Update of the HY-2A SRP model

Clément Masson, Alexandre Couhert, Flavien Mercier, Hanane Aït-Lakbir, John Moyard
Outline

• General information
• Estimation of the SRP coefficient
• Estimation of the GPS phase center
• Estimation of the DORIS phase center
General information

- DORIS-only and GPS-only orbits (with fixed ambiguities)
- 3-year period: January 2016 to November 2018 (arc 225 to 373)
- Estimation of SRP coefficient with GPS orbits
- Estimation of GPS and DORIS COP with new SRP coefficient
GPS Ambiguity fixing

- Method similar to Jason 3 and Sentinel-3
- Very good behavior of the GPS receiver
- Most days > 98 %
- Measurement gaps or errors in RINEX files
Estimation of the SRP coefficient

- Estimation on GPS-only dynamic orbits with fixed ambiguities
- Best results during eclipses
- Odd behavior around high $\beta'$
- New value: 0.88
Estimation of the GPS phase center with the new SRP coefficient

- Daily reduced-dynamic GPS-only orbits computed for ambiguity fixing
- No change on the Z direction (radial) with the new SRP
- Initial COP position: (0.349, -0.165, -1.315) m
- Very small and stable bias (-2 mm)
Estimation of the GPS phase center with the new SRP coefficient

- Y direction shifted by 5 mm
- Strong β’ signal still present
- Initial COP position :
  (0.349, -0.165, -1.315) m
- Bias on entire period :
  -1mm → +7 mm
- Bias during eclipses :
  -8mm → -2mm
Estimation of the DORIS phase center with the new SRP coefficient

- Dynamic DORIS-only orbits
- Initial COP position: 
  \((0.850, -0.750, 1.010)\) m
- Radial direction: no change
- Median: -11 mm
- -45mm seen on previous study with DPOD2008
- +20mm offset in 2017 -> current IDS documentation value
- + DPOD update
Estimation of the DORIS phase center with the new SRP coefficient

- Initial COP position:
  \[(0.850, -0.750, 1.010) \text{ m}\]
- Entire period:
  -7.3 mm \(\rightarrow\) -15.4 mm
- On eclipses only:
  -2mm \(\rightarrow\) -8mm
- \(\beta'\) signal
Empirical accelerations on GPS orbits

- Accelerations as a function of $\beta'$
- Origin shifted to subsolar latitude
- Tangential sine strongly changes with $\beta'$, corrected by new SRP coefficient
- Odd behavior of the normal acceleration: bias, drift + not a function of $\beta'$
Empirical accelerations

- Jump at $\beta'=90^\circ$
- Behavior seen on 3 years
- Attitude change?
Conclusions

- New SRP coefficient removes tangential acceleration dependency to $\beta'$
- COP bias and $\beta'$ signal in the normal direction for GPS and DORIS
- Strange behavior of empirical accelerations in the normal direction at $\beta'=90^\circ$
- Better estimates of SRP coefficient and more reliable estimates of COP (DORIS and GPS) in the normal direction possible once this behavior is explained

- **DORIS COP values** :
  
<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Updated</th>
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<tbody>
<tr>
<td>X (Tan)</td>
<td>0.850</td>
<td>0.850</td>
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<tr>
<td>Y (Nor)</td>
<td>-0.750</td>
<td>-0.742 (+8 mm) ?</td>
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<tr>
<td>Z (Rad)</td>
<td>1.010</td>
<td><strong>1.021 (+11 mm)</strong></td>
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- **GPS COP values** :

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<td>0.349</td>
<td>0.349</td>
</tr>
<tr>
<td>Y (Nor)</td>
<td>-0.165</td>
<td>-0.167 (-2 mm) ?</td>
</tr>
<tr>
<td>Z (Rad)</td>
<td>-1.315</td>
<td><strong>-1.317 (-2 mm)</strong></td>
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