Performance of the Jason-2/OSTM Instrument over Inland Waters

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1. Introduction

Several inland water investigations are utilizing archival (T/P, GFO, ERS-1, ERS-2, Jason-1) and current (ENVISAT, Jason-2/OSTM) radar altimetry data sets. The science programs encompass elements of river hydraulics and dynamics, climate change, and drought/flood forecasting in remote regions. The operational programs are aimed at irrigation potential and crop analysis. A multi-altimeter approach provides a more global outlook, combining the temporal and spatial resolution merits of each mission, while twenty years of combined observations improves statistical analyses. Central to all studies though is a strong technical program focusing on instrument performance and the improvement of target detection and elevation accuracy. Here, we focus on such analysis with the Jason-2/OSTM IGDR data sets, particularly assessing the quality and quantity of data over inland water surfaces. These include a range of targets with varying surface roughness, terrain and areal extent. Validations will be by ground-based gauge and synergistic altimetry data sets, but here, comparisons are made to results from the earlier Topex/Poseidon and Jason-1 missions and to the current ICESat (lidar) mission.

2. Data

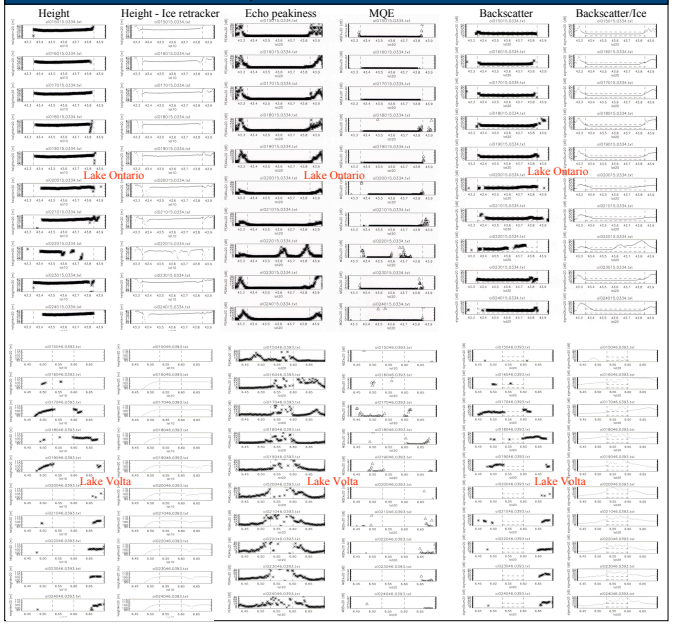
Jason-2/OSTM IGDR data is utilized here, Version 1.0 (cycles 000 to cycle014) and Version 1.2 (cycles 015 to 029). NetCDF files are converted and modified to binary format, then sub-set via geographical location to form IGDR target files over lakes, rivers and wetlands. Along-track spacing is 0.05s or 290m.

IGDR data stream parameters are constructed to form 20Hz time, latitude, longitude, height and backscatter coefficient. Two sets of Ku band height values are constructed using a) the 20Hz Range_20Hz_Ku and b) the Ice_Range_20Hz_Ku assuming,

Height = (Altitude-CRange) - tidal corrections

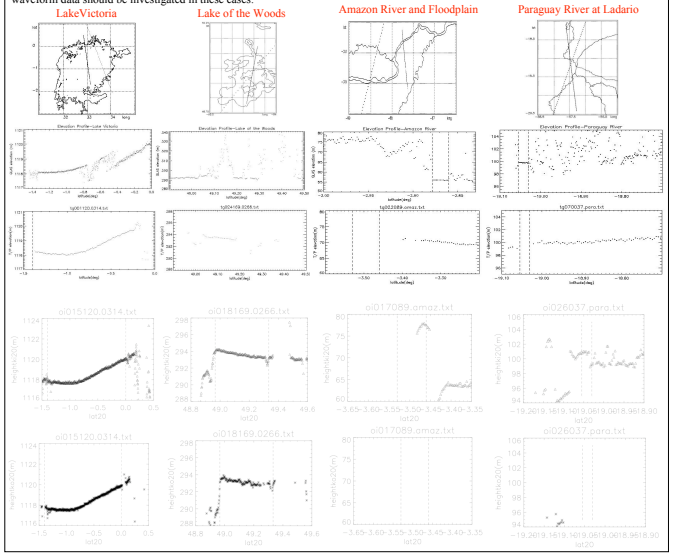
CRange=Range + atmospheric corrections +embias
Tides = earth+pole+loading
Atmospheric = wet +dry +iono

3. Quick Look Profiles



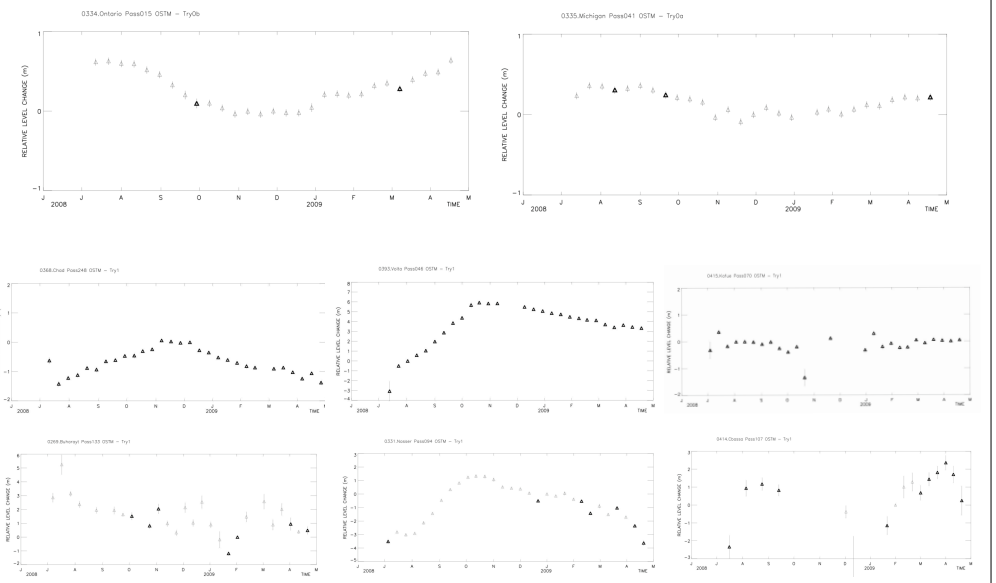
4. Radar/lidar Comparisons

Comparison between lidar and radar performance across 4 inland water targets. Top height profile row is ICESa/GLAS, 2nd row Topex/Poseidon, 3rd row OSTM/Jason-3 ice retracking, bottom row OSTM/Jason-3 ocean tracking. GLAS acquires the actual river channels but fairs poorly over the vegetated covered floodplain zones (Amazon, Paraguay) and in the presence of clouds (Lake Victoria). Compared to T/P, OSTM acquires a greater number of valid elevations over Lake Woods but likewise fails over the river channels - waveform data should be investigated in these cases.



5. Preliminary Time Series

OSTM time series of height variations for some of the major large lakes. Cycles 000 to 029 IGDR data. Validation via ground based gauge data TBD

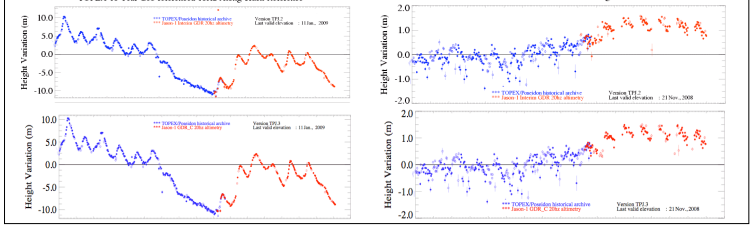


6. Jason-1 Upgrade

With Jason-2/OSTM cal/val and observations progressing, effort has also been on the updating of the Jason-1 lake data products that currently exist on the USDA Crop Explorer web site. To date, the time series displayed there has been formed from the Topex/Poseidon (GDR-C) and Jason-1 (IGDR) data sets (called the TPJ.2 products). With the end of the nominal Jason-1 mission in 2008 the Jason-1 near real time products are in the process of being converted to archival products based on Jason-1 GDR-C. Using the appropriate parameter upgrade tables plus a new orbit supplied by NASA/GSFC, new TPJ.3 products are being created. For the large lakes the upgrade from Jason-1 IGDR to Jason-1 GDR is subtle (a few cm rms) but these new time series form the baseline for adding on the new OSTM near real time products by the summer of 2009.

Lake Tharthar Height Variations
TOPEX 10 Year Geo-referenced 10Hz Along Track Reference

Lake Balkhash Height Variations
TOPEX 10 Year Geo-referenced 10Hz Along Track Reference



7. Summary

Preliminary IGDR cycle 000 to 029 results show that the OSTM Jason-3 instrument is performing well being mostly comparable to the T/P instruments but in some cases showing a better capacity for acquisition of the surface within a lake basin. There is no data drop out problem as per the Jason mission.

Use is made of the range values from the ice retracker for those targets that have smoother, less wind-roughened surfaces (small lakes, sheltered reservoirs, rivers, vegetated covered wetlands) where the radar echoes are deviating from those with typical ocean-like properties.

Future work centers on validation exercises in the case study basins, and on uploading the first near real time OSTM lake and reservoir products to the USDA Crop Explorer web site.

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