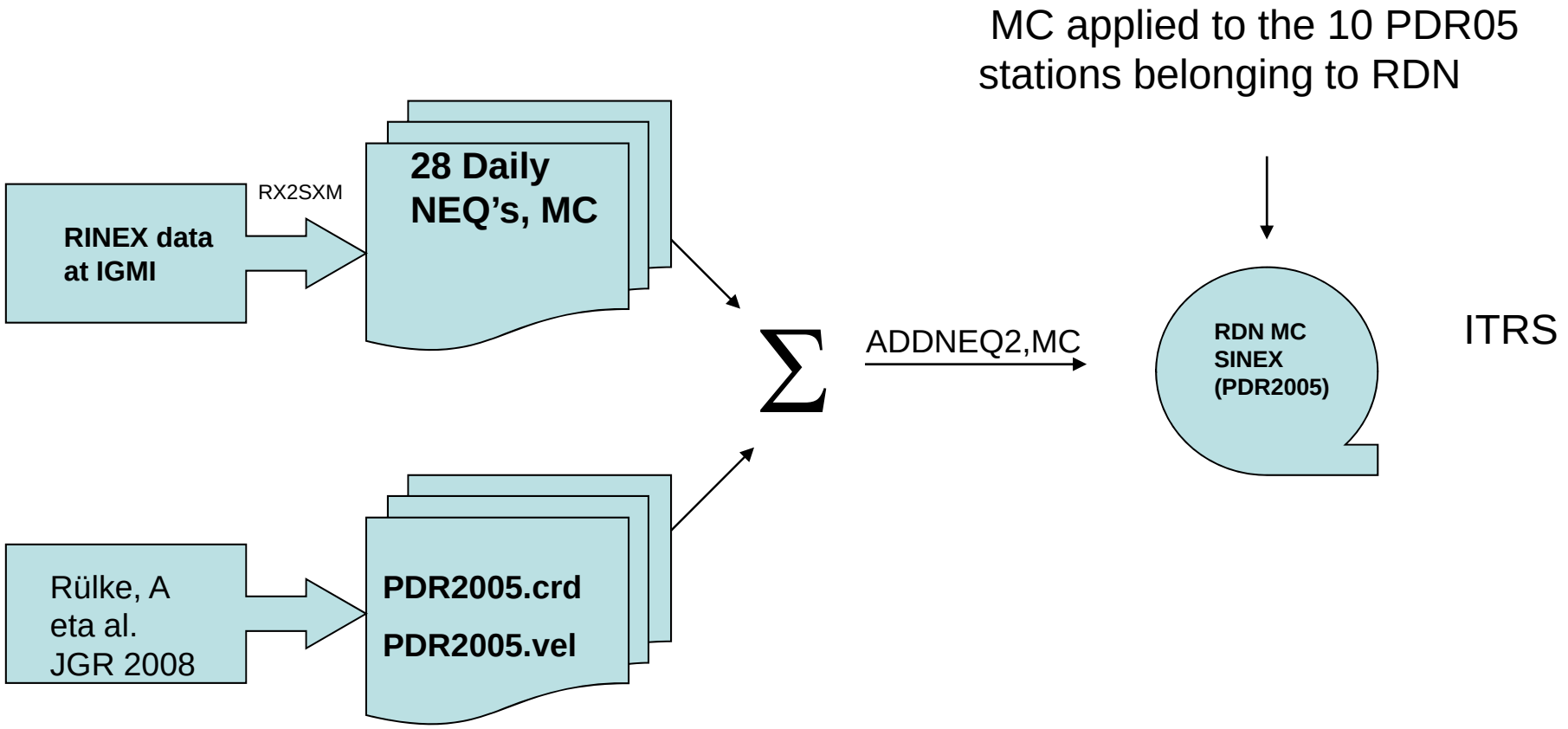
Other combination schemes using EPN products EURwwww7.SNX



MC applied on those 26 EPN stations used by BKG to realize ITRF2005/IGS05 weekly

Gurtner, W., C. Boucher, C. Bruyninx, H. V.D.Marel (1997), The use of the IGS/EUREF permanent network for EUREF densification campaigns , EUREF Publication No. 6, Veröffentlichungen der Bayerischen Kommission für die Internationale Erdmessung der Bayerischen Akademie der Wissenschaften, pp. 50-51, Sofia, Bulgaria, June 2-5 1997.

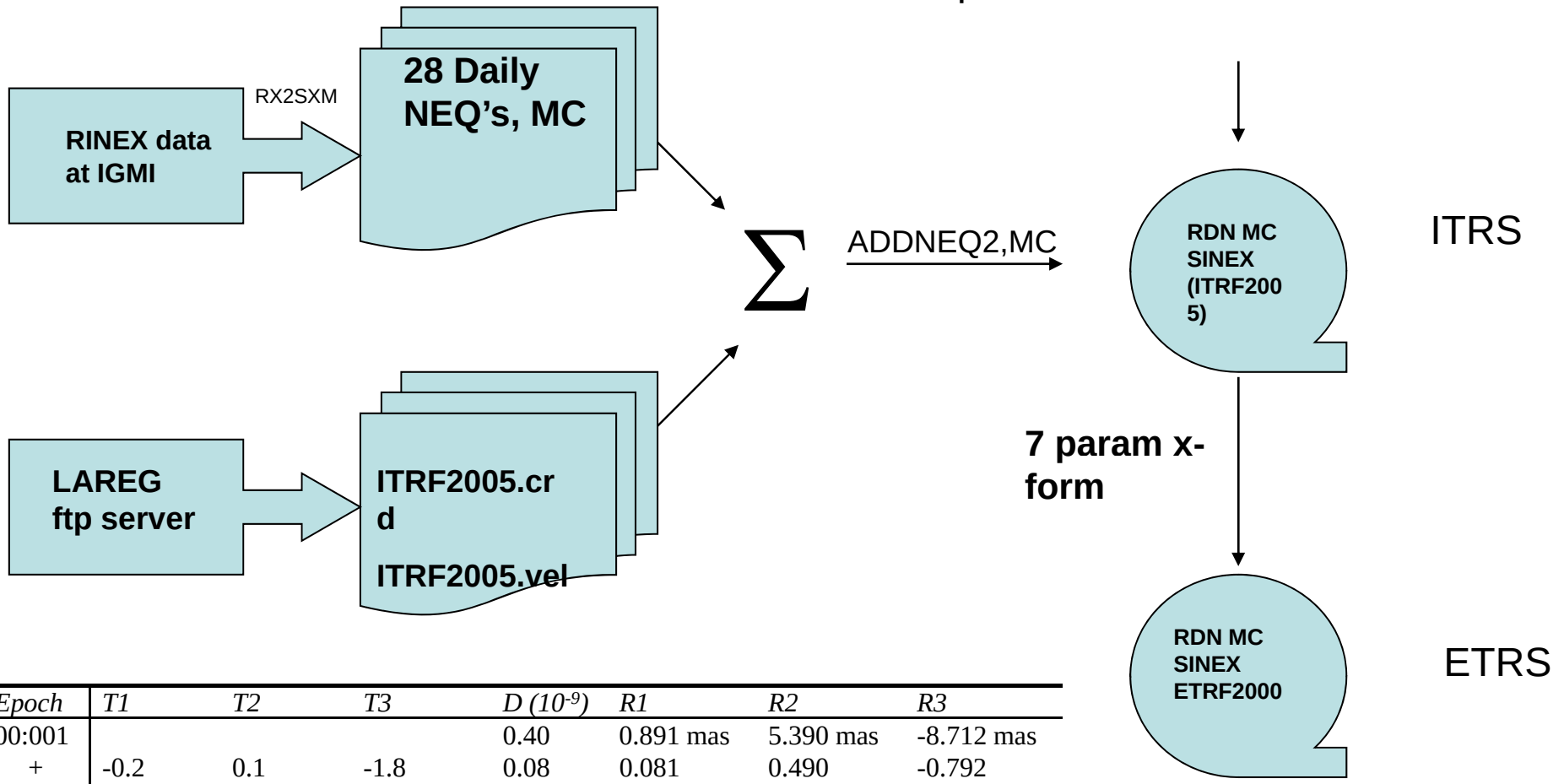
Combination scheme with PDR2005 (independent realization of ITRS: reprocessed orbits, consistent antenna models, geocenter constrained through tidal model)



Rülke, A., R. Dietrich, M. Fritsche, M. Rothacher, and P. Steigenberger (2008), Realization of the Terrestrial Reference System by a reprocessed global GPS network, J. Geophys. Res., 113, B08403, doi:10.1029/2007JB005231.

ITRF2005 → ETRF2000

MC on ITRF2005 stations also part of RDN



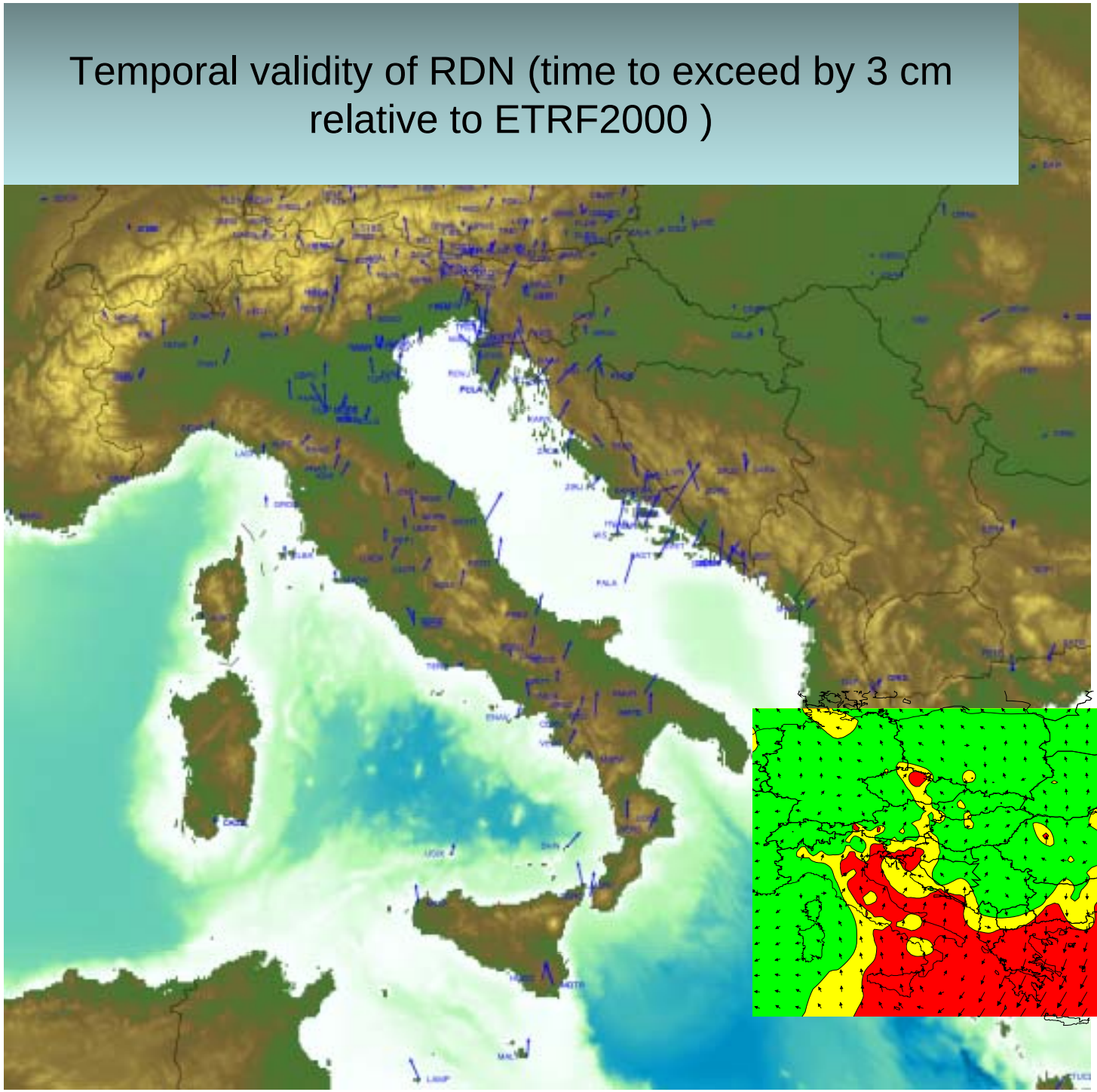
Epoch	*T1*	*T2*	*T3*	*D (10^{-9})*	*R1*	*R2*	*R3*
00:001				0.40	0.891 mas	5.390 mas	-8.712 mas
+	-0.2 mm/yr	0.1 mm/yr	-1.8 mm/yr	0.08 1/yr	0.081 mas/y	0.490 mas/y	-0.792 mas/y
08:001					1.539 mas	9.310 mas	-15.048 mas
	52.50	51.0	-68.2	1.04			

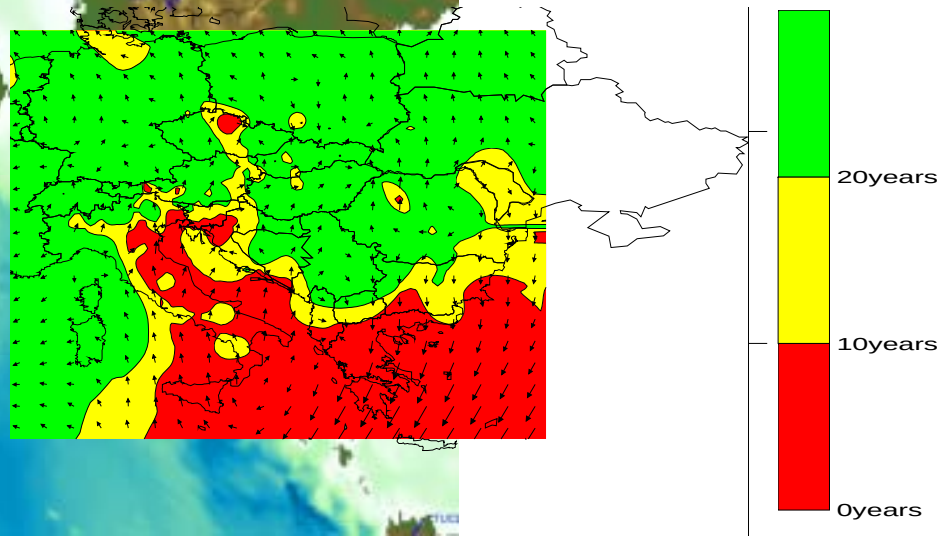
Boucher e Altamimi: memo V7 2 Ottobre 2008

Temporal validity of RDN (time to exceed by 3 cm relative to ETRF2000)

Velocities relative to ETRF2000 from Caporali et al. (2009) Tectonophysics: a few mm/yr typical

Predict time needed for the displacement relative to 2008.0 position to exceed 3 cm





Conclusions

- Processing according to IGS/EPN specs
- Consistency between ITRF2005 (2008.0), PDR05(2008.0) and IGS05 (2008.0)
- Repeatibility better than 10 mm (except Palermo vert.)
- Timely delivery of SINEX/CRD file to IGMI