Consistency evaluation of space geodetic techniques via ITRF combination

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Outline

• Consistency between Space Geodesy (SG) and local ties (A reminder)

• Consistency between techniques on site velocities

• Plate motion comparisons between SG and geological models

• Use ITRF2008 input/results
ITRF2008: Consistency btw local ties and space geodesy estimates

- GPS is linking SLR, VLBI & DORIS because
  - VLBI-SLR alone: 8 co-locations only
  - VLBI or SLR-DORIS alone: 10 co-locations only

- ITRF2008: Percentage of Tie-SG discrepancies

See Altamimi et al (2011) for more details
GPS-VLBI horizontal velocity differences

WRMS
East = 0.34 mm/yr
North = 0.23 mm/yr

# sites 26
σ = 0.3 mm/yr

1 mm/y
GPS-SLR horizontal velocity differences

WRMS
East = 0.47 mm/yr
North = 0.48 mm/yr

# sites 20
σ = 0.3 mm/yr
GPS-DORIS horizontal velocity differences

WRMS                               # sites  16
East = 1.37 mm/yr                  σ = 0.3 mm/yr
North = 1.33 mm/yr
GPS-VLBI vertical velocity differences

WRMS 0.77 mm/yr

# sites 23

σ = 0.3 mm/yr
GPS-SLR vertical velocity differences

WRMS: 0.62 mm/yr

σ = 0.3 mm/yr

# sites: 20
GPS-DORIS vertical velocity differences

WRMS                  # sites 16
1.16 mm/yr            σ = 0.3 mm/yr

UP velocity Differences
Velocity spherical errors

Site velocity spherical errors

IDS

ITRF2008-IDS
Velocity spherical errors

Site velocity spherical errors

ILRS

ITRF2008-ILRS
Velocity spherical errors

Site velocity spherical errors

IVS

ITRF2008-IVS
Site velocities used for ITRF2008 PMM
ITRF2008 PMM Post-fit site residuals
WRMS: simultaneous estimate of all plates angular velocities

East 0.50
North 0.40 mm/yr
Comparisons to geological models

The NNR realization uncertainty is about 2 mm/yr

See poster # 4750 for more details
**Summary**

- Technique velocity consistencies, via GPS

<table>
<thead>
<tr>
<th>Technique</th>
<th>WRMS 2D mm/yr</th>
<th>WRMS UP mm/yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>VLBI</td>
<td>0.3</td>
<td>0.8</td>
</tr>
<tr>
<td>SLR</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>DORIS</td>
<td>1.3</td>
<td>1.2</td>
</tr>
</tbody>
</table>

- VLBI, SLR & DORIS benefit from GPS for site velocities, but probably SG-Tie discrepancies are due to GPS in some sites

- Discrepancy mitigation in ITRF computation: down-weighting the ties and relaxing the constraint on velocity equality

- Precise ITRF2008 Plate Motion Model: WRMS 0.5 mm/y

- Uncertainty of ITRF2008 NNR implicit realization = ~ 2 mm/yr