

The Application of Multiple Satellite Radar Altimetry Data Sets to Inland Surface Water Projects.

I. Near real time operational monitoring of lake and reservoir water level for water resources, irrigation potential and agriculture



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http://www.pecad.fas.usda.gov/cropeplorer/global_reservoir

ABSTRACT: Several inland water investigations are utilizing archival (T/P, ERS) and current (Jason-1, GFO, ENVISAT, OSTM) radar altimetry data sets. The science programs encompass elements of river hydraulics and dynamics, climate change, and drought/flood forecasting in remote regions. A multi-altimeter approach provides a more global outlook, combining the temporal and spatial resolution merits of each system, while 20yrs of combined observations improves statistical analyses. Central to all projects are instrument performance studies with additional focus on improved target detection and elevation accuracy. Operational programs are also underway, delivering near real time lake and reservoir surface-height products to the USDA/FAS and the general public. Here, we give the status of the USDA/FAS program as it enters Phase IV under new NASA funding, and briefly summarize the contribution of the various datasets including that of OSTM/Jason-2.

Introduction

The NRT Operational project centers on the proven ability of satellite radar altimeters to monitor the variation of surface water height for large inland water bodies. It utilizes both archived and near-real time altimetric data to monitor the changing elevations of lakes and reservoirs world wide.

On a weekly basis, a semi-automated data ingestion and analysis system gathers near real time altimetric data. It constructs elevation parameters and updates time series products in a lakes database. The updated products, in graph and text format, are collected by the United States Department of Agriculture. They become part of the Crop Explorer system, with unrestricted viewing, at a world wide web site.

The Foreign Agriculture Service utilizes the products for observation of general flood and drought conditions. The Precipitation Estimation Crop Assessment Division (PECAD) will additionally utilize the data for the determination of reservoir storage and irrigation capacity.

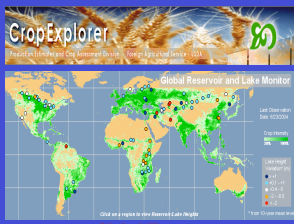
The program currently uses T/P, Jason-1 and GFO data sets but Phase IV with new NASA funding will allow the incorporation of ERS and ENVISAT data, as well as OSTM/Jason-2 data for long-term continuity.

The ESA data sets will expand the current number of USDA targets of interest, while the GFO data allows us to fill-in some of the missing Jason-1 products (an on-board data filtering problem affecting some inland water programs).

The lake and reservoir products allow USDA to assess current high water status and long-term drought conditions, provide a measure of irrigation potential, and serve as a check on dam treaty compliance in areas for which access to ground-based gauge data is problematic.

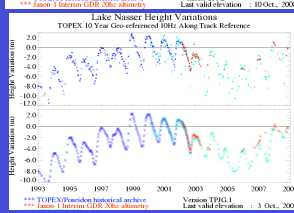
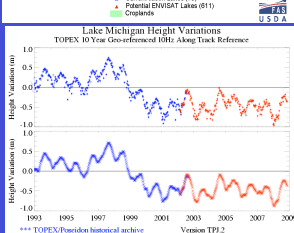
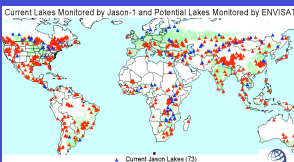
Example Application

Link to the example application: http://www.pecad.fas.usda.gov/cropeplorer/global_reservoir



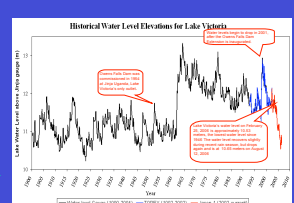
Global Targets

USDA select targets include those of the world's most important, high population density, and high water stress areas. The global targets are listed in the table below. The table is updated weekly. The table is available at: http://www.pecad.fas.usda.gov/cropeplorer/global_reservoir



Lake Products

Lake elevation products from the TOPEX/Poseidon, Jason-1, Jason-2, and ENVISAT altimetry data sets. The products are available at: http://www.pecad.fas.usda.gov/cropeplorer/global_reservoir



OSTM/Jason-2

The Operational program will utilize IGDR near real time data from the OSTM/Jason-2 mission, both as continuity for existing T/P and Jason-1 products, but also as a relative validation tool for products derived from ERS and ENVISAT. It is therefore important to assess the performance of the OSTM altimeter over varying inland water surface, target types and sizes. IGDR quick looks on the first 10 cycles reveal large discrepancies between the quantity of height information offered by the Topex NRA and the Jason-2 altimeter despite the testing of J-2 tracking modes. This discrepancy is observed over rivers, wetlands, floodplains and lakes for which the radar echoes are more narrow peaked and thus deviate from the nominal ocean-like waveform shape seen over oceans and large lakes. Cross checks are still being performed with emphasis on examining the tracking modes, retracking parameters, and liaising with both CNES and NOAA on the details. For the ~80 lakes currently in the Crop Explorer data base there are signs of improved data quantity between OSTM and Jason-1 for some of the lakes, but not all, and preliminary results on the 1st 10 cycles indicate a poorer along-track range rms performance than the Topex NRA. Examples below show T/P (left column) and OSTM (right column) ground track height profiles across various regions for either single cycles or sets of 3 cycles.

