Investigating HY2A radial offset for Precise Orbit Determination and Geodesy

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OUTLINE

• Introduction
• Direct estimation (POD runs) – radial offset
  – Using phase center corrections from files
  – Computing phase center corrections
  – Comparing results from other satellites
• Indirect estimations (geodesy) – TRF scale
• Discussion
• Conclusions
HY2A satellite

Vector: origin of the frame → center of phase of the DORIS antenna (R, X, Y)

- a priori value (this study)
- time evolution
- orientation in space (attitude)
Data processing

• **POD runs**
  – Daily runs
  – Station coordinates fixed (DPOD2008 v1.13)
  – No opr empirical accelerations (dynamic modelling)

• **Geodetic runs**
  – Daily runs
  – Orbit and station coordinates estimation
  – Weekly combinations
  – Projection/Transformation using internal frame
Direct estimations (POD)
Formal errors

![Graph showing formal errors over time](image-url)
Direct estimation (POD)
using phase center corrections from data files

Mean = 44.1 +/- 0.4 mm
Direct estimation (POD)
Computing phase center corrections
Direct estimation (POD)
Other DORIS satellites

<table>
<thead>
<tr>
<th>Satellite</th>
<th>Radial offset (mm)</th>
<th>Formal error (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cryosat2</td>
<td>10.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Envisat</td>
<td>9.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Hy2a</td>
<td>44.1</td>
<td>0.4</td>
</tr>
<tr>
<td>Jason</td>
<td>(100.3)</td>
<td>(1.0)</td>
</tr>
<tr>
<td>Jason-2</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>Saral</td>
<td>23.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Spot-4</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>Spot-5</td>
<td>16.4</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Daily estimations, 2011-2016 data span
Indirect estimation
(geodetic runs)
Indirect estimation (geodetic runs)

Scale = 3.47 +/- 0.15 ppb

HY2A solution vs. ignwd15
Discussion
Should we correct a priori values?

• POD runs
  – No effect on orbit radial component

• Geodetic runs
  – Direct effect on TRF scale
  – Potentially important for combined (multi-satellites) solutions
  – Potential problems:
    • Consistency between Acs solutions (software dependency?)
    • use of information from prior ITRF to determine data to estimate future ITRF
    • What about time evolution of this parameter?
CONCLUSIONS

• HY2A Radial offset
  – Direct estimation (POD): 44.1 +/- 0.4 mm
  – Indirect estimation: TRF scale: 3.47 +/- 0.15 ppb

• Similar study on other satellites
  – Systematic study required for all satellites and all components
  – Could it explain current TRF variations (amount and availability of data per satellite)?

• Should we correct this effect for future IDS solutions?