JASON-2 POD results from ESOC

Claudia Flohrer, Michiel Otten, Florian Dilssner
ESA/ESOC
Jason-2 orbit solutions based on SLR, DORIS, and GPS

- Orbit comparisons
- Solar radiation pressure modeling
- Along-track CPR’s
- GPS antenna phase maps (derived from residuals)
POD standards

Reference System

- Station coordinates: DPOD (v1.4) for Doris, LPOD (v10) for SLR, IGb05 for GPS, all station displacements according to IERS-2003
- Satellite reference: Post-launch value of mass and theoretical attitude model (with attitude event file)

Force Models

- EIGEN-GL05C static field degree/order 120 (C21 & S21 values replaced with IERS-2003 values)
- Atmospheric contribution to the gravity degree/order 20 (AGRA service at GSFC)
- IERS 2003 Solid Earth tides
- FES 2004 Ocean tides (all principal constituents, with admittance) degree/order 50
- Sun, Moon and all Planets (DE-405)
- Boxwing model for drag, solar radiation and Earth radiation (albedo & IR), using CNES Jason-1 GDR-C values with Cr fixed to 0.99
- MSIS-90 model for atmospheric density with HWM93 for winds
Estimated Orbit Parameters

- Satellite state vector
- 5 drag coefficients per 24 hours
- 2 sets of CPR’s per 24 hours (along and cross track direction)

ESOC Orbit Solutions

- **ESOC SD**
  - SLR+DORIS solution (version 3)
  - 7 day arcs

- **ESOC SDG**
  - SLR+DORIS+GPS solution (test version)
  - 3 day arcs

External Orbit Solutions for comparison

- **CNES**
  - CNES GDR-C POE
OSTST Meeting – Seattle June 2009

**Used tracking data from CDDIS and AVISO**

**DORIS**
- 10° elevation cut-off
- Troposphere: Temp./pressure from GPT, zenith delay (dry) from Saastamoinen mapped with GMF dry, estimated pass-specific zenith delay mapped with GMF wet
- Frequency: Bias per pass adjusted
- Weight: 0.35 mm/s

**SLR**
- 7° elevation cut-off
- Troposphere: Mendes-Pavlis following IERS-2003 update
- Retro-reflector: Constant correction of 4.9 cm for all stations
- Weight: 10 cm

**GPS**
- 7° elevation cut-off
- 30 sec sampled observations - undifferenced code and phase
- ESA orbits and clocks (30 sec)
- Phase windup correction applied
- No elevation dependent weighting applied
- No Jason-2 ANTEX correction applied
- Extended ANTEX correction used for GPS satellites (< 17°)
- Weight: 1 cm for phase, 1 m for code
Orbit comparison – daily RMS difference

ESOC SD - CNES
Notice the much smaller cross-track difference but slightly higher radial difference.
Orbit overlap error – daily RMS difference
Solar radiation pressure model
scale factor derived from different models

Constant area
Jason-1 GDR-C Boxwing
ESOC Boxwing
Jason-1 Boxwing
Solar radiation pressure model

SLR residuals using different models

Jason-1 GDR-C
Boxwing

ESOC BoxWing
Along-track CPR’s

Notice the clear pattern correlating with the different attitude modes of Jason-2, and the different behavior for 2009 after the last transition to the yaw steering mode.

fixed yaw mode
• Tune the **ESOC SLR – DORIS – GPS orbit solution**

• Estimate a **Jason-2 antenna phase map** as part of the orbit estimation (derived from normal equation stacking)

• Provide a **ESOC Jason-2 orbit solution on a routine basis**