

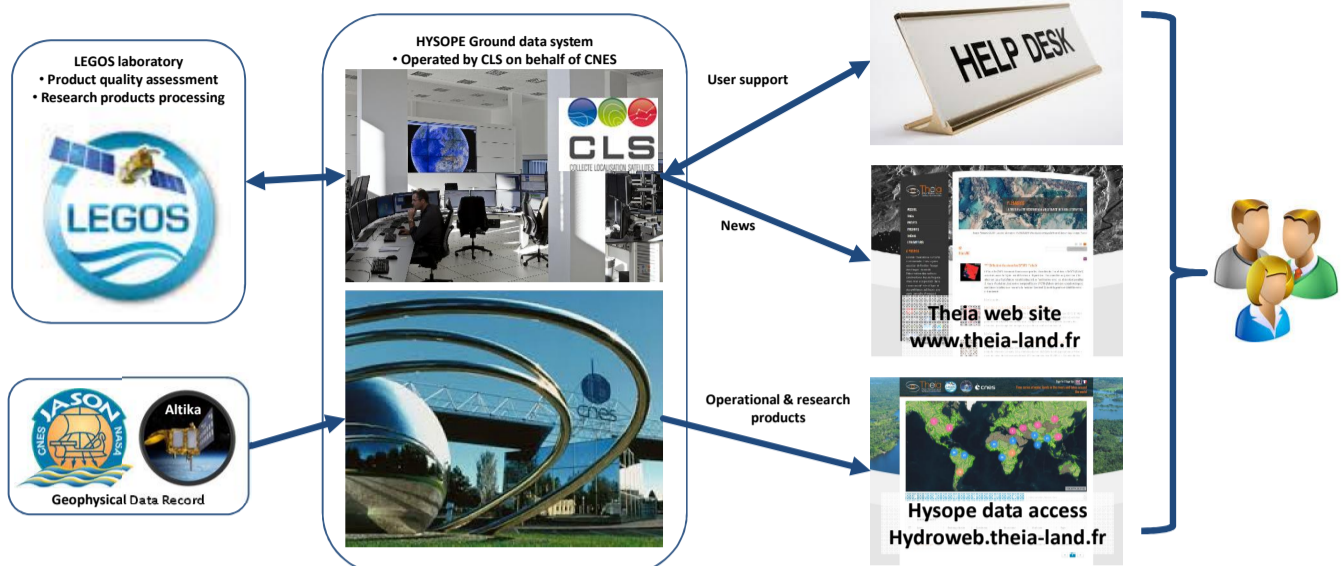
# HYSOPE : an operational processing center for lake and river observation



Philippe Pacholczyk, CNES, 18 Avenue Ed. Belin, 31401 Toulouse Cedex 9, France, [philippe.pacholczyk@cnes.fr](mailto:philippe.pacholczyk@cnes.fr)  
 Jean-François CRETAUX, LEGOS, 18 Avenue Ed. Belin, 31401 Toulouse Cedex 9, France, [jean-francois.cretaux@legos.obs-mip.fr](mailto:jean-francois.cretaux@legos.obs-mip.fr)  
 Marie-Claude GENNERO, LEGOS, 18 Avenue Ed. Belin, 31401 Toulouse Cedex 9, France, [marie-claude.gennero@legos.obs-mip.fr](mailto:marie-claude.gennero@legos.obs-mip.fr)  
 Stéphane CALMANT, LEGOS, 18 Avenue Ed. Belin, 31401 Toulouse Cedex 9, France, [stephane.calmant@ird.fr](mailto:stephane.calmant@ird.fr)

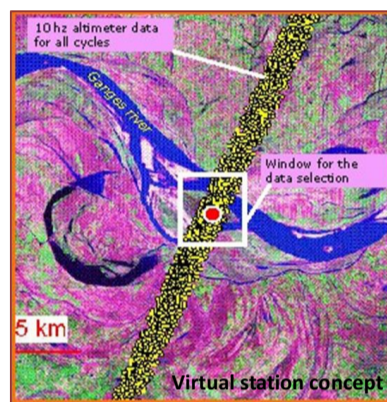
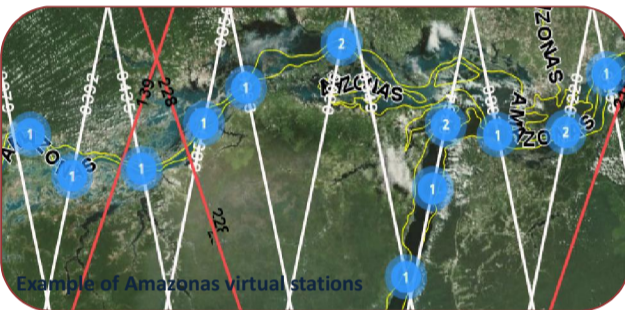
Rivers and lakes are a key component of the continental hydrological cycle but they are poorly observed at a global level. Beginning of 2014, after more than 10 years of water level research product distribution through the HydroWEB project, CNES and LEGOS decided to develop an operational processing center named HYSOPE (HYDrométrie Spatiale OPérationnelle) which aims at providing time series of water level for rivers and lakes and volume variation for lakes, calculated from the satellite altimetry data : currently Jason-2 & Saral/AltiKa and Jason-3, Jason-CS & Sentinel3 in the future. The water level and volume time series is operationally updated less than 1.5 working days after the availability of the input altimetry data, for 80 lakes and 300 virtual stations on twenty rivers. 150 lakes and 1000 virtual stations are also monitored on a research mode basis. The objective is to demonstrate the capability of providing operationally continuous level and volume measurements with a guaranteed quality, and to upgrade the number and quality of the products with the arrival of more performant mission. HYSOPE ground data system has been developed by ATOS company and is operated by CLS company, on behalf of CNES.

## HYSOPE architecture and operation

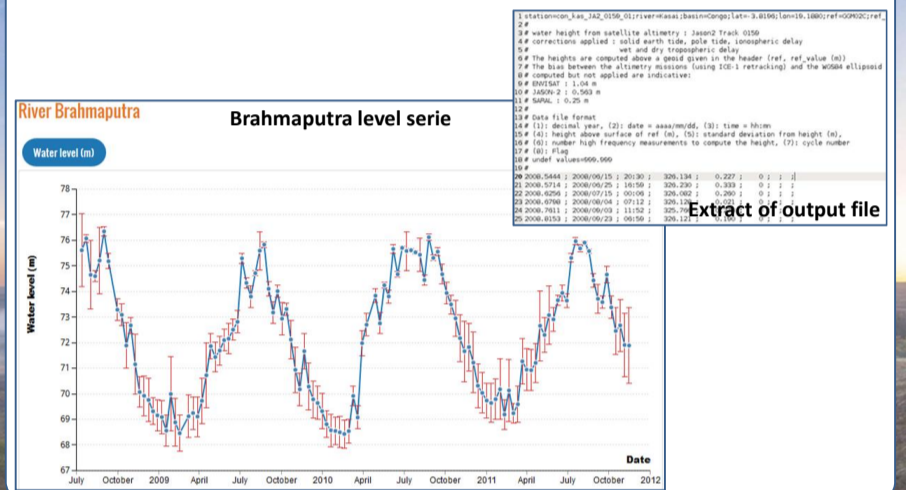


### River level monitoring

- Three steps dealing with tracks and virtual stations
- A virtual station is the intersection between a satellite track and a river bed :
  - Several virtual stations per river for different satellites
- Processing of a river water level related to the local EGM2008 reference for each virtual station :
  - Outlier rejection
  - Applying of a yearly filter

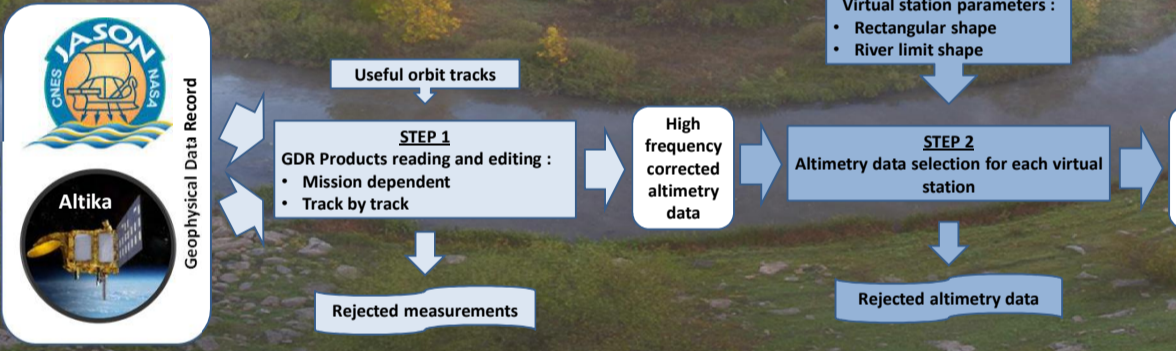


### Water level time series for rivers



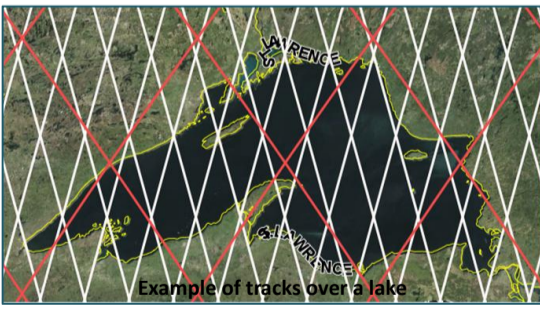
### Operational product characteristics

- Easy-to-use text file (csv format)
- 300 virtual stations on twenty rivers in operational mode
- Time series update 1.5 working days after GDR product availability
- Temporal resolution depending on the altimetry mission coverage :
  - Jason-2 : 10 days
  - Saral/AltiKa : 35 days
- Accuracy depending on river shape and altimetry mission :
  - 10 cm to 50 cm

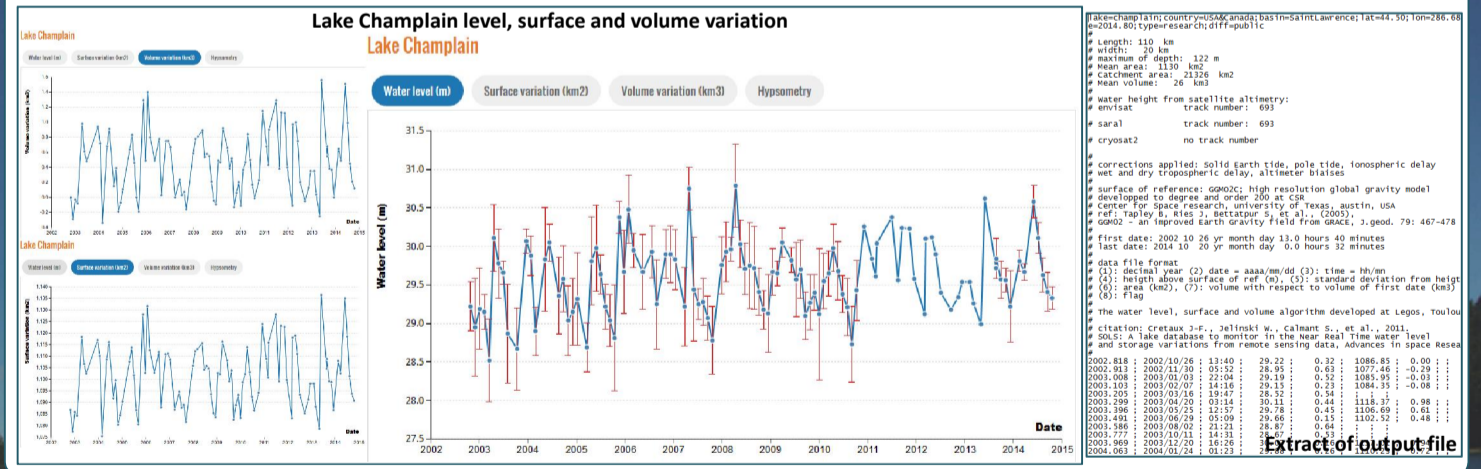


### Level, surface & volume variation monitoring for lakes

- Three steps for each lake
- Use of all interesting high frequency measurement inside the lake shape for all missions
- Processing of a median water level for each lake taking into account :
  - The altitude
  - The lake profile
- Processing of the lake volume / surface variation :
  - hypsothetic curve : relation between level and surface



### Level, surface & volume variation time series for lakes



### Operational product characteristics

- Easy-to-use text file (csv format)
- 80 lakes in operational mode
- Time series update 1.5 working days after GDR product availability
- Temporal resolution depending on the altimetry mission coverage :
  - Jason-2 : 10 days
  - Saral/AltiKa : 35 days
- Accuracy depending on lake shape and altimetry mission :
  - 3 cm to 20 cm

