Terrestrial Reference Frame investigations in preparation of GRASP GPS and DORIS PPP results and preliminary comparisons with geodetic local ties

Pascal Willis (IGN/IPGP), Michael Heflin (JPL), Bruce Haines (JPL), Yoaz Bar-sever (JPL)
OUTLINE

• Main goal (preparing GRASP)
• Method description
• Preliminary results
• Conclusion and future work
Main goal

• Main assumptions
  – GRASP would include all 4 techniques
  – GRASP Satellite orbit should be at mm-level
  – PPP solutions from GRASP could be done for GPS and DORIS, providing results in a unique TRF

• Goal:
  – test this possibility using current Jason-2 satellite
Method description

• Data used:
  – DORIS PPP solutions = new results using JPL Jason-2 orbits (from GPS) + DORIS data in PPP mode (daily solution, 1 satellite)
  – Geodetic local ties = as provided by IGN/SIMB

Comment:
  GPS and DORIS results refer to center of phase
  geodetic local ties refer to monumentation
Results

DORIS PPP (Jason2 orbit)

GPS PPP results (JPL)

DORIS Jason2/PPP results

Why selecting Santiago?
Maule Earthquake on 27-FEB-2010
Distance = 50 m
Local tie precision = 1mm
Santiago
SANT/GPS--->SANB/DORIS

GPS---> DORIS (lon) (cm)

2008 2009 2010 2011 2012 2013 2014
## Santiago

<table>
<thead>
<tr>
<th></th>
<th>Mean (cm)</th>
<th>Std (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>longitude</td>
<td>-1.5</td>
<td>4.4</td>
</tr>
<tr>
<td>latitude</td>
<td>-10.5 ???</td>
<td>3.7</td>
</tr>
<tr>
<td>up</td>
<td>-2.1 (first data only)</td>
<td>4.3 (first data only)</td>
</tr>
</tbody>
</table>
Conclusion and future work

• Conclusions
  – Test done only for SANB/SANT (Santiago de Chili)
  – GPS/DORIS vector not affected by Earthquake
    (velocity could be held fixed through Earthquake in IDS and ITRF solutions)
  – Mean = 2 or 10??? cm, std = 4 cm (1 day, 1 satellite)
    (equivalent to 7 mm for 5 satellites @ 1 week)

• Future work
  – Do similar tests for weekly or monthly solutions
    • 1 week 15 mm ???
    • 1 month = 7 mm ???  GRASP results should be better
    • 3 month = 4 mm ???
  – Do extensive tests (more DORIS stations) using all available localities