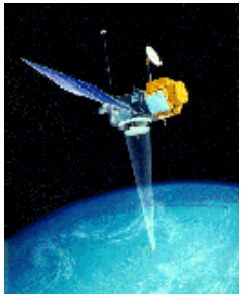
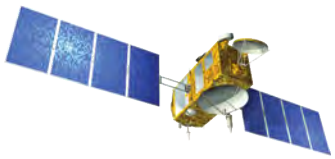
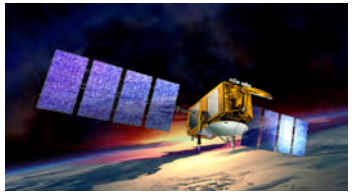





SWT2016, POD Splinter Summary

Session Summary (1)

- 10 oral talks (1 invited); 12 posters.
- Updates by CNES, GSFC, JPL & ESOC.
- Detailed topics (treated in oral talks & posters):

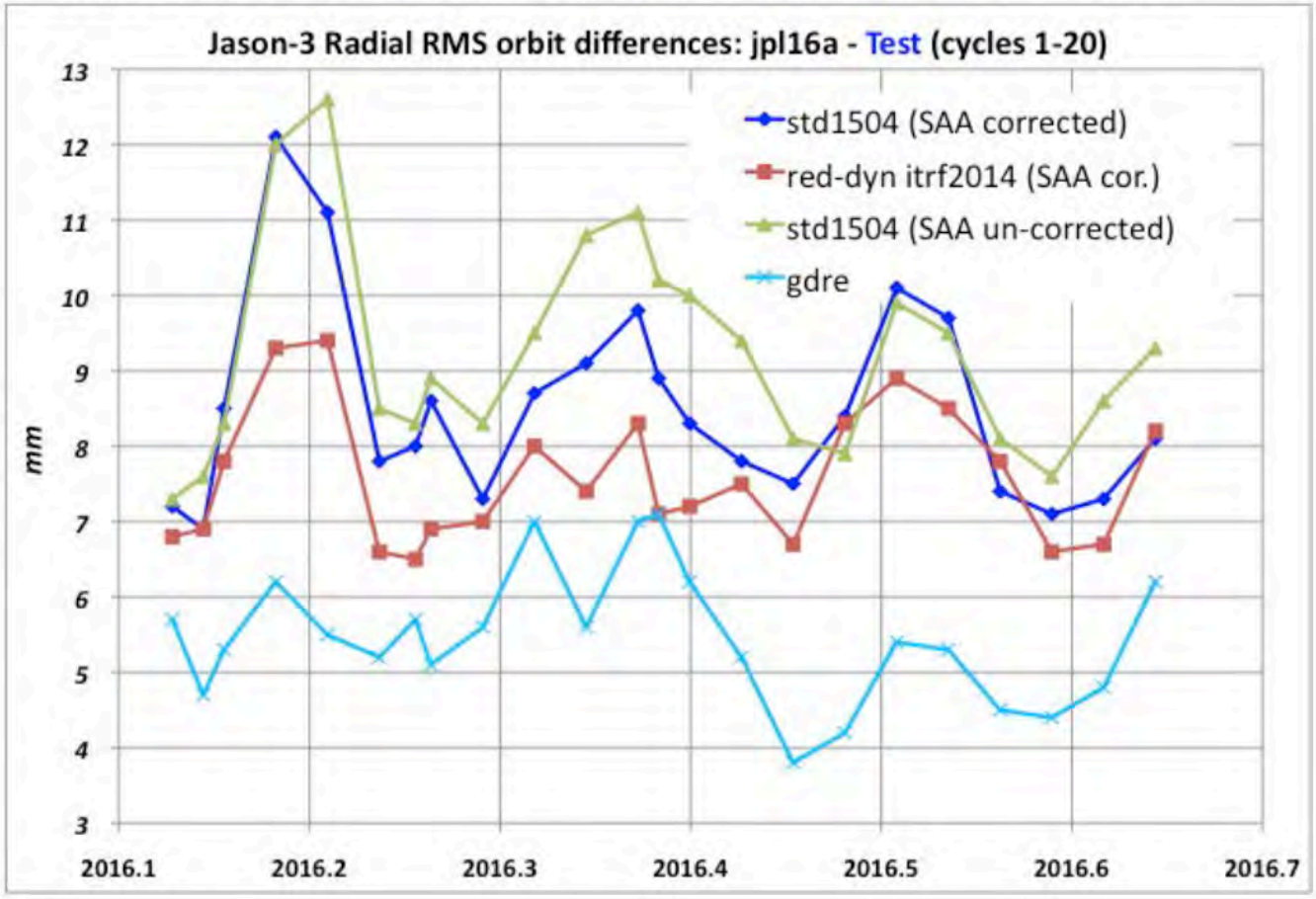
1. POD Updates on Jason-2, 3, Sentinel-3A.
2. Quality of tracking systems evaluated for Jason-3.
3. Estimation of Geocenter models to apply in altimeter POD (SLR, and DORIS data)
4. Evaluation of ITRF2014; Development of DORIS-only cumulative solution (DPOD2014) → application for POD, also to be used in operations by CNES.
   Test time series developed in ITRF2014 (GSFC, GFZ).

5. Reprocessing of TOPEX with GDR-E standards. So now two time series of orbits are available for entire time series. std1504 (gsfc) and GDR-E (CNES, DORIS only, SLR used for validation).

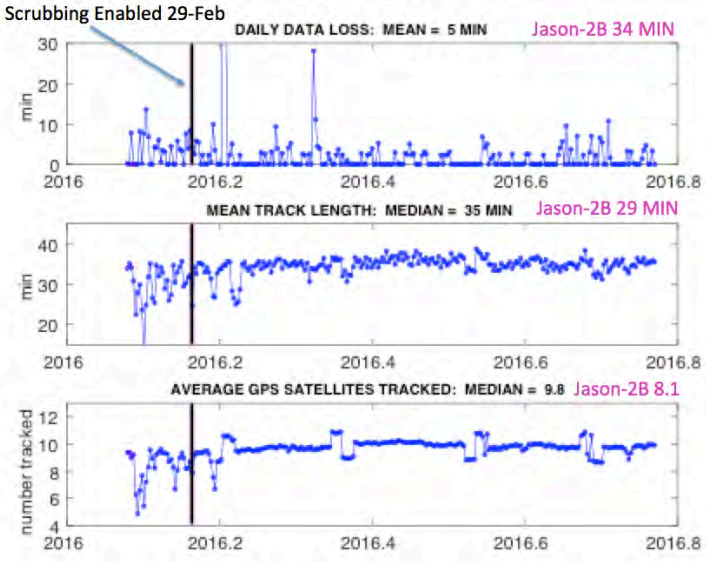
6. Invited presentation discussed work by ILRS community to analyze stability of quality of SLR stations with respect to ranging bias.

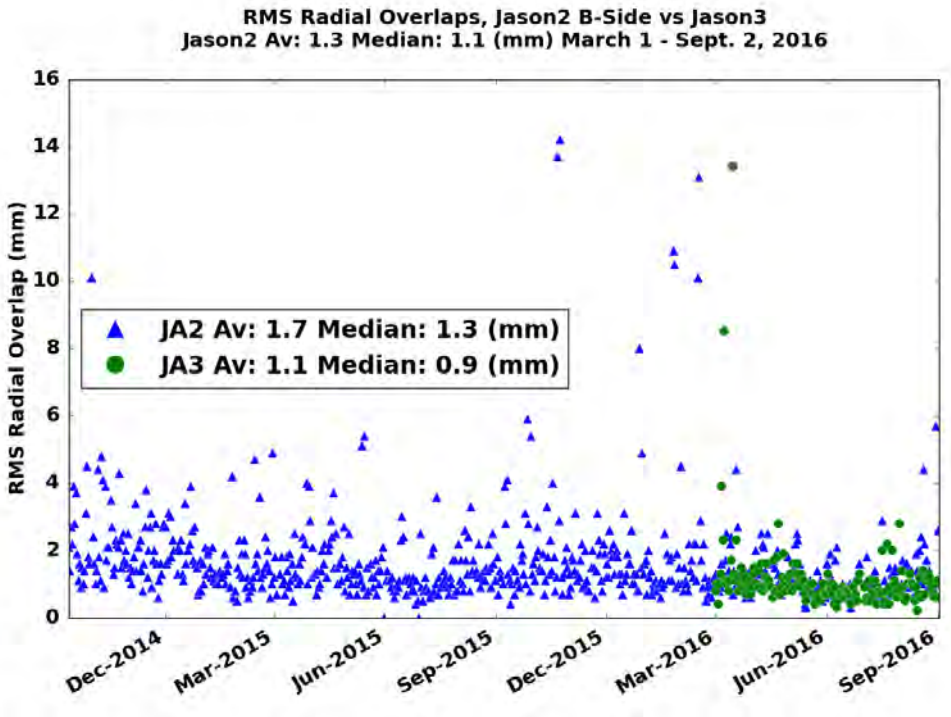
Jason-3:
Radial Orbit Differences

Jason-3 JPL16a orbits vs. CNES/GDRE & GSFC orbits

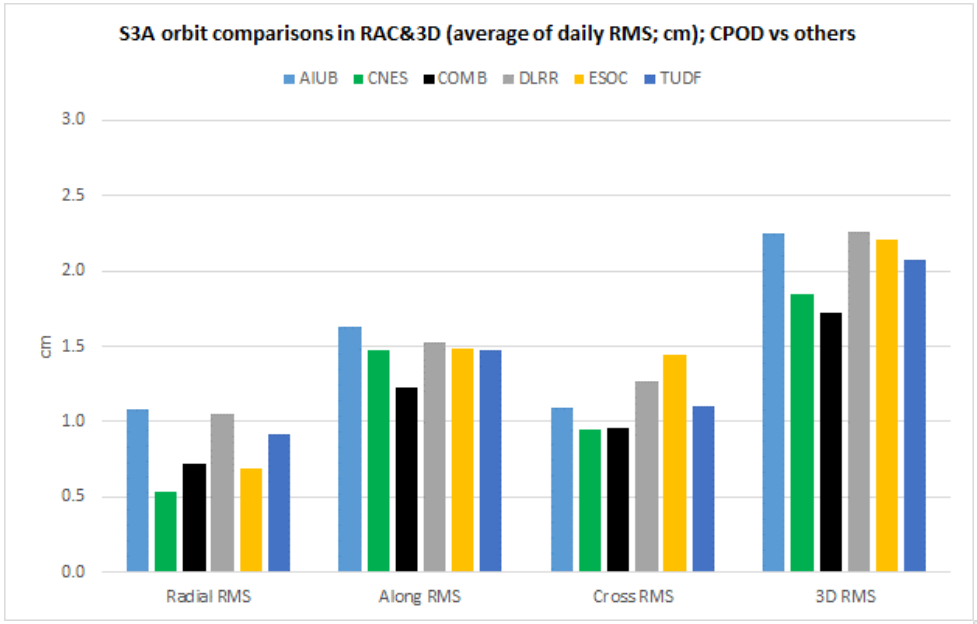


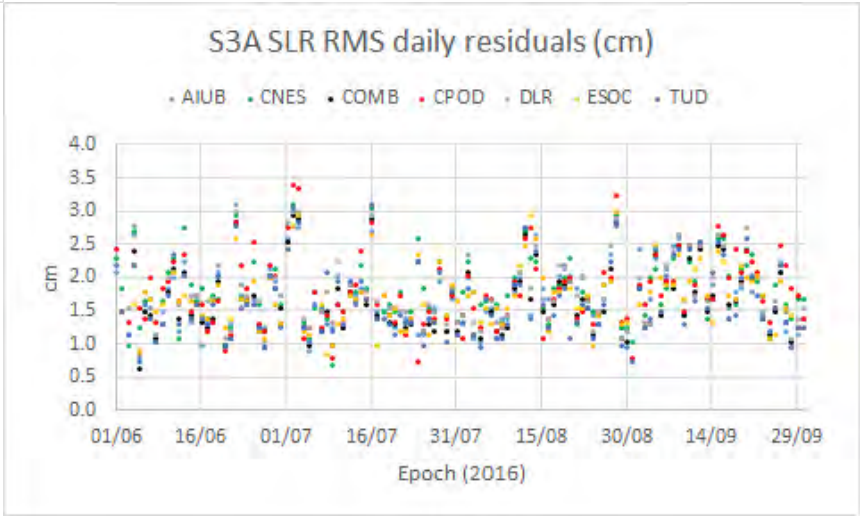
Jason-3 GPS Receiver Performance
Jan. 20 - Oct. 6, 2016





Sentinel-3A Status (POD)
Comparisons with POD centers

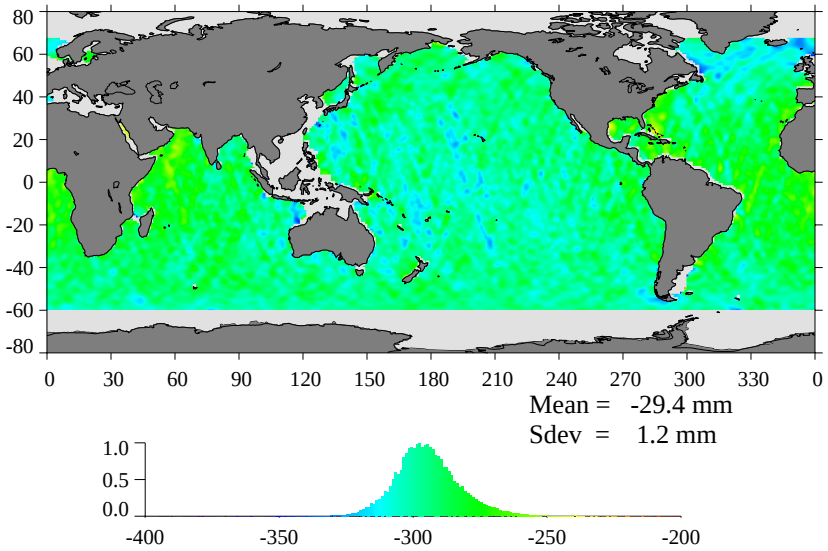




Fernandez et al., OSTST2016

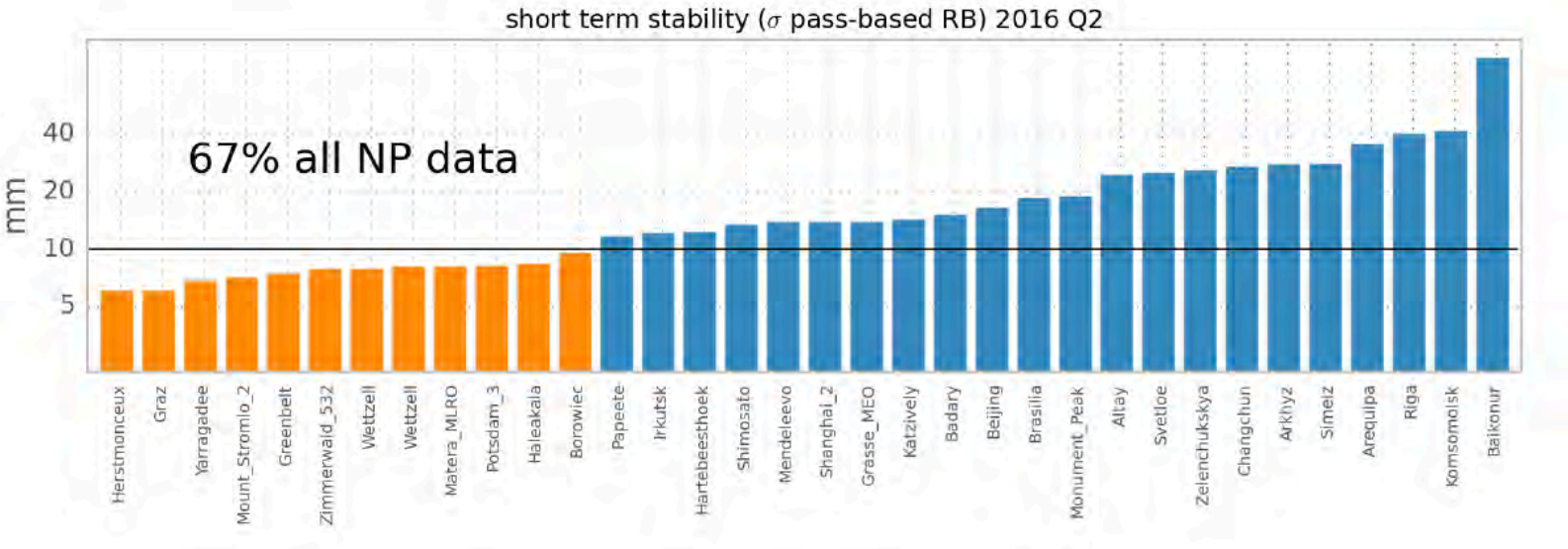
Jason3-Jason2 SSH differences over inter-calibration period for SLR+DORIS orbits

(gsfc-std1504_saa, ITRF2008)



No significant orbit-related signal; or instrumental-related signal; 1.2 mm in stddev

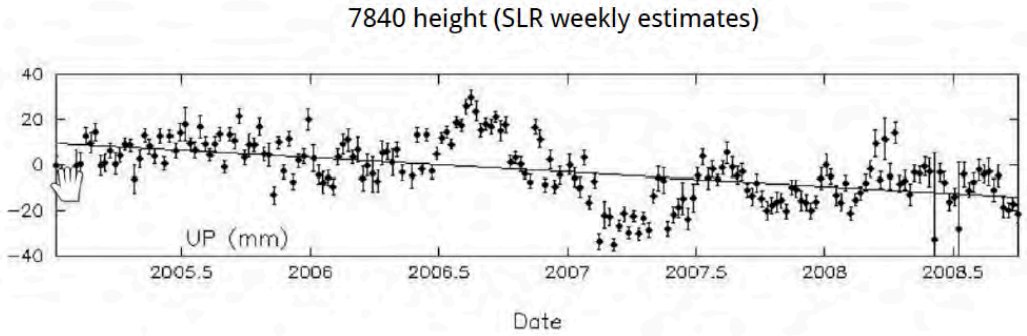
Validation of Altimeter satellite orbits by SLR.-
Issues with short and long-term precision (1)



Validation of Altimeter satellite orbits by SLR.-
Issues with short and long-term precision (2)

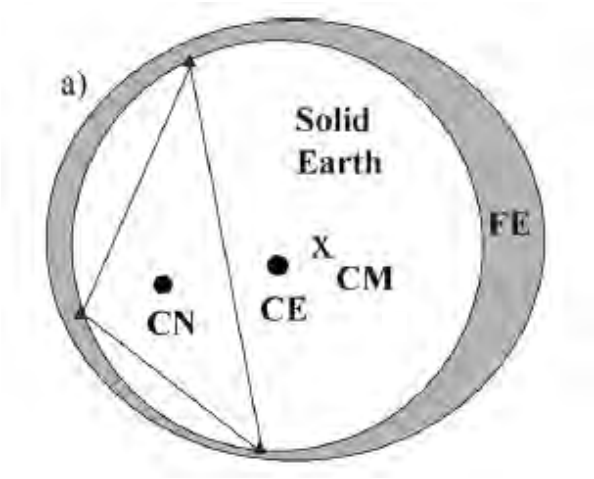
So what can possibly go wrong?

An example:

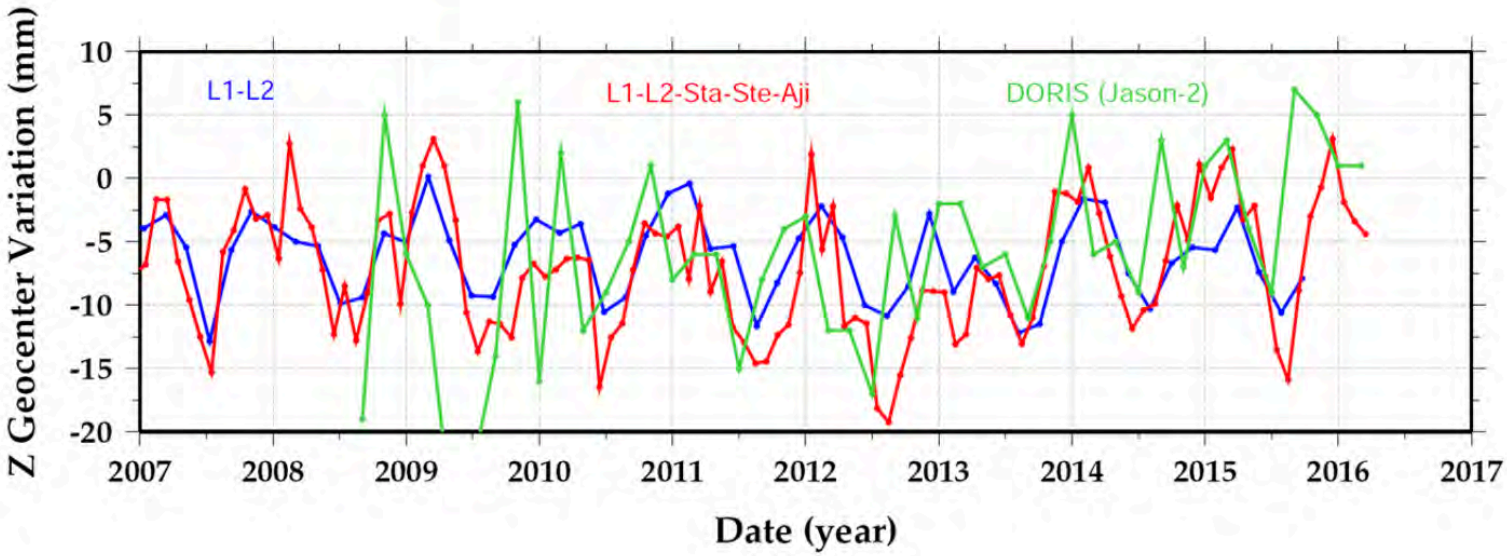


- Herstmonceux: 2007 upgrade from Stanford counters to event timer uncovered a years-long range bias of ~11 mm (>_<)
- Initially unnoticed, problem was detected by analysis of estimated range bias time series
- What is there to assure us that similar issues did not affect other stations?

Comparison of geocenter solutions for altimeter POD (SLR, DORIS-based)



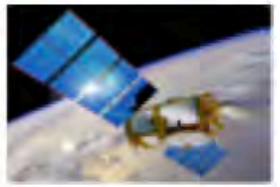
- Good overall agreement in the North/South direction



1. Pole Tide & Mean Pole Modeling Issue in IERS Conventions:

Given the recent papers of King and Watson (*2014, Geophysical J. Intl.*), Wahr et al. (*J. Geophys. Res-Solid Earth, 2015*), the OSTST expresses concern that the current IERS2010 standards for the definition of the pole and the calculation of the corrections for the pole tide (in deformation and in terms of gravity coefficients) are not adequate to meet the long-term needs for a long-term stable reference frame for altimetric products, and for the accurate determination of velocities at tide gauge sites essential for validation of altimeter data. The OSTST requests that the IERS clarify these standards and provide guidance for POD centers that perform altimeter orbit computations and update these standards well in advance of any new computations for a new realization of the ITRF.

Round Table Questions POD
Mean Pole & Pole Tide



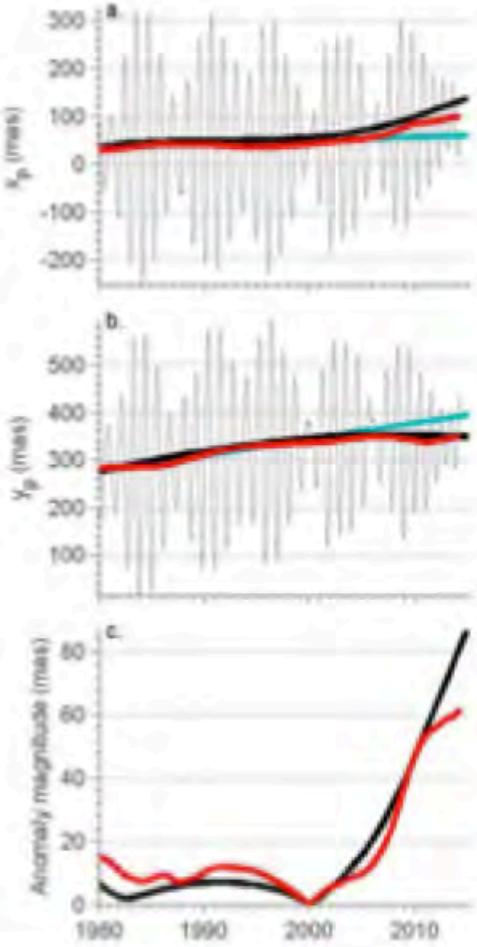
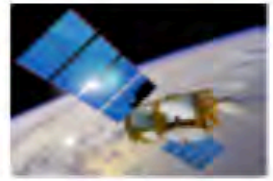


Figure 1. (a) and (b) Time-series of Earth's polar motion showing for the x and y components, respectively, of the unfiltered (grey) IERS C01 time-series (x_p, y_p)A (black) IERS2010 cubic+linear model ($\bar{x}_p$, $\bar{y}_p$) and (red) our filtered IERS C04 time-series. The cyan line is a continuation of the estimated mean rate over 1900–1990 (Gross & Vondrák 1999). (c) Polar motion anomaly to the 20th century mean rate described in the main text, with magnitude computed relative to 2000.0, for the IERS2010 cubic+linear model (black) and our filtered C04 time-series (red).

(King & Watson, 2014, Geophys J Intl)

Round Table Questions POD
Mean Pole & Pole Tide



King and Watson (2014), "Geodetic vertical velocities affected by recent rapid changes in polar motion", Geophys. J. International, 199, 1161-1165.

- "Secular motion of the pole results in a large-scale secular deformation of the Earth."
- "Geodetic velocities determined since ~2005 are biased by ±0.38 mm/yr relative to the longer-term deformation pattern."

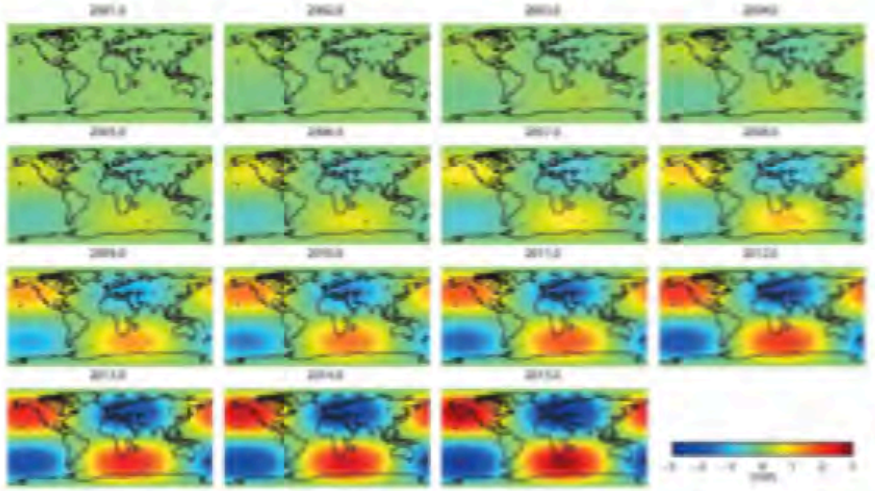
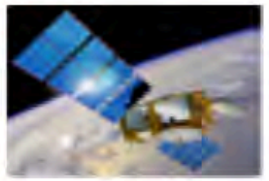


Figure 2. Modelled deformation patterns for 2001 January 1 to 2015 January 1 expressed as anomalies to the average pattern (related to polar motion) over the 20th century.

Round Table Questions POD
Mean Pole & Pole Tide



Wahr, J. R.S. Nerem and S.V. Bettadpur, "The pole tide and its effect on GRACE time-variable gravity measurements: Implications for estimates of surface mass variations", J. Geophys. Res., Solid-Earth, 2015.

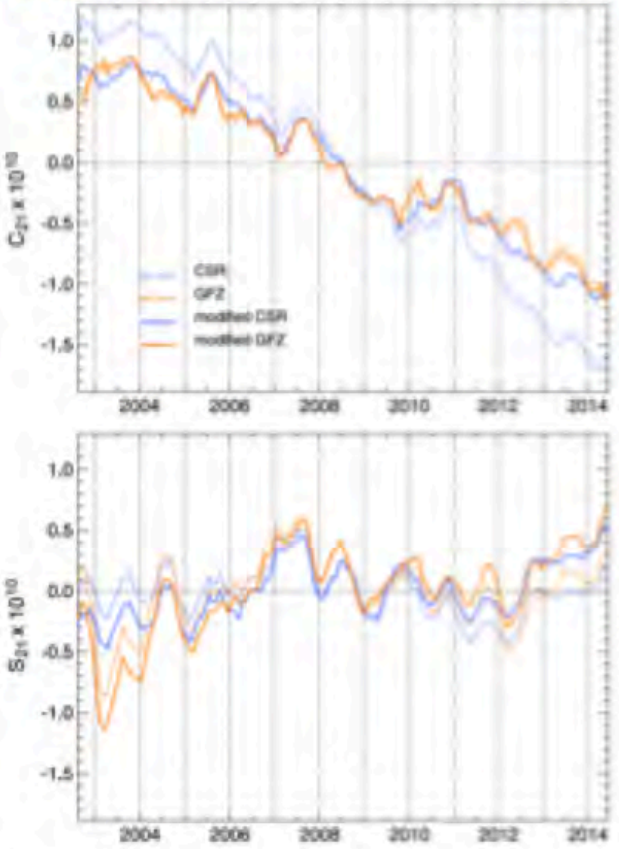


Figure 3. The dotted lines show the CSR and GFZ Release 5 GRACE C_{21}, S_{21} results, smoothed with a five-point sliding boxcar, plotted about their mean values. The solid lines show those same values after subtracting corrections (21) and (22).

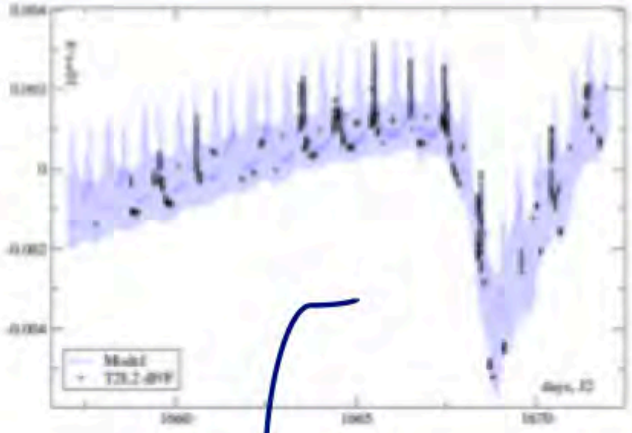
2. SAA/Jason-3/Jason-2 & T2L2.

“The OSTST recommends continuation of support for the T2L2 experiment on Jason-2 in order to provide the necessary data to monitor the behavior of the DORIS USO on Jason-2, and provide the most accurate possible reference for development of a SAA correction model for Jason-3, and to elucidate the implications of time system errors at the stations of the Satellite Laser Ranging network for precise orbit determination and the stability and accuracy of the terrestrial reference frame”

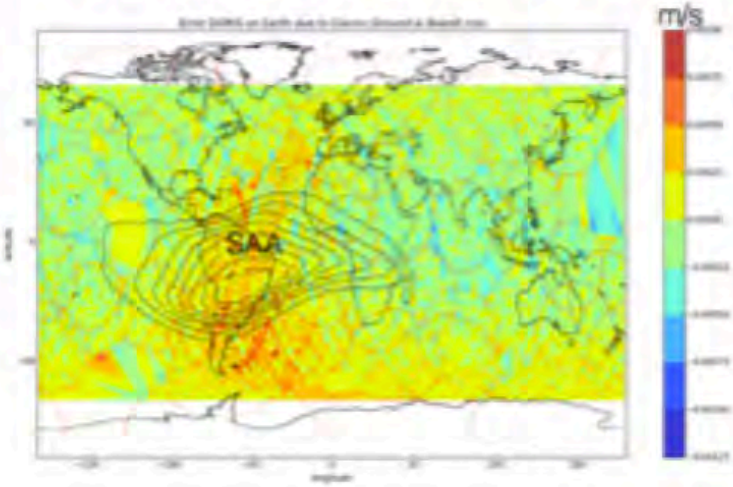
Example-1

- **Modelling the DORIS USO thanks to T2L2 /Jason-2; interests for:**
  - **mission and products**
  - **contribution to Jason-3**
  - **other DORIS satellites -> a generic model ?**

- **Using**
  - **J2/J3 tandem period**
  - **J2 new orbit AND T2L2**
  - **POE/DIODE products**

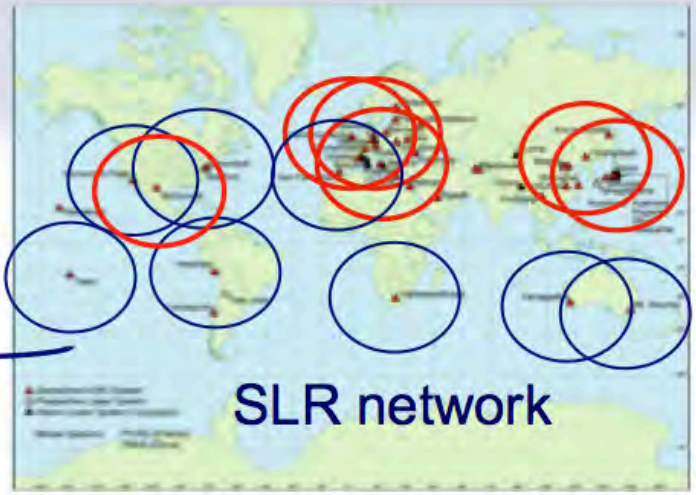


Expected ground signature



Example-2

- **Time transfer between SLR's thanks to T2L2 /Jason-2; interests for:**
  - **POD and reference frame**
  - **Time Bias of laser ranging st.**
  - **Contribution to:**
    - Jason-2, LAGEOS, and other laser satellites
- **Quantities:**
  - **Time bias: 200 to > 1000 ns ->**
  - **Along-T effects expected:**
    - Jason : 2 mm – 28 mm
    - LAGEOS : 1 mm – 16 mm
  - **Geocentric coordinates**
  - **Transmission of time errors (bias) from laser to DORIS**



T2L2 as a time link between SLR's