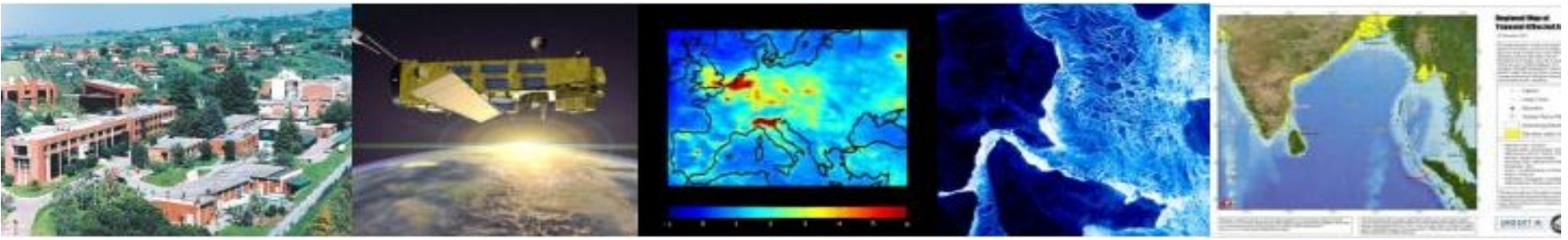
JASON POD at ESOC



Michiel Otten ESA/ESOC

Introduction

Why Jason POD at the Navigation Office in ESOC?

- We have been involved in the Orbit Validation for all ESA's altimeter missions (ERS-1/2 and Envisat)
- Further we are participation in the IDS for the ITRF-2008 release by providing a reprocessed time series from 1994 – 2008
- Jason-2 allows us to validate with one satellite our SLR, DORIS and GPS processing capabilites.
- In return we will be able to provide different orbit solution based on any combination of the three tracking techniques.
- The Initial results shown on the next slides are based on our SLR+DORIS solutions.

POD Standards

REFERENCE SYSTEM:

-polar motion and UT1: IERS bulletin 05 C04 with IERS 2003 daily and sub-daily corrections

-stations coordinates: DPOD-2005 reference for Doris Stations, LPOD-2005 reference for SLR stations

-satellite reference: Post-Launch value of Mass, attitude model: Nominal Yaw Steering Law

FORCE MODELS:

- EIGEN-GL04S gravity field including seasonal variations up to degree/order 50
- Atmospheric contribution to the gravity field up to degree/order 20 (AGRA service at GSFC)
- IERS 2003 Solid Earth tides
- FES 2004 ocean tides (all principal constituents, with admittance) up to degree/order 50
- Sun, Moon, and all Planets (DE-405)
- box-wing* model for drag, solar, infrared and albedo radiation
- MSIS-90 model for atmospheric density

POD Standards

PARAMETERS:

- 7-Day arcs, estimated Satellite State Vector
- Five drag coefficient and one 1/rev along-track and cross-track constant per 24 hours.

TRACKING DATA:

- All station displaced corrections according to IERS 2003
- DORIS:
- Troposphere: Saastamoinen with GPT, GMF with estimated zenith delay (wet)
- Frequency: Bias per pass adjusted
- Weight: 0.5 mm/s
- LASER:
- Troposphere correction: Mendes-Pavlis following IERS 2003 update
- Retroreflector correction: Constant radial correction of 4.9 cm for all stations
- Weight: Globally 4 cm

Preprocessing JASON-2 Data

For the initial results show here we used the DORIS data in the “old” Exchange Format (version 2.2).

Large percentage (30%) of measurements were flagged to have invalid Ionosphere correction for the first 8 cycles of Jason-2 that were processed (Ionosphere refraction correction was set to zero).

Orbit Comparison

CYCLE 1			
Comparison	Radial	Along	Cross
ESOC – CNES	13.5	32.9	32.8
ESOC – JPL	19.0	42.0	30.5
CNES – JPL	22.5	48.5	15.5

CYCLE 2			
Comparison	Radial	Along	Cross
ESOC – CNES	14.8	33.4	35.0
ESOC – JPL	21.8	48.6	32.8
CNES – JPL	24.4	52.1	18.3

Shown in the tables on the left are the orbit difference for the different cycles between our solution and the available Sp1 orbit solution found on the CDDIS server.

The difference are RMS values for the complete cycle in millimeters.

Still relative large cross track difference for the ESOC solution the solar radiation modeling is suspected to be the cause and is under further investigation.

Orbit Comparison

CYCLE 3			
Comparison	Radial	Along	Cross
ESOC – CNES	12.7	31.4	27.1
ESOC – JPL	11.8	31.8	23.6
CNES – JPL	14.3	32.7	15.4

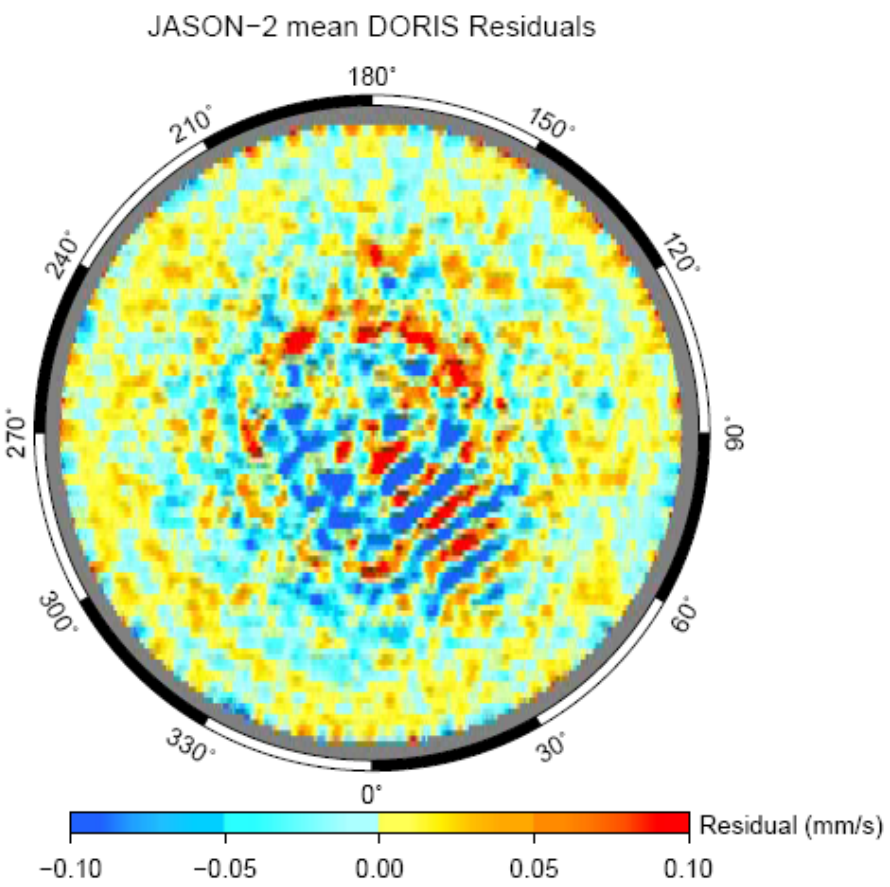
Comparison between CNES - ESOC			
Cycle	Radial	Along	Cross
1	13.5	32.9	32.8
2	14.8	33.4	35.0
3	12.7	31.4	27.1
4	10.7	33.0	31.0
5	*	*	*
6	9.0	34.6	41.7
7	13.3	30.2	25.2

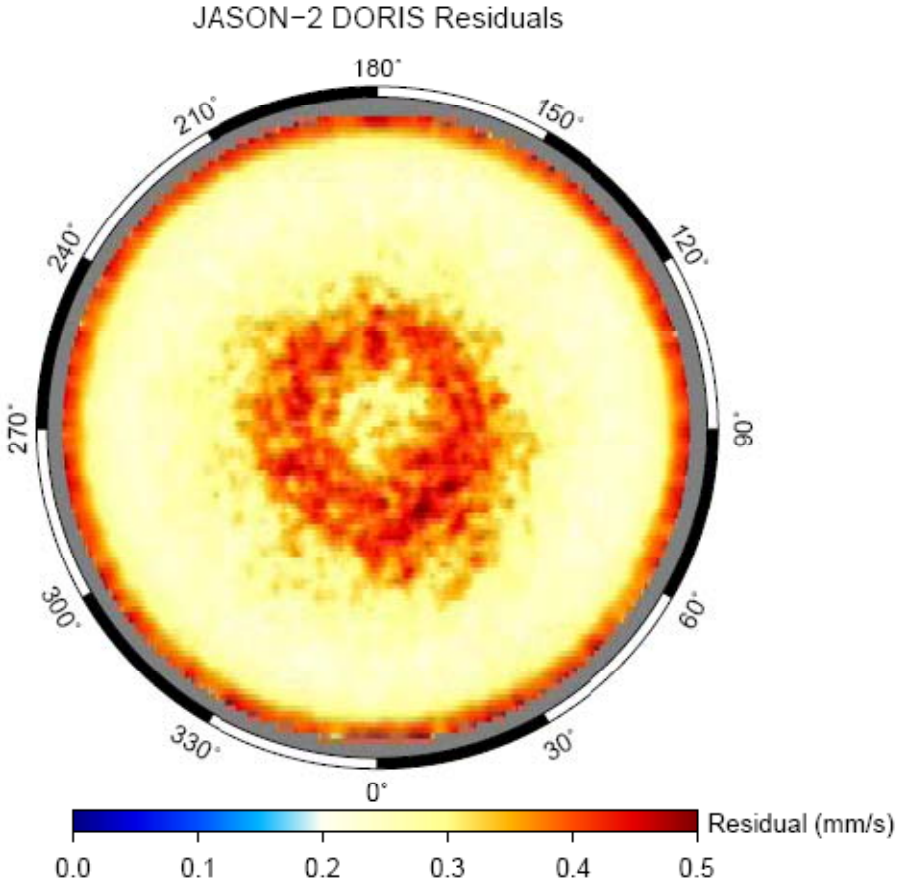
Shown in the tables on the left are the orbit difference for the different cycles between our solution and the available Sp1 orbit solution found on the CDDIS server.

The difference are RMS values for the complete cycle in millimeters.

* The values for Cycle 5 are omitted because of the large difference due to the manoeuvre in this cycle

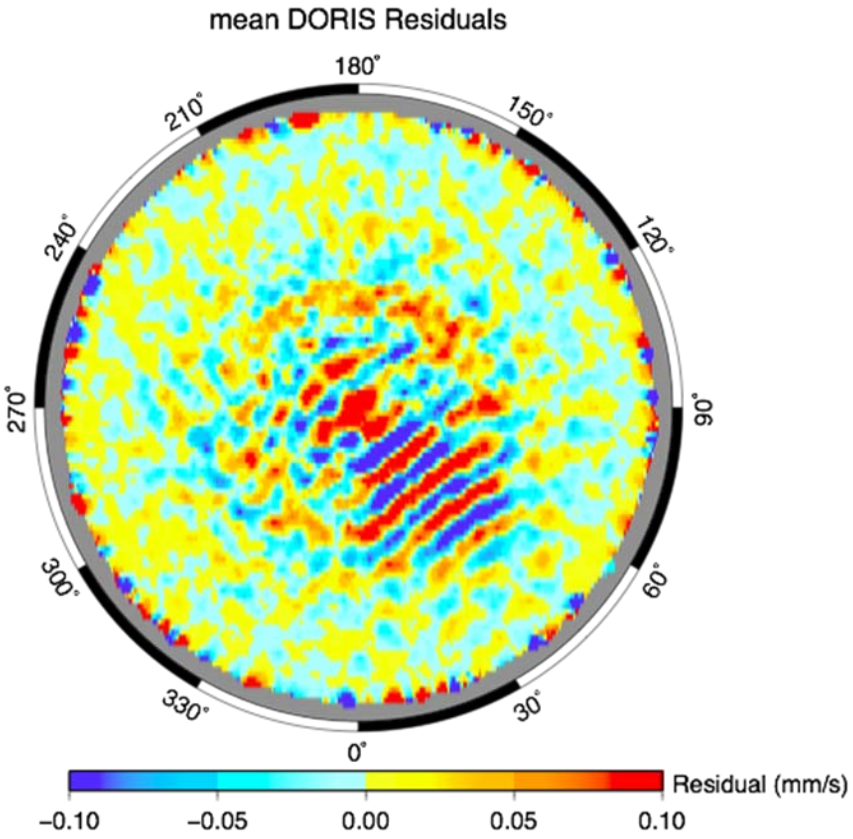
Initial Results

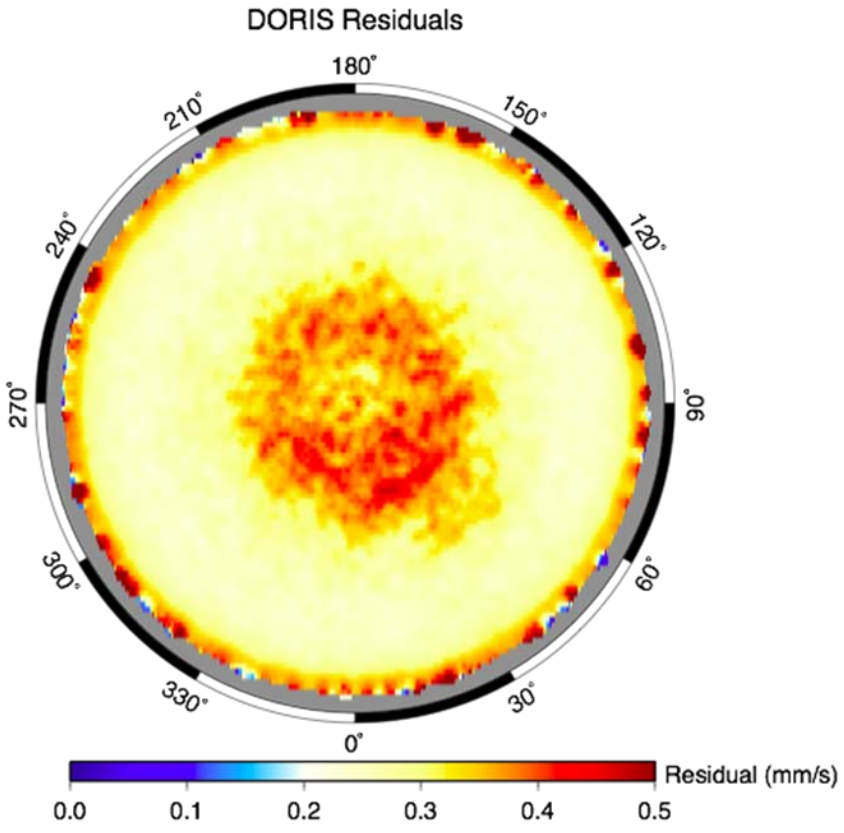




Shown on the left plot are the DORIS mean residuals for Jason-2 as seen from the satellite (the DORIS transmitting antenna in yaw and nadir angle). The right plot shows the residuals themselves.

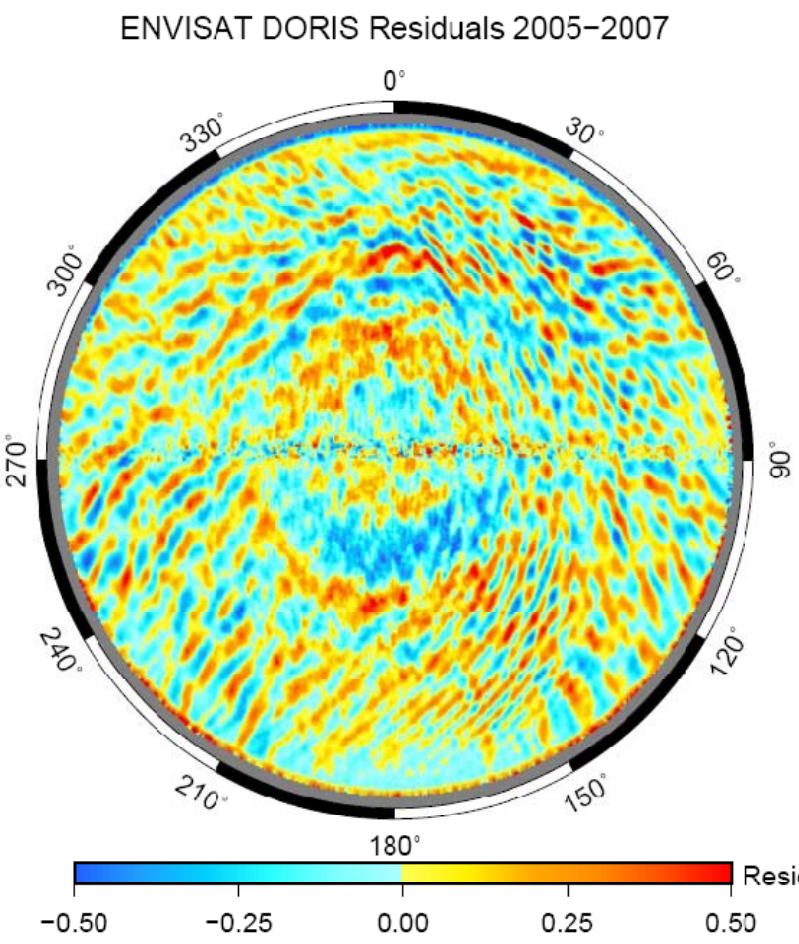
Initial Results

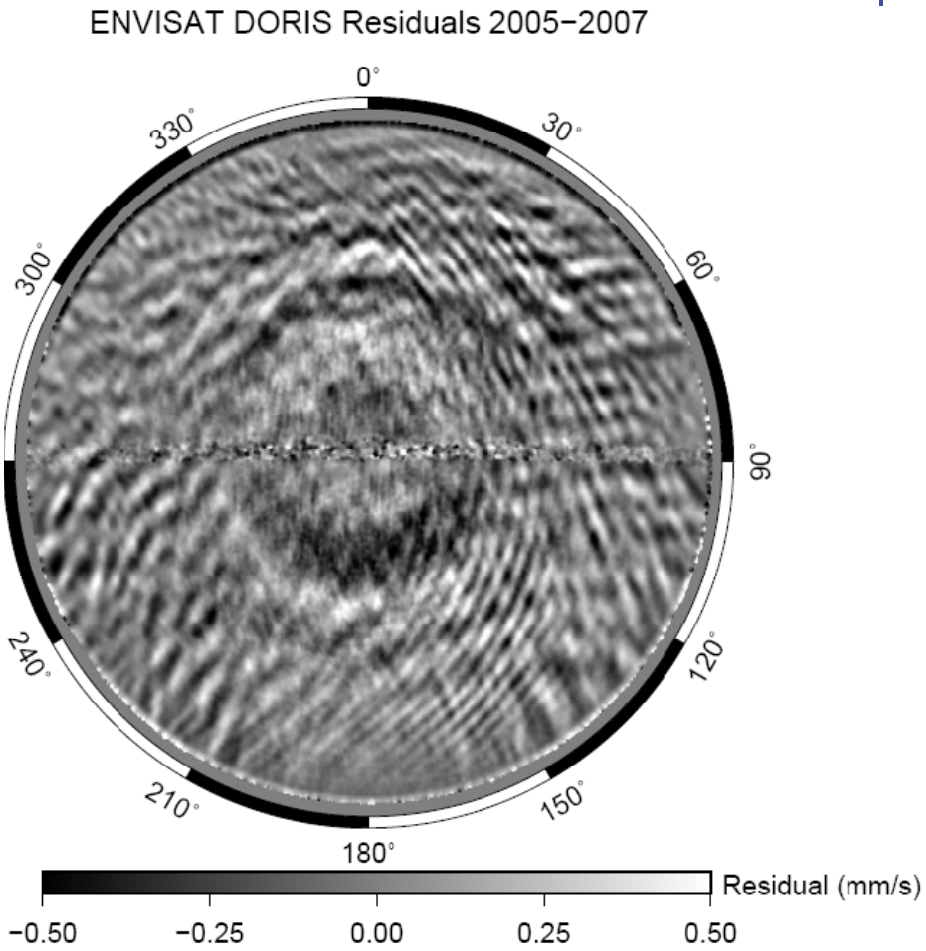




For comparison are shown the DORIS mean residuals and the residuals but now for Jason-1 taken from our IDS processing. Notice the very similar pattern present for both Satellites in the mean residuals.

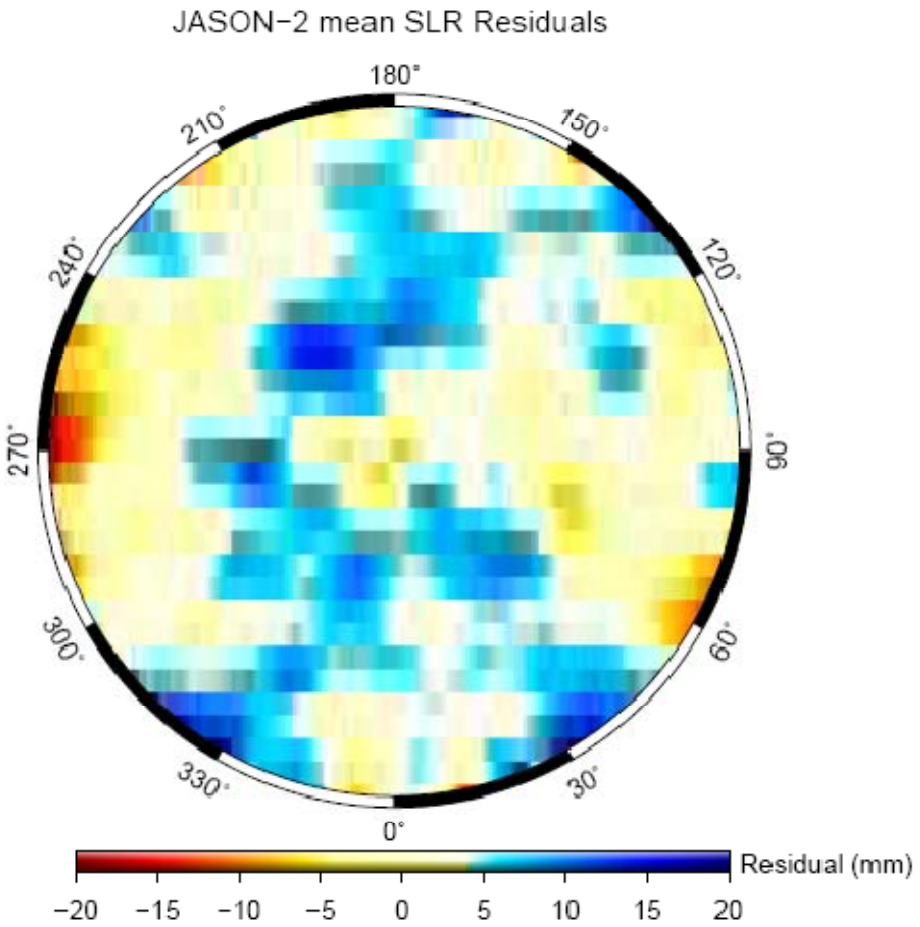
Initial Results





For comparison are shown here the mean DORIS residuals for Envisat notice a very different pattern for the different satellites. The Enviat scale used for these plots is 0.5 mm/s against 0.1 mm/s for the previous Jason plots.

Initial Results



The plot on the left shows now for the SLR the mean residual for the first 8 cycles. No along track pattern is visible indicating that the time tagging of the DORIS measurements are correct.

Notice that this plot is only bases on 8 cycles of SLR tracking providing only a limited number of points per bin.

Outlook

- Before the end of the year we will generate Jason-2 solutions based on GPS+(SLR) and DORIS+SLR.
- Will switch from the theoretical attitude model to the quaternions.
- Will resolve the larger cross-track difference for the ESOC solution.