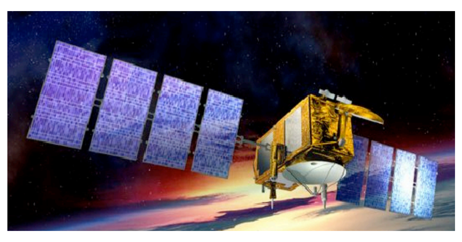

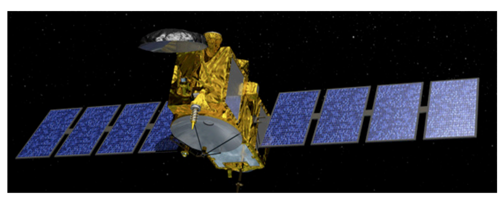

The status of the Jason 2 & 3 missions with respect to POD and the contribution of Satellite Laser Ranging

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Background

The Jason-3 satellite, launched on January 17, 2016 from Vandenberg Air Force Base Launch Complex (California, USA) via a Falcon 9 rocket], is the fourth in a series of satellites launched to synoptically monitor the global ocean surface topography using a radar altimeter. The Jason-3 satellite continues the time series of data acquired by TOPEX/Poseidon (1992-2000), Jason-1 (2000-2009), Jason-2 (2008-2016) that have been acquired from a near ten-day repeat orbit at an altitude 1336 km and inclination of 66°.

The data acquired by these satellites have revolutionized our understanding of the world's oceans and have provided vital science data to understand their dynamics. The data from these satellites also play a critical role in monitoring the global change in mean sea level, since the orbit used by these satellites, in combination with the precision geodetic tracking, serves as precise reference with which to monitor the change in the height of the ocean surface.

The launch of each "successor" mission has required that initially (for the first 8-9 months of each new mission, each satellite fly in tandem (~60 seconds apart), so that the radar altimeters and water vapor radiometers can be precisely inter-calibrated. This tandem mode of operations assures that we can seamlessly connect the altimeter data across different missions.

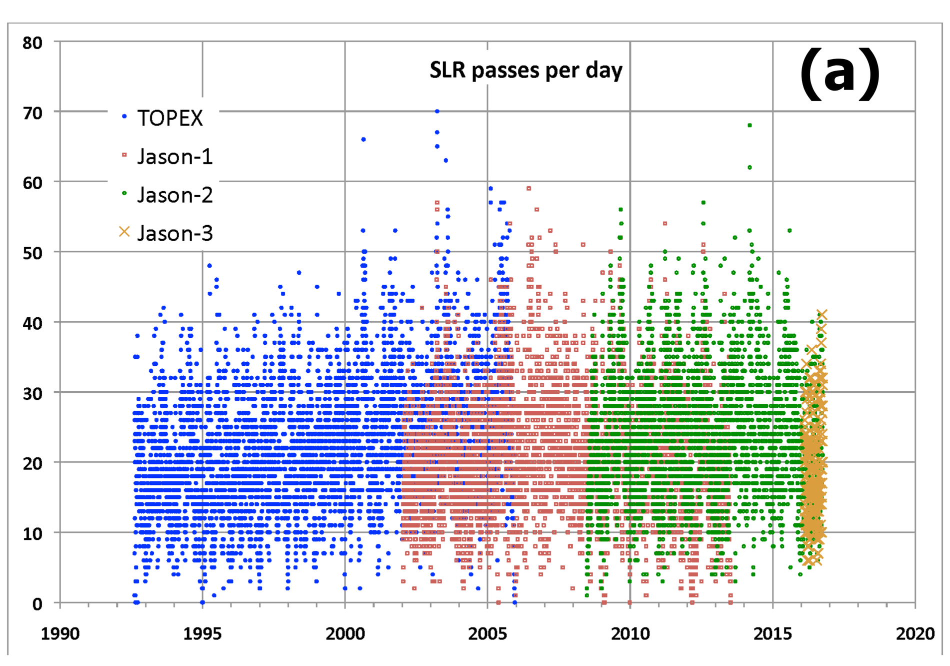
The Jason-2 and Jason-3 satellites have been flying in tandem mode since early February 2016. The tandem period will end on October 2, 2016, and at that time a series of maneuvers will be undertaken to move Jason-2 to a different orbit, one whose orbits interleave with those of Jason-3. This "interleaved" mode of operations was chosen in order to optimize the temporal and spatial sampling of the oceans by these two satellites.

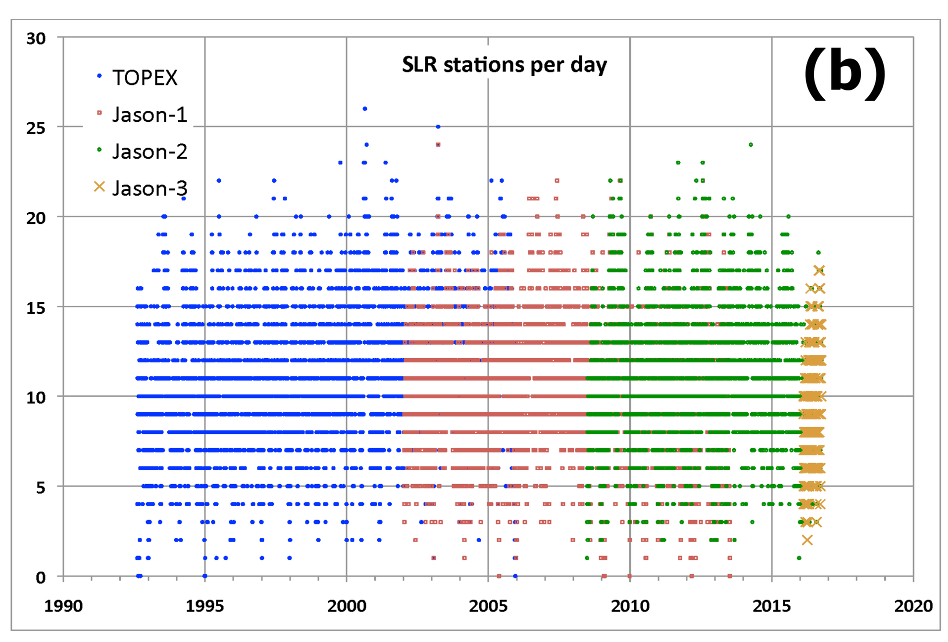
The space geodetic tracking systems, including Satellite Laser Ranging (SLR) are absolutely vital to the success of these altimeter missions. They provide the data that allow us to compute the orbits with an RMS precision of 1 cm radial RMS accuracy. The SLR data anchor the altimeter satellite data in the International Terrestrial Reference Frame. The SLR data also allow us to independently validate the orbits computed by other geodetic techniques, e.g. via DORIS and GNSS.

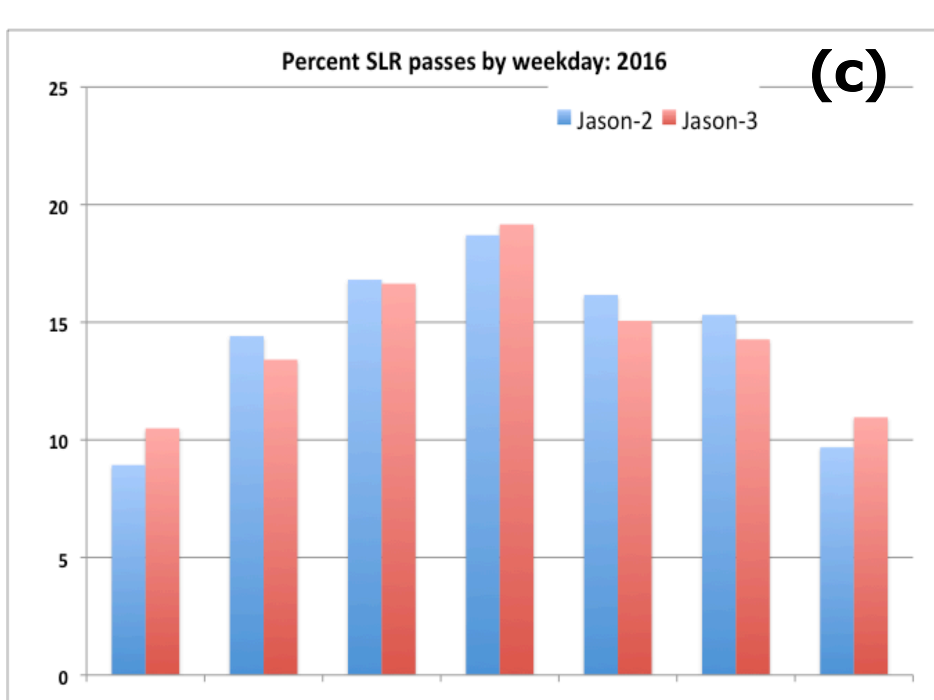
Jason-2 & Jason-3 are built and operated as a partnership between NASA, the CNES, NOAA, and EUMETSAT.

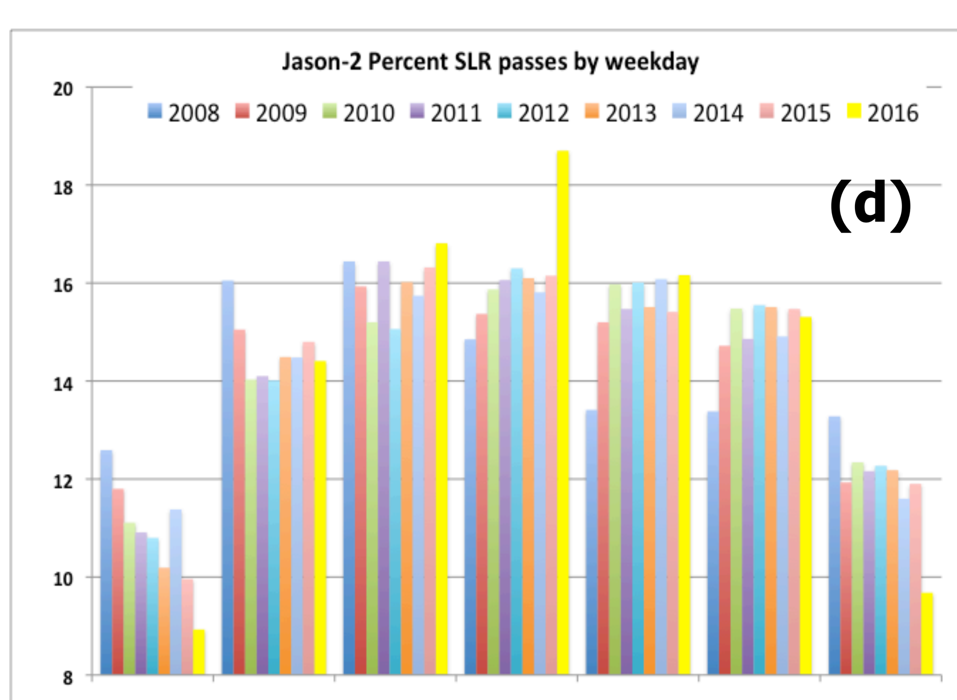
Jason-3 was launched from VAFB on Jan. 17, 2016.

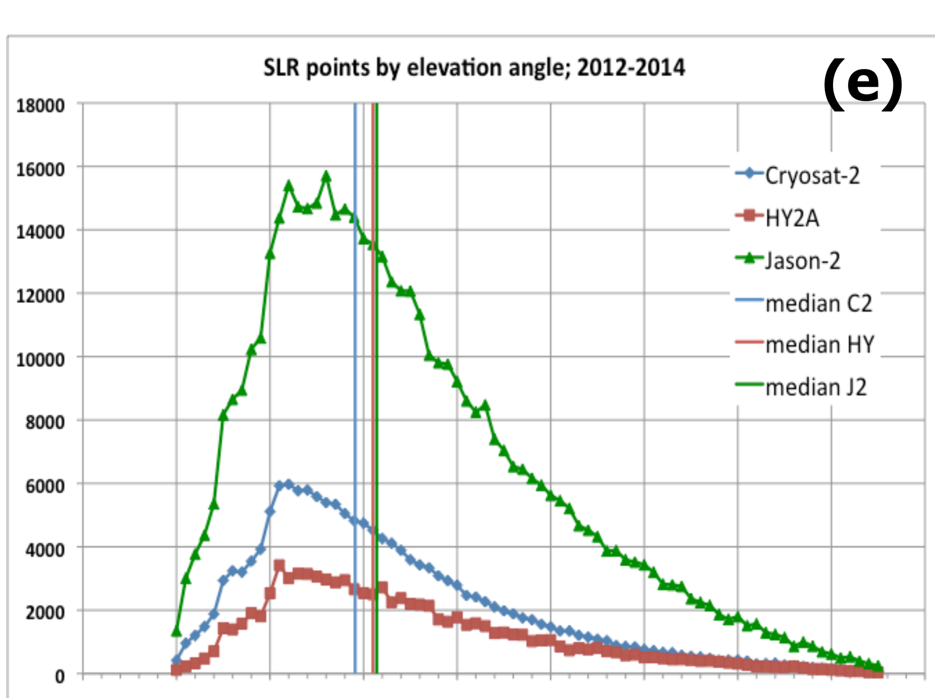
Summary of SLR Tracking for Jason-2 & Jason-3











(a) No of SLR passes per day for TOPEX, Jason-1, & Jason-2 from the ILRS station.
(b) No of SLR stations tracking per day for TOPEX, Jason-1 & Jason-2.
(c) Percent SLR data by day of week for Jason-2, Jason-3 in 2016.
(d) Percent Jason-2 SLR data by day of week (2008-2016).
(e) Distribution of SLR data vs. elevation for Jason-2, HY-2A, and Cryosat-2 (2012-2014).

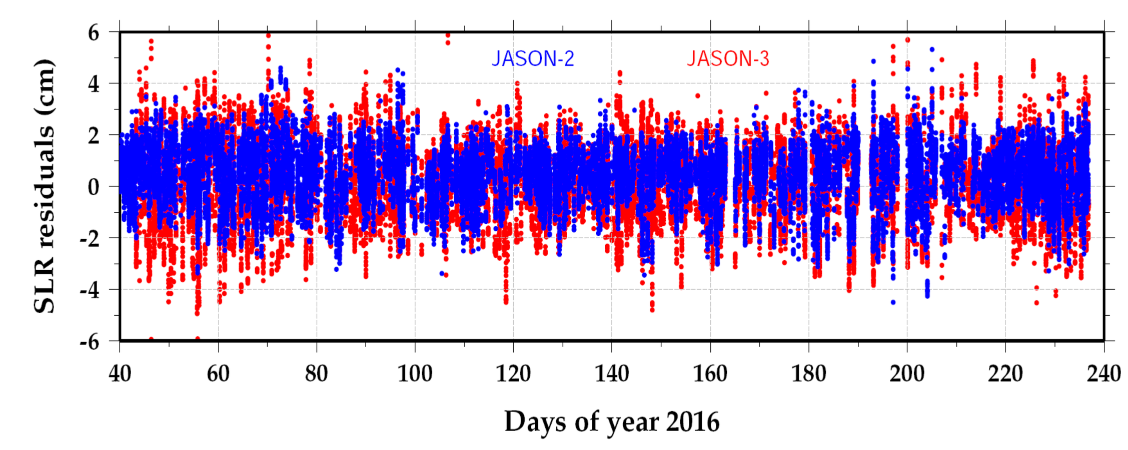
The Jason-2 and Jason-3 projects acknowledge the support of the ILRS.
For more information about the POD on Jason-2 & Jason-3, please contact the Jason-2 & Jason-3 POD team, co-chairpersons:
Sean Bruinsma (CNES/GRGS); Alexandre Couhert (CNES), Frank Lemoine (NASA GSFC).

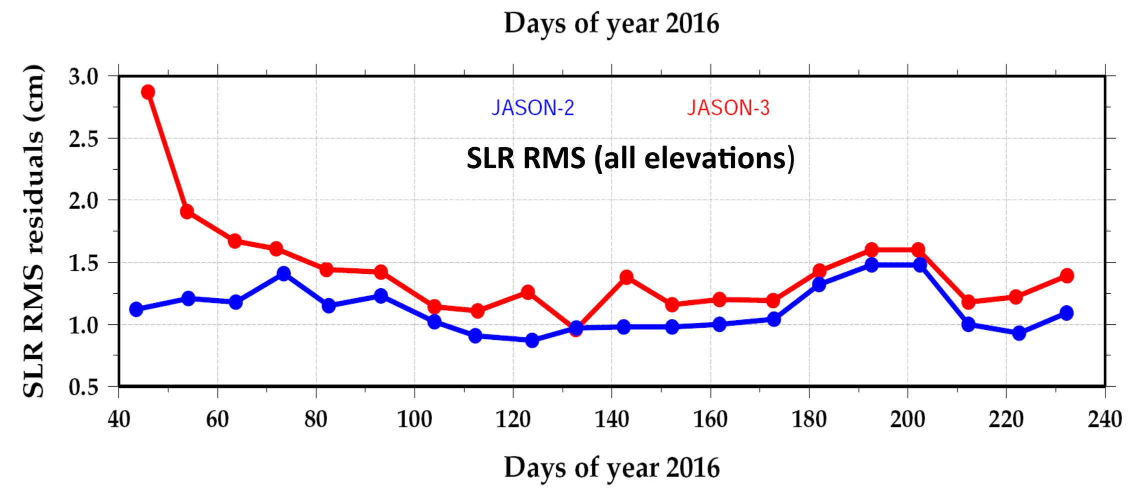
20th International Workshop on Laser Ranging, Potsdam, Germany, October 9-14, 2016

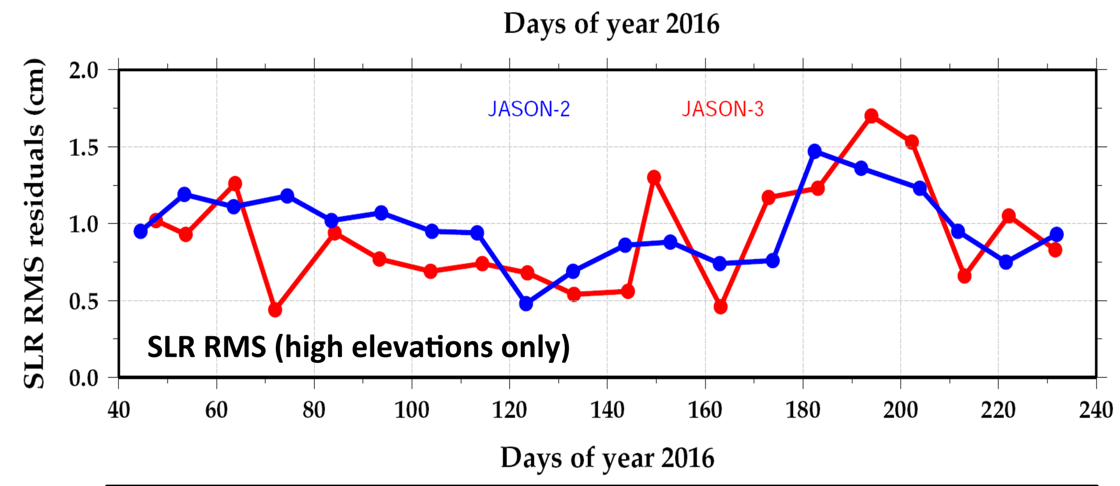
Summary

- **The Jason-2 & Jason-3 missions continue to operate normally and acquire altimeter data.**
- **The Jason-2 satellite will be moved to an "interleaved" orbit between October 2 and October 16, 2016.**
- **After Jason-2 moves to the interleaved orbit, both spacecraft should continue to be tracked with equal priority by SLR.**
- **In 2016, the SLR tracking was roughly equally partitioned between Jason-2 and Jason-3, which was as desired.**

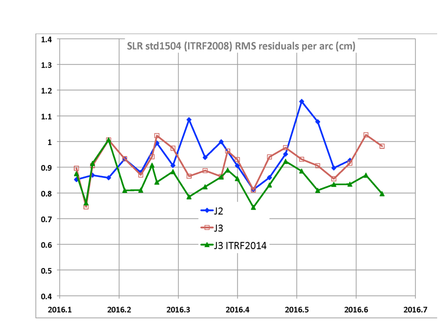
Jason-2 & Jason-3 POD Performance







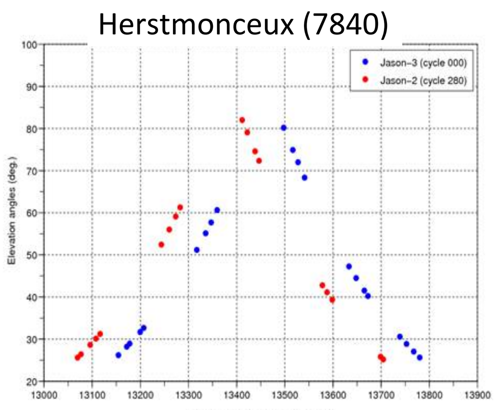
Jason-2 & Jason-3 SLR residuals (**core network**) in 2016 from the CNES GDR-E. The GDR-E orbits use only DORIS & GPS data and apply a "reduced-dynamic" parameterization. The SLR data provide independent orbit validation.

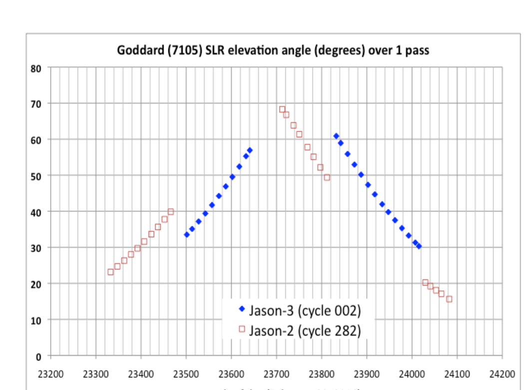


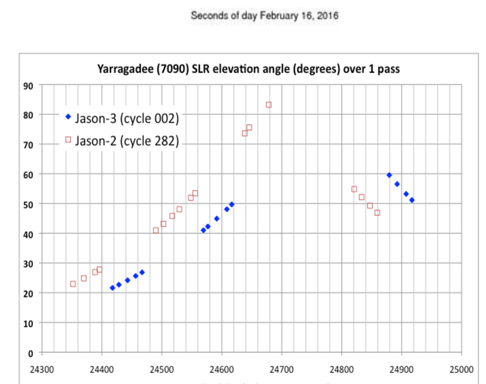
Jason-2 & Jason-3 SLR RMS residuals (in 2016) by ten-day cycle for the NASA GSFC "std1504" orbits. These orbits use SLR & DORIS data and rely on a "dynamic" orbit parameterization.

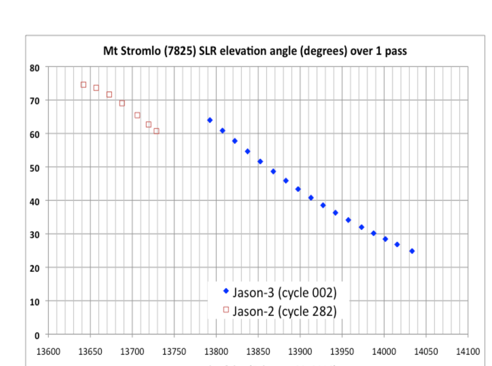
Jason-2 & Jason-3 Interleaving (examples)

Herstmonceux (7840)

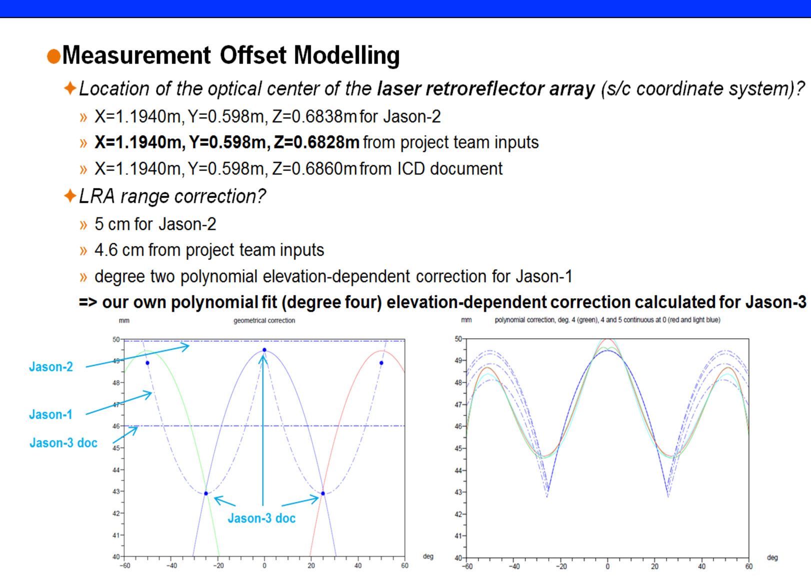








Jason-2 & Jason-3 LRA modeling



Until recently we have only considered a mean LRA range correction for the Jason satellites' LRA There is a hint from the SLR residuals, and evidence from numerical modeling (**Flavien Mercier & Alexandre Couhert (CNES), manuscript in preparation, 2016**), that the Jason satellite LRA range correction varies by elevation and that for proper precise POD modeling we need to take this into account.