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

Alessandro Caporali, Filippo Turturici

Università di Padova

EUREF Symposium 2009, Firenze
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 \(\rightarrow\) ETRF2000
  – Helmert transformation (Memo Altamimi et al. (2008))
Results of daily processing

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

Result: HFLK not used for MC constraints but included in the final adjustment
Other combination schemes using EPN products EURwwwww7.SNX (1/2)

Other combination schemes using EPN products EURwww7.SNX


MC applied on those 26 EPN stations used by BKG to realize ITRF2005/IGS05 weekly
Combination scheme with PDR2005 (independent realization of ITRS: reprocessed orbits, consistent antenna models, geocenter constrained through tidal model)

MC applied to the 10 PDR05 stations belonging to RDN

ITRF2005 $\rightarrow$ ETRF2000

MC on ITRF2005 stations also part of RDN

Boucher e Altamimi: memo V7 2 Ottobre 2008

<table>
<thead>
<tr>
<th>Epoch</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>$D \times 10^{-9}$</th>
<th>$R_1$</th>
<th>$R_2$</th>
<th>$R_3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:001</td>
<td>-0.2</td>
<td>0.1</td>
<td>-1.8</td>
<td>0.40</td>
<td>0.891 mas</td>
<td>5.390 mas</td>
<td>-8.712 mas</td>
</tr>
<tr>
<td></td>
<td>mm/yr</td>
<td>mm/yr</td>
<td>mm/yr</td>
<td>1/yr</td>
<td>mas/y</td>
<td>mas/y</td>
<td>mas/y</td>
</tr>
<tr>
<td>08:001</td>
<td>52.50</td>
<td>51.0</td>
<td>-68.2</td>
<td>1.04</td>
<td>1.539 mas</td>
<td>9.310 mas</td>
<td>-15.048 mas</td>
</tr>
</tbody>
</table>
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)
- Repeatability better than 10 mm (except Palermo vert.)
- Timely delivery of SINEX/CRD file to IGMI