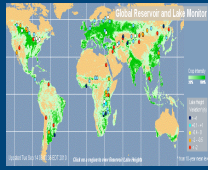


Near Real Time Monitoring of Global Lakes and Reservoirs



OST-ST Meeting
Altimetry for
Oceans and
Hydrology



Lisbon, Portugal 18-20th October, 2010

1. Introduction

A USDA/NASA funded program is performing near-real time altimetric monitoring of the largest lakes and reservoirs around the world. The near-real time stage measurements are currently derived from incoming data from the NASA/CNES Jason-2/OSTM mission. Archived data from the NASA/CNES Topex/Poseidon and Jason-1 missions are also utilized to provide historical time series variations from 1992-2008. The program is also being expanded and enhanced by including the ESA ERS and ENVISAT data sets which will allow the additional monitoring of ~500 lakes. Radar, lidar and ground-based data sets are all used for validation exercises. The USDA/FAS utilize the products for assessing irrigation potential (and thus crop production estimates), and for general observation of high-water status, short-term drought, longer-term climatic trends, and anthropogenic effects. Here, we report on the overall performance and contribution of the Poseidon-3 radar altimeter IGDR data set, in terms of overall product quality and quantity, and make comparisons to products derived from the contemporary and historical altimeters.

2. Objectives

USDA integrates a wide variety of data sets and uses an 'all sources' methodology that varies by country and commodity (example data sets Terra, Aqua, TRMM for precip, land cover, soil moisture etc).

The input information is used in a monthly 'lookup' process to set global crop condition and crop production numbers.

The output information is shared between USDA and US Gov agencies for various Decision Support Protocols.

Two types of products/service:

- Crop Production Estimates for International Countries and the World Agriculture Outlook Board. (Principle Federal Economic Indicators published monthly. Estimates drive price discovery, trade and trade policy, farm programs, foreign policy).
- 'Early Warning of Events' to the Farm Service Agency (agriculture production, food programs and markets).

***** Missing Input - The VOLUME of stored water for irrigation considerations *****

3. Requirements

The USDA Decision Support System requires knowledge of the lake/reservoir height for monitoring hydrological droughts - these have longer time scales (months to years) than agricultural droughts. Such information is rarely available from all international governments and agencies.

USDA Requirements

Long-term: Quantitative (VOLUME) determination of irrigation potential in agriculture-sensitive regions

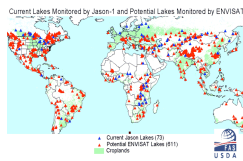
Short-term: Qualitative indication of drought/high-water situations use of SATELLITE RADAR ALTIMETRY for water levels, with long-term refined data sets and validated/published techniques

Project Requirements

Provide lake-level variations in near-real time for a designated set of lakes and reservoirs. Products to be ascii text and graphics showing variations with respect to an historical mean.

Expectations

- Final Number of targets >500
- Elevation Accuracy = better than 20cm rms, or 10% of max seasonal Amp.
- Min Temporal Sampling = monthly
- Time Period Coverage = Historical Archive (>5yrs) with Near Real Time
- Product Update Search = Weekly
- Product Latency = 2 weeks after satellite overpass
- Product Access = Via html for open and free access



4. Data Sets

Satellite Radar Altimeters

Satellite Laser Altimeter

3 lasers, 1064 and 532nm,
1-10ns pulse, ~70m footprint, 175m AT spacing,
17 x 33-day campaigns 2003-2009.
Cross-platform validation data set.

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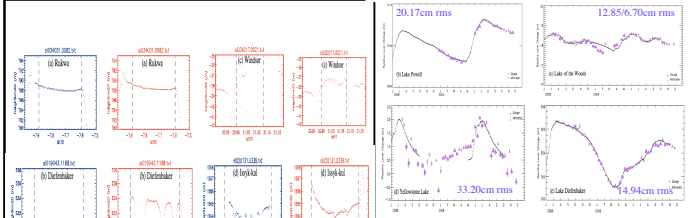
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5. Jason-2/OSTM Performance

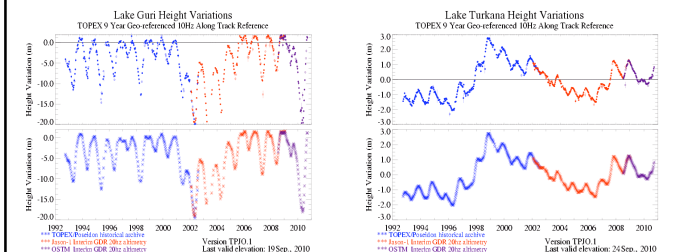
Absolute validation of the OSTM lake levels



Absolute validation of the TPJO.1 product

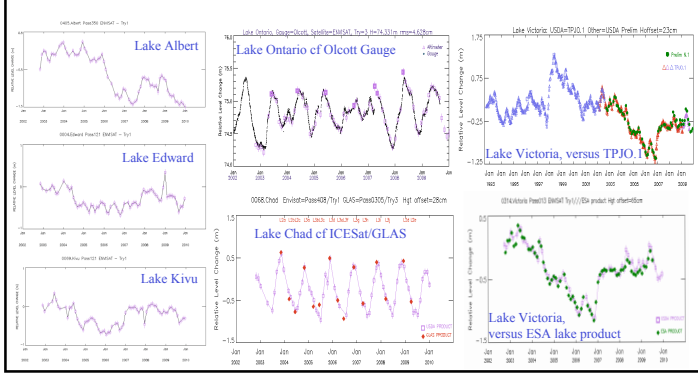
Surface water height profiles, ocean-retracker (blue), ice-retracker (red). Observations are May/June for Rukwa and Windsor, December/January for Issyk-kul and Diefenbaker

6. New TPJO.1 products - since October 2009



Lakes in the news. Lake Guri (left) is recovering after drought and excessive abstraction of water for hydro-electric power. Lake Turkana (right) is the current focus of civil engineers who are modeling the potential effects of the new Gibe 3 dam upstream on the Omo river.

7. ENVISAT N.1 products and their validation



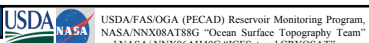
8. Conclusions

- Excellent performance from OSTM+ENVISAT.
- Product validations make use of gauge, and cross-platform data sets - both radar and lidar.

9. Future

- Revision of the TPJO.1 wrt 20Hz reference datum, and use of GDR +SDR
- ENVISAT product archive in public domain by end of 2010, ERS1+2 by mid-2012.
- Near Real Time 35-day products from SARAL/AltiKa in 2011 with greater system automation.
- Enhanced future instruments for mapping/monitoring and validation - Jason-3, ICESat-2, SWOT.

10. References and Funding



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