Assessing Orbit Quality Using SLR

Ramesh Govind
University of Cape Town

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Introduction:

- Verification and Validation of space geodetic products – satellite orbits
- Use multi-technique
- Co-location at the satellite
- Implications for accuracy of the tracking networks – reference frame

DORIS Constellation Status - Current Missions (5)

Satellite	Agencies	Altitude (km)	Inclin.	Dates
DGXX Receiver (7 channels)				
Jason-2	NASA/CNES/ EUMETSAT/NOAA	1336	66°	June 2008 → 2017
Cryosat-2	ESA	717	92°	April 2010 → 2017
HY-2A	CNSA, NSOAS	960	99°	August 2011 → 2014 (AC)
SARAL	ISRO, CNES	800	98.5°	Feb. 2013 →
DGM Receiver (2 channels)				
SPOT-5	CNES	830	98°	May 2002 → 2015.

Courtesy Pascale Farage/IDS

DORIS Constellation Status - Future Missions

Satellite	Agencies	Altitude (km)	Inclin.	Dates
DGXX Receiver (7 channels)				
Sentinel-3A , Sentinel-3B	ESA	814	98.6°	2015, 2017
Jason-3	NASA/CNES/ EUMETSAT/NOAA	1336	66°	2015 → 2020
HY-2B, C, D	CNSA,	960	99°	2014, 2016, 2018 (3 yrs)
Jason-CS A,B	EUMETSAT/NOAA	1336	66°	2019, 2025
SWOT	NASA/CNES	970	78°	2020

Courtesy Pascale Farage/IDS

Proposed Satellites to 2020

Satellite	DORIS	GPS	SLR	DATE
SAREL Altika	X		X	2014
Sentinel 3A	X	X	X	2014
Jason-3	X	X	X	2014
Sentinel 3B	X	X	X	2017
Jason-CS	X	X	X	2017
SWOT	X	X	X	2020
HY-2B, 2C, 2D	X	X	X	TBA

Courtesy Pascale Farage/IDS

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Options for Assessing Orbit Quality between two techniques (single satellite):

- Trajectory differences in Radial, Along-Track and Cross-Track components
- Fit the data of one technique to the satellite orbit determined from the co-located technique
  - SLR data fitted to a DORIS or GPS determined orbit

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- Jason-2:
  - SLR and DORIS data
  - 2008-07-13 to 2014-08-31
  - Weekly arcs
  - Computation standards
    - IDS ITRF2008
    - ILRS ITRF2008 (models, station qualification, etc.)
  - Trajectory differences of SLR and DORIS orbits
  - SLR data fitted to weekly DORIS determined orbits

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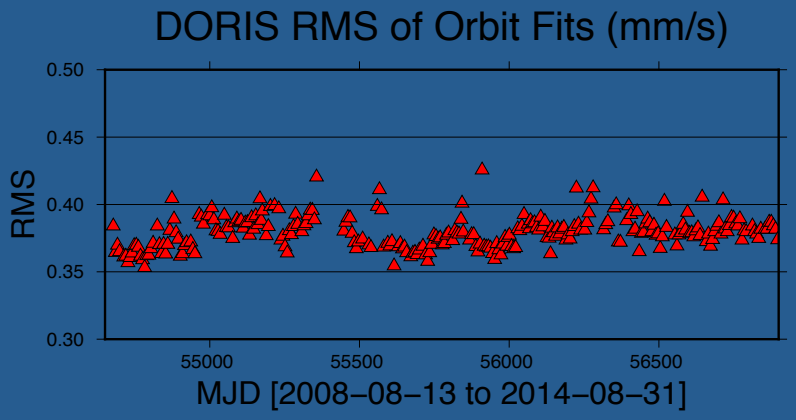
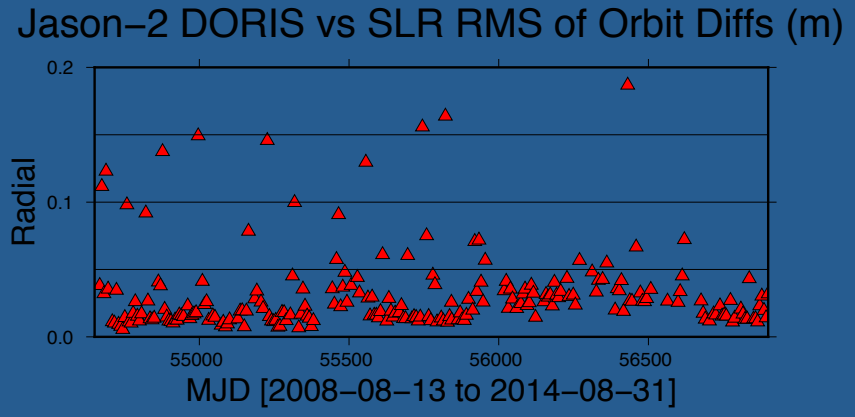
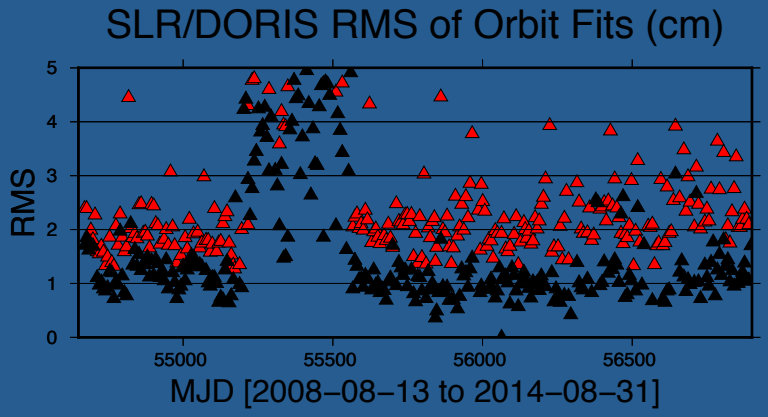
POD Results: Mean RMS of orbit fits

	Mean RMS of Orbit Fit
DORIS	0.38 mm/sec
SLR	1.7 cm
SLR Data / Orbit	2.5 cm

Jason-2 SLR/DORIS Orbit Comparisons







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Summary

- SLR/DORIS orbits generally compare at the 2.5 cm level.
- Some large differences at the 5.0 level need to be investigated – but provides a an assessment of the orbit quality per arc.
- Necessary to undertake both comparisons – orbit (RCA) differences and SLR data fits to DORIS orbits.
- SLR data fits to DORIS orbits is a good measure for assessing orbit quality.
- Common source of the differences in the RMS could be from using the external attitude.