

#### DAHITI

Virtual Stations

- Мар
- Lake/River not found?

Publications

DAHITI-API (Beta)

Database for Hydrological Time Series of Inland Waters (DAHITI)



### WELCOME TO DAHITI ...

The **Database for Hydrological Time Series of Inland Waters** (DAHITI) was developed by the <u>Deutsches Geodätisches</u> Forschungsinstitut der Technischen Universität München (DGFI-TUM) in 2013. DAHITI provides water level time series of lakes, reservoirs, rivers, and wetlands derived from multi-mission satellite altimetry for hydrological applications. All water level time series are free available for the user community after a short registration process.

- DAHITI has been developed since 2013 by DGFI-TUM
- DAHITI provides more than 500 water level time series of lakes, reservoirs and wetlands
- The DAHITI approach is based on an extended outlier detection and Kalman filtering (Schwatke et al., 2015)

tributed over all continents, except Antarctica. In 2), and <u>South America</u> (243) water level time series n be downloaded after a short registration process.

### Contact

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DAHITI-Flyer

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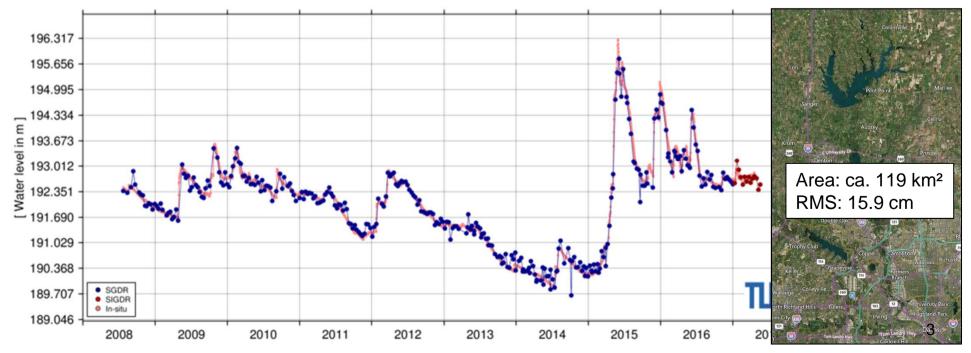
Recently Updated Water Bodies

Amazon, River

# DAHITI – Data holding



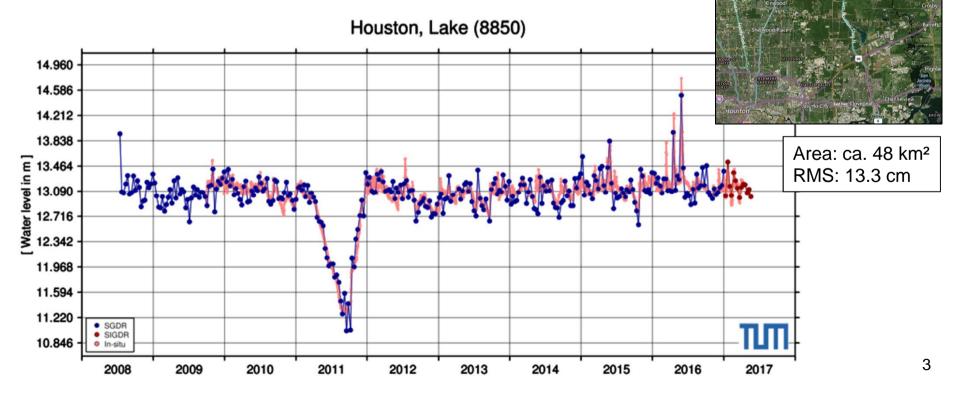
- DAHITI provides about 170 water level time series for lakes and reservoirs and about 340 time series for rivers
- Lakes and reservoirs with an area extent greater 1 km<sup>2</sup> can be captured by DAHITI (Thülsfelder reservoir in Germany // Id: 1898)
- Accuracies vary between few centimeters for large lakes and few decimeters for smaller lakes.



Ray Roberts, Lake (10146)

# DAHITI – Real-Time

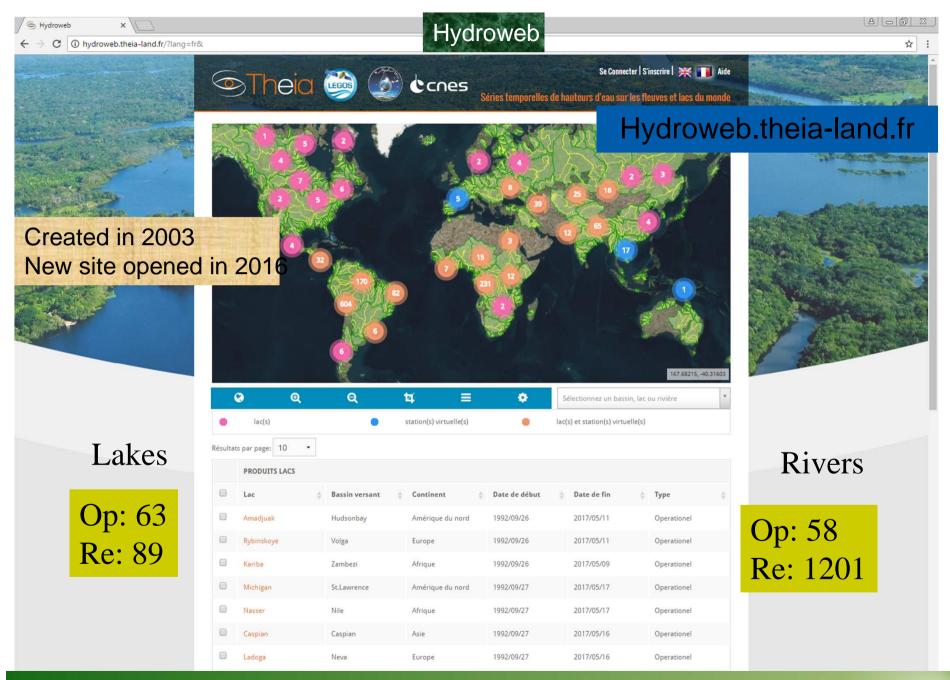
- DAHITI provides about 200 (lakes, reservoirs: 57) near real-time water level time series
- Combination of SGDR and SIGDR altimeter products are used
- Jason-2 (EM), Jason-3, SARAL (DP) are used for near real-time water level time series.



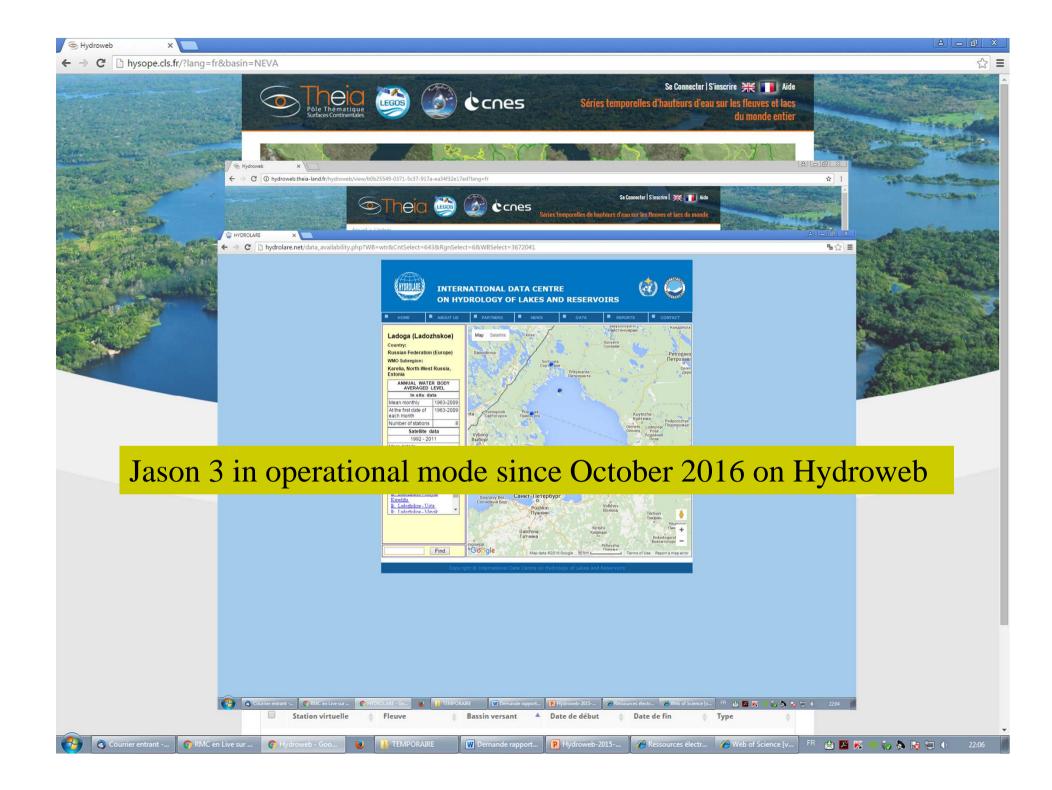
# DAHITI – Outlook



- Increasing the number of inland water targets in DAHITI performed by automated target detection
- Switch to near real-time processing for all targets for which data is available
- Providing time series of area extent for lake and reservoirs



Site developped by Legos, maintained and operated by CLS under CNES & Copernicus c



## Users registration and citations

#### 2012: 80 new users 2014: 126 new users 2013: 88 new users 20 ■ 2012 ■ 2013 ■ 2014 ■ 2015 ■ 2016 18 16 14 12 10 Hydroweb 8 Distribution of european users 6 ASIA; 32,6% 4 2 0 S-AMERICA; jul fev jan mar avr mai jun aug sep oct nov dec

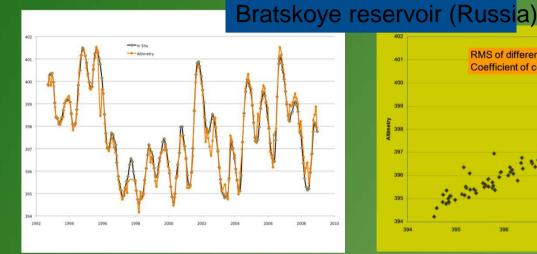
2015: 114 new users 2016: 90 new users 2017: 29 new users OCEANIA: 2.2% EUROPA; 40,9% AFRICA: N-AMERICA; 6.0% 13,6%

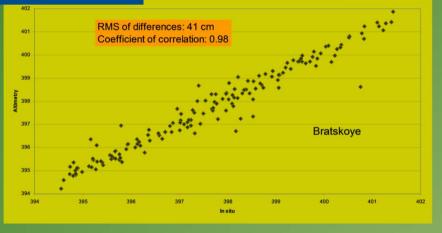
Citations: 37 in 2014, 29 in 2015, 30 in 2016, 11 in 2017

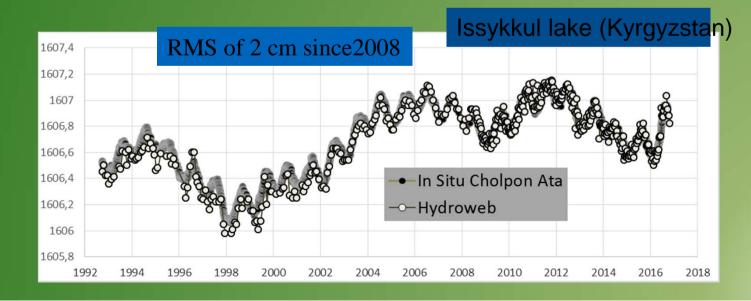
## Comparison to in situ data

## SHI, IWPB / cooperation with Legos

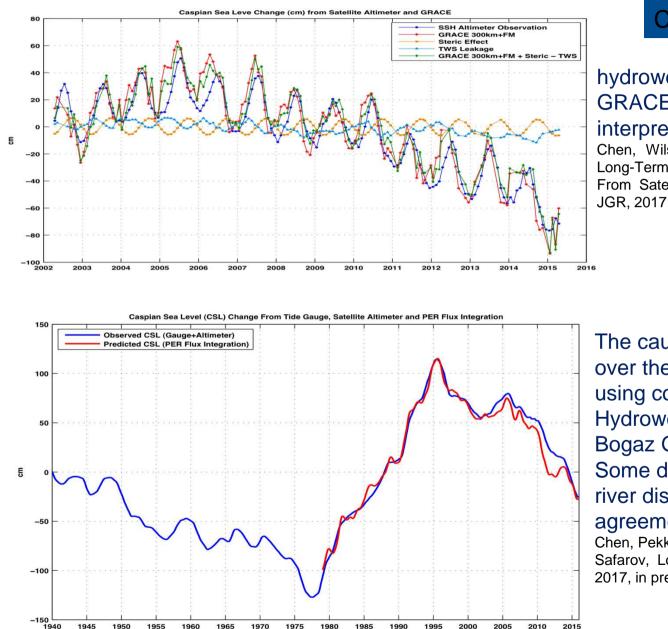
## 2-3 cm <accuracy< 1m







## Validation of GRACE data and models using altimetry



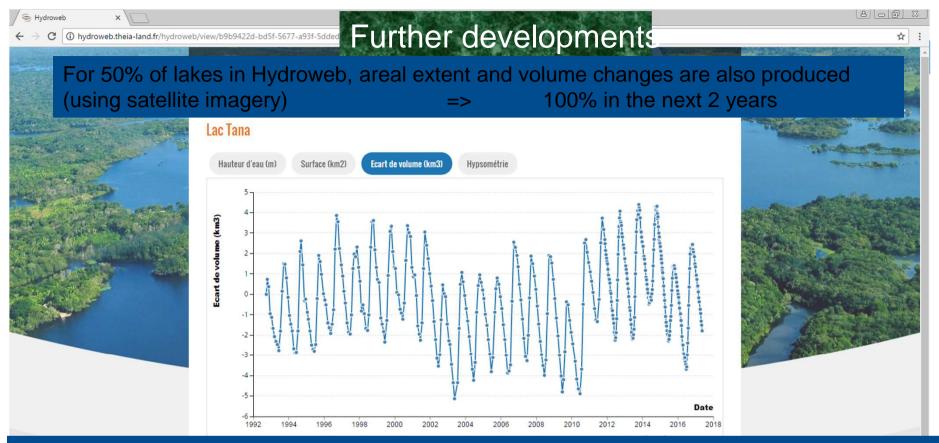
### Caspian Sea (Ru, Tk, Kz, Ir, J

пп

hydroweb data used as reference for GRACE signal decontamination and interpretation over the Caspian Sea Chen, Wilson, Tapley, Save, Bettadpur, Cretaux, Long-Term and Seasonal Caspian Sea Level Change From Satellite Gravity and Altimeter Measurements,

The causes of long term changes over the CS have been investigated using combination of In Situ data, Hydroweb products (CS and Kara Bogaz Gol reservoir). Some discrepancies due to uncertain river discharge are still present but agreement is remarkable

Chen, Pekker, Wilson, Tapley, Kostianoy, Cretaux, Safarov, Lon-Term Caspian Sea level changes, GRL, 2017, in press



- Drastically increase the number of lakes in Hydroweb using the new missions Sentinel-3A & 3B, Jason-CS & SWOT
- Determination of near lake bathymetry using Laser ranging instruments & global lakes extent products (Peckel, Shen)
- Continue & Strenghen the participation in the Hydrolare project
- Include lake ice products (duration and date of ice formation and breakup)
- Development of a CCI+ project for Lake's ECVs in a European consortium



### **Global NRT Product Locations**



#### ESA | Observing the Earc

### Main

#### Products

Africa

Asia

Europe

North America

South America

Australia & Oceania

Information

Jason-2

**River Modelling** 

**Historical Review** 

**Current Capabilities** 

Documents

References

**Project Members** 

**Project Users** 

F.A.Q.

Quotes

Contact

## The "River & Lake" Project



- R&D and Pilot demo funded by ESA (2002-2012) to derive accurate measurements of inland water heights from Satellite Radar Altimetry in near-real-time
- Measurements obtained remotely, regardless of human proximity, is of particular benefit specially for developing countries
- Over 1500 registered users (by 2012)
- Near-Real-Time service provides river and lake level within 3 days of measurement with Envisat (in its repeat orbit) and Jason-2
- **Historical time-series** providing data over targets stretching back over two decades, using ERS-2, TOPEX/Poseidon, Envisat, Jason-1 and Jason-2 altimeters
- River & Lake products have been **incorporated into river modelling** over the Zambezi, Syr Darya, Amu Darya and Mekong

## Who is behind River & Lake?



Consortium Members:



In cooperation with:



Kazakhstan-Kryghiszstan-Tadjikistan-Turmenistan-Uzbekistan



Uzbekistan Met Office



Danish Hydraulic Inst.

ETH

Eldgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

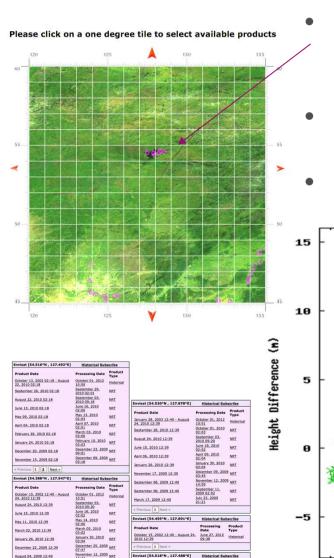
Swiss Fed. Inst. of Technology



Mekong River Commission For Sustainable Development

## Area Selection > Time Series > Download Reservoir Zeyskoye Vodokhranilishche, Russia

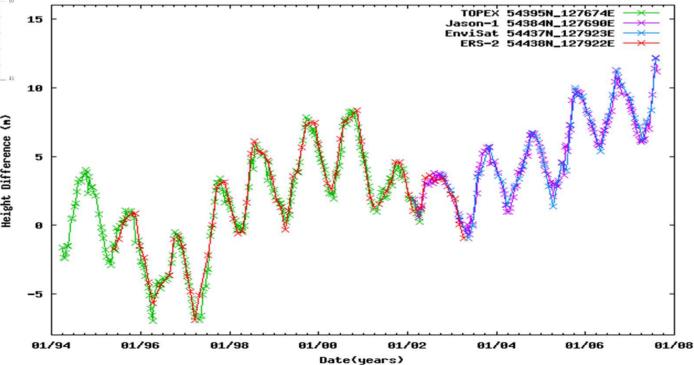




oust 04, 2009 12:40

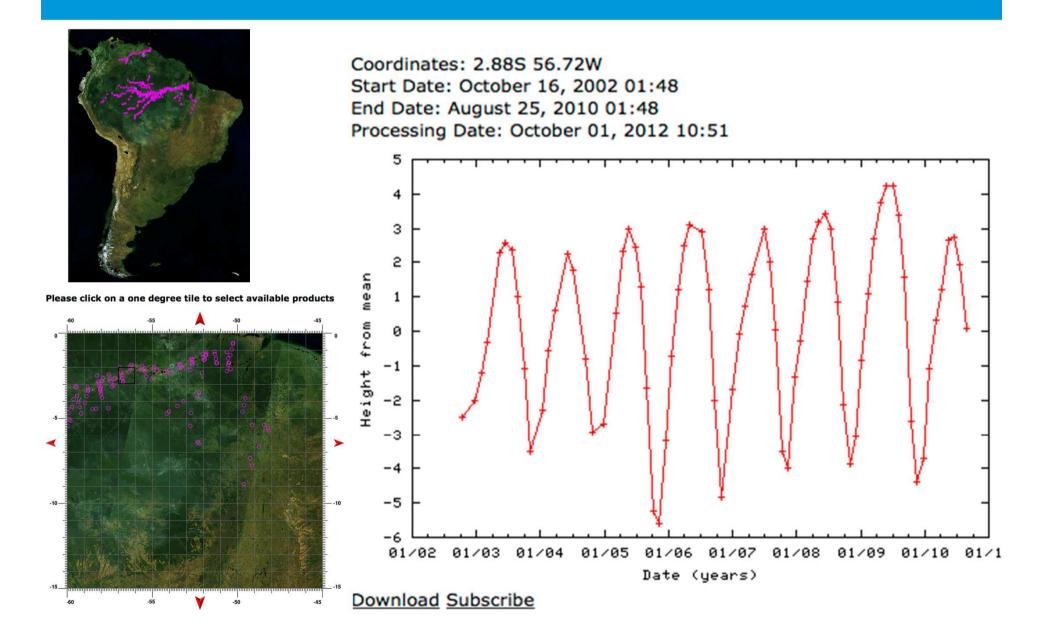
oril 21, 2009 12:40

- Reservoir water level with 12 year combined timeseries derived from retracked ERS-2, EnviSat, TOPEX and Jason-1waveform data.
- Excellent agreement is achieved over this fairly **complex target**.
- Note the very good data from Jason-1 over this reservoir.



### Area Selection > Time Series > Download





## Data over selected area (12 targets)



To view the historical time-series for a product, click on the appropriate Historical link below, a link to download the historical product will then also be available. Alternatively to subscribe to NRT and/or Historical products choose their relevent links or click on subscribe.

Envisat [2.883°S , 56.718°W]	Historical Subscribe	
Product Date	Processing Date	Product Type
October 16, 2002 01:48 - August 25, 2010 01:48	<u>October 01, 2012 10:51</u>	<u>Historical</u>
September 29, 2010 01:48	<u>October 02, 2010 02:01</u>	<u>NRT</u>
<u>August 25, 2010 01:48</u>	September 03, 2010 09:21	<u>NRT</u>
<u>June 16, 2010 01:48</u>	<u>June 19, 2010 02:00</u>	<u>NRT</u>
<u>May 12, 2010 01:48</u>	<u>May 15, 2010 02:03</u>	<u>NRT</u>
April 07, 2010 01:48	April 10, 2010 02:03	<u>NRT</u>
March 03, 2010 01:48	March 06, 2010 03:00	<u>NRT</u>
January 27, 2010 01:48	<u>January 31, 2010 03:02</u>	<u>NRT</u>
December 23, 2009 01:48	December 26, 2009 03:27	NRT
November 18, 2009 01:48	December 09, 2009 03:50	NRT

« Previous

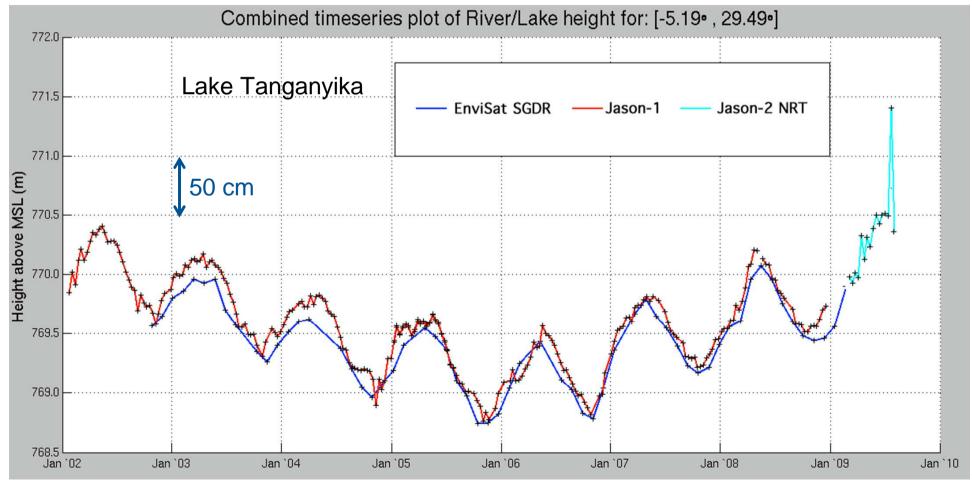
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<u>2</u> <u>Next »</u>

## Jason-2 Near Real Time Added (2009)



- All Jason-2 and Envisat crossing height measurements have statistical data associated with them, comprising the RMS of the height measurement about the mean value, and the number of individual measurements that were combined to give the final height value.
- The data retrieval at individual crossings has been significantly augmented.



## **River & Lake Data Products**



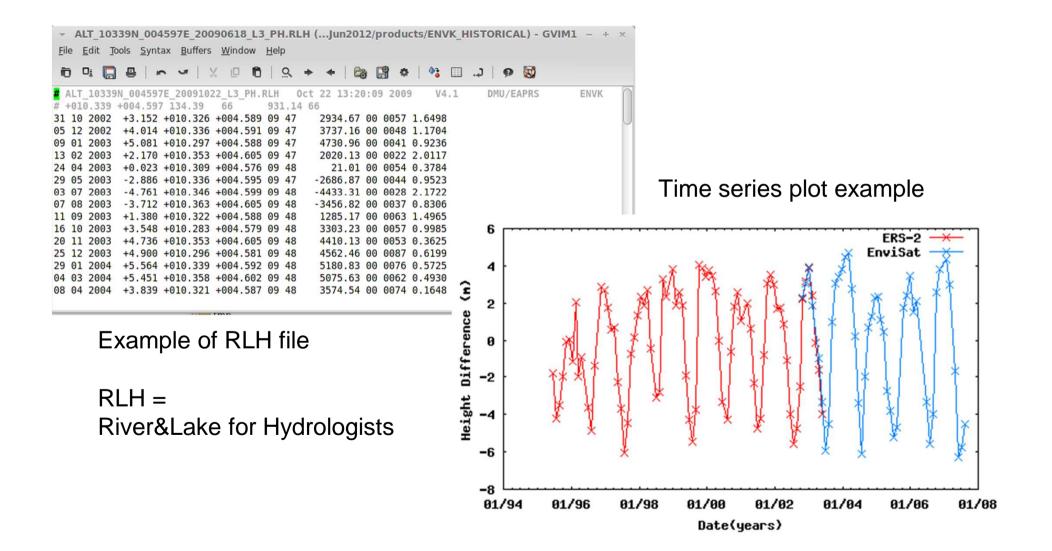
There are two *River & Lake* products:

- **RLH** Provides orthometric height measurement in text format along with position of target
- RLA for advanced altimetry users, this data contains the waveforms used to generate height measurements in binary format

NB: A <u>lake volume variation</u> product can be made available on request

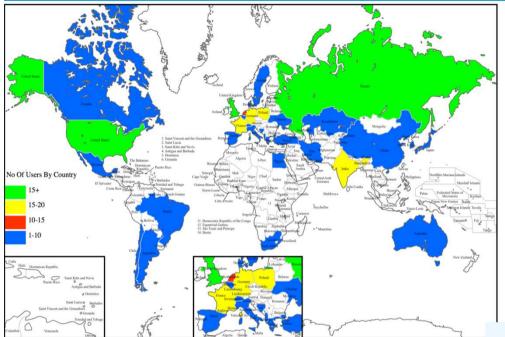
### **River & Lake Data Products**





## **River & Lake Users**





There are 1597 registered users located on 5 continents (picture on the right)

66 users have subscribed to receive e-mailed data for 303 targets

(by 07/2012)



Website hit locations (unique visitors)

Visits

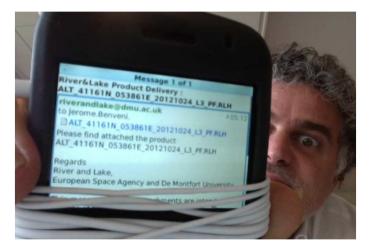
## **Data Products Availability**



• Data are freely available to be download from

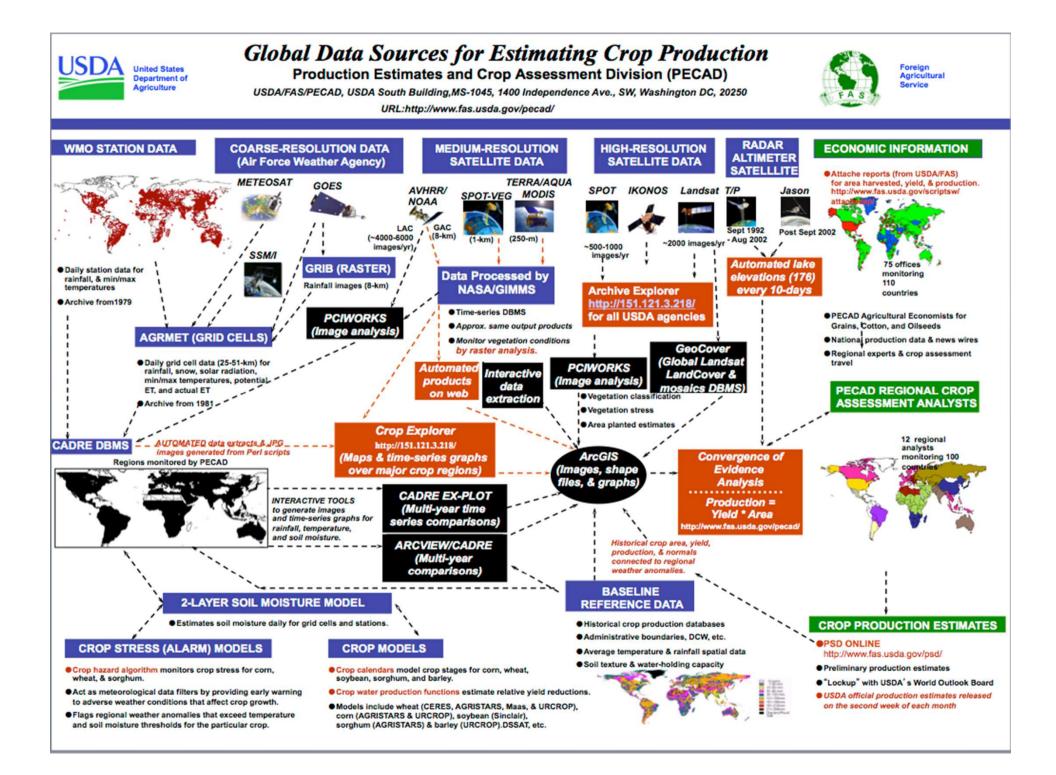
# http://earth.esa.int/riverandlake

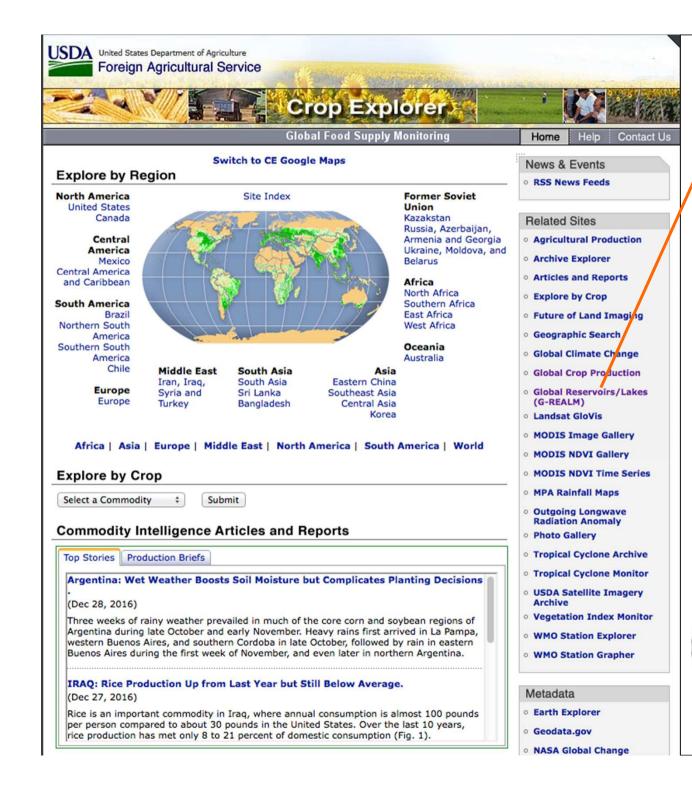
 Via push-mail by subscribing online "RIVER&LAKE on your Mobile":



NB: To register you just need an e-mail address

Email contact : rl-info@esa.int





## G-REALM Global Lake and Reservoir Monitor

Incorporated into CropExplorer January 2003

USDA and NASA funded

### USDA/UMD/SGT collaborative project





SYSTEM SCIENCE

NTERDISCIPLINARY CENTER



Crop Explorer



### Toolbox

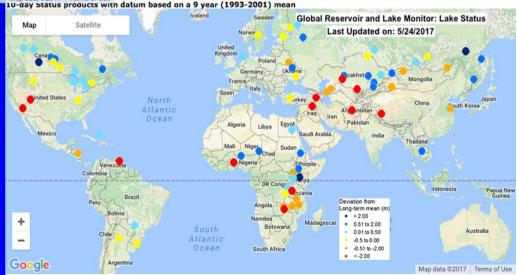
http://www.pecad.fas.usda.gov/cropexplorer/global\_reservoir/

### Global Reservoirs/Lakes (G-REALM)



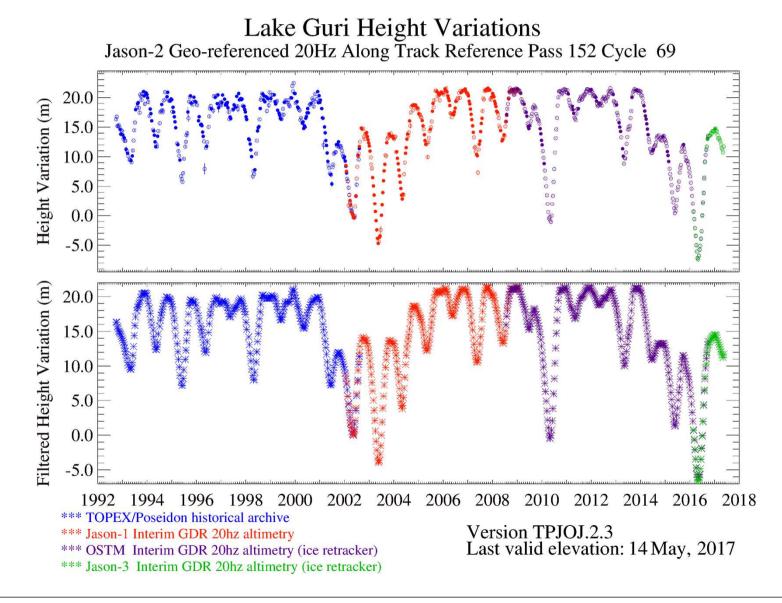
TPJO.2 products for agricultural drought. Emphasis on near real time monitoring. Product updates 1-2 weeks after satellite overpass. (single-date datum)

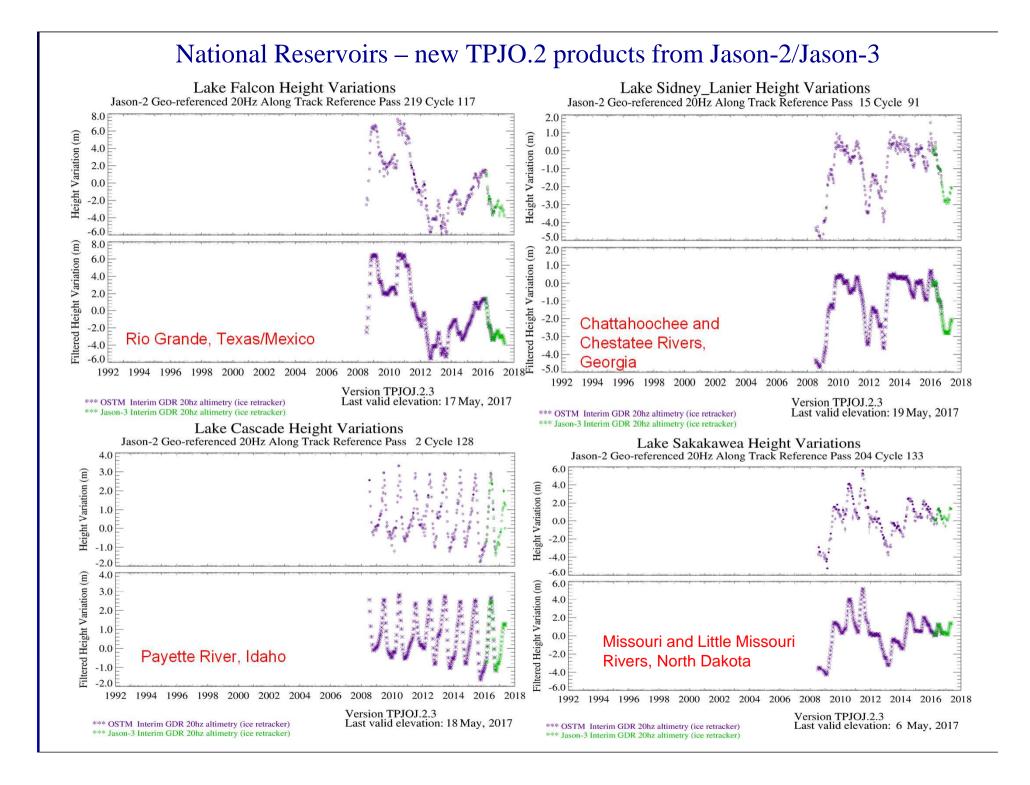
TPJO.1 products for hydrological drought. Emphasis on appending archive measurements to create a long data record. Lake "Status" indicators to denote high or low water conditions with respect to a long-term mean. (9 year datum)



## **TPJO.2** Lake Level Products

Relative variations in surface water level over the mission lifetime, variable accuracy  $\sim$  5-30cm rms, acquiring a third of the world's largest water bodies, 10-day resolution, lake-specific datum. Scope for national and international monitoring but specifically relevant to gauge-poor or limited-reporting regions.





## **G-REALM**



279 Lakes/Reservoirs 10-day resolution TPJOJ products (1992-2017)

146 Lakes/Reservoirs 35-day ENV.1 products (2000-2010)

Bi-weekly updates using IGDR

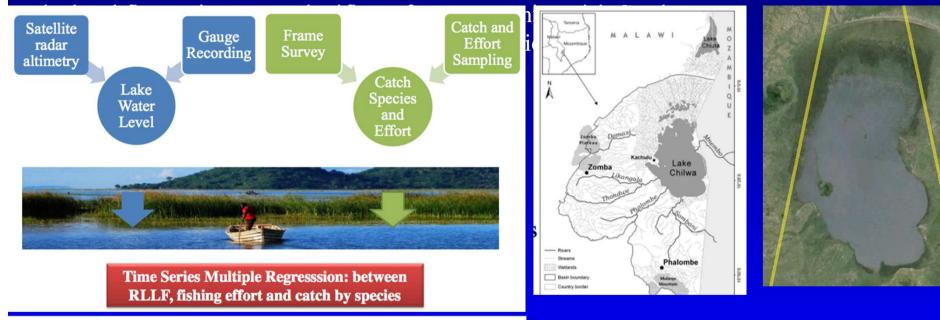
Web Site statistics gathered for reporting (~1000 per month)

NASA/Water Resources and NASA/MEaSUREs Earth Science Data Records programs both contributing to the project.

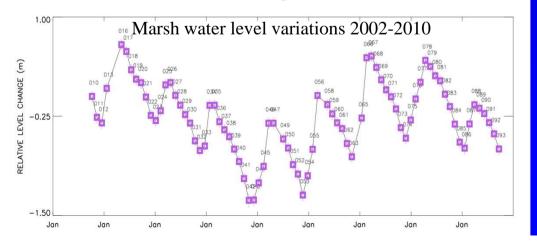
NASAESDR:PO.DAACarchivedlake/reservoirLevel/Extent/Storage,andriverLevel/Width/Slope/Storage/Dischargeproducts."PRESWOT Level2/3 products"

## Inland Capture Fisheries: Under reported and valued. Little understanding on Drivers and Trends. Case Study: Endorheic Lake Chilwa, Malawi.

Unstable, shallow, highly fluctuating, complex socio-ecological system.



0079.Chilwa Pass092 ENVISAT - Try1 Sealcetracker USO-corrected



G-REALM preliminary wetland product. 1m seasonality, general decline 2002-2007 then recovery, are consistent with historical gauge data. "Cost-effective, timely and reliable monitoring, combined with RLLF may provide a deeper understanding of <u>drivers and trends</u>".

## FUTURE: G-REALM 2017-2020



Agriculture, Regional Security, and Inland Fisheries - priority.

New Lake products – 1000 lakes/reservoirs, main emphasis on reservoir acquisitions in the smaller 10-99km<sup>2</sup> size range.

New Wetland Products for fisheries (primary) and ecology/conservation (secondary). Test case regions will be pathfinders.

Extended Temporal Range – 1992-2020 multi-mission archive plus J-3, Sen-3A/3B near real time monitoring. Sentinel-3 series appended to SARAL/ENVISAT/ERS archive.

Refined Products – improved automation, surface detection, and accuracy (satellite orbit, range, atmospheric corrections, multi-platform mergers, data filtering, IGDR to GDR etc), faster data postings, web site modification – Various prototypes under development

Surface Extent/Storage – Various Investigations, how best to move to Operations?