Plate motion and glacial isostatic adjustment from DORIS

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SUMMARY

• Scientific goals
  – Validate DORIS precision (station velocity)
  – Is DORIS useful in a GPS-VLBI-SLR solutions?
• Method (using STCD files)
• Results
DORIS network and major plate tectonics

34 used on plates
20 at plate boundary
5 omitted (GIA)
Analyzing STCD files:
Estimating velocity + annual signal with/without breaks
Concatenating/correcting STCD files
Verifying DORIS-DORIS local ties (SIMB)

Noise is in the DORIS IGN/JPL weekly results
Not in local ties
We enforced all geodetic local ties provided by IGN/SIMB
(45 with formal error $\leq 5$ mm, only 5 not used)

(NB: SYOB tie is provided with 50 mm formal error by SIMB)
## Discontinuities detected for DORIS stations on plates

<table>
<thead>
<tr>
<th>Station</th>
<th>Epoch</th>
<th>E (mm)</th>
<th>N (mm)</th>
<th>V (mm)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>syob</td>
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<td>20</td>
<td>-2</td>
<td>58</td>
<td>Imprecise tie</td>
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<tr>
<td>adea</td>
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<td>15</td>
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<td>-54</td>
<td>6</td>
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<td>otta</td>
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<td>-21</td>
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<td>tria</td>
<td>29-JUL-2004</td>
<td>-18</td>
<td>-65</td>
<td>-40</td>
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<td>-40</td>
<td>1</td>
<td>Unknown cause</td>
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Discontinuities detected for DORIS stations at plate boundary

<table>
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<th>Station</th>
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<th>E  (mm)</th>
<th>N  (mm)</th>
<th>V  (mm)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>sana</td>
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<td>23</td>
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<td>20</td>
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<td>-13</td>
<td>-11</td>
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<td>gola</td>
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<td>-16</td>
<td>-4</td>
<td>-1</td>
<td>Hector Mine Earthquake M 7.1</td>
</tr>
</tbody>
</table>
ERROR BUDGET

\[(\text{true error})^2 = (\text{random error})^2 + (\text{system error})^2\]

random error = dispersion of position estimates about constant velocity

system error = \frac{distance}{time}
18 mm/12 yr = 1.5 mm/yr

24 mm/12 yr = 2.0 mm/yr
When other techniques are present

Eurasia–North America

North America–Pacific

March 13-15, 2006

IDS Workshop, Venice, Italy
When other techniques are scarce

Nubia–Antarctica

Nubia–South America

March 13-15, 2006  IDS Workshop, Venice, Italy  12/14
Vertical motion

Key

March 13-15, 2006
IDS Workshop, Venice, Italy
CONCLUSIONS

• Local ties (SIMB) were checked and are good (when formal errors <= 5 mm)

• DORIS accuracy in velocity
  – Horizontal: 1.5 mm/yr
  – Vertical: 2.0 mm/yr

• DORIS is becoming useful for geodynamics
  – specifically in vertical
  – When no other technique or just GPS is present
BACK-UP SLIDES
Analyzing STCD files:
offset + rate + annual signal + discontinuities
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offset + rate + annual signal + discontinuities