Surface Water and Ocean Topography (SWOT) Mission

Science Team Meeting

21 June 2024

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Next Steps on Validation Data Collection

French Plans

❖ Continue the development of our **CNES expertise center** (Key for our project analysis, refer to Roger presentations on Wednesday, not described further)

❖ Continue developing the **comparison with other satellite data :** altimetry, IceSat-2, optical imagery (S2, Pleiades, …), SAR imagery (S1, Radarsat, …), …

❖ **Collect more in situ data** over **selected sites** mostly in continuity with 2023 effort (refer to Roger presentations on Tuesday)

❖ Re inforce our collaboration with various teams, mostly selected as part of TOSCA

❖ Precise the procedures to compare in situ data with SWOT, share the tools among the community

❖ **Process and validate in situ data**, develop error metrics, compare with JPL results

❖ Nadir altimeter data can be valuables to support the validation of SWOT data (but SWOT is so accurate …).

❖ We will make use of Hydroweb products, complemented by new processing methods :

  ❖ River Slope derived from S6 data

  ❖ Lake Processing prototype

  ❖ New retracking techniques applied to SWOT nadir LRM data, to S6 and S3 nadir SAR data
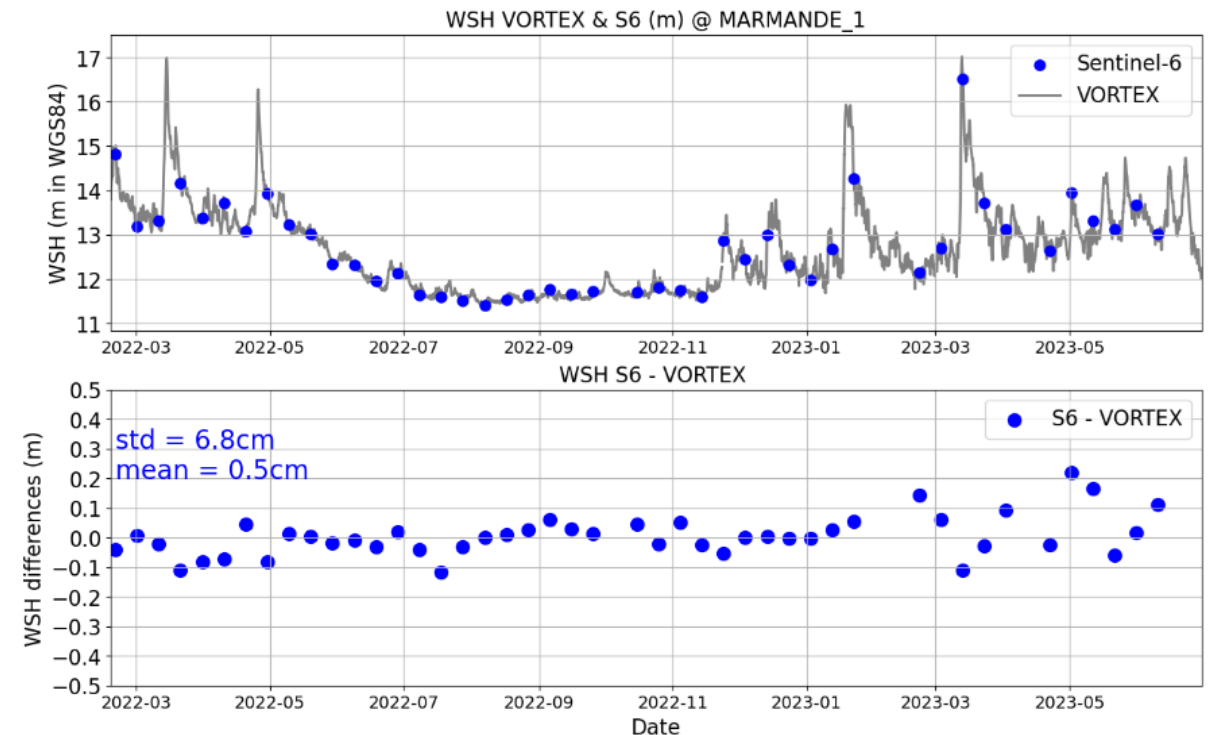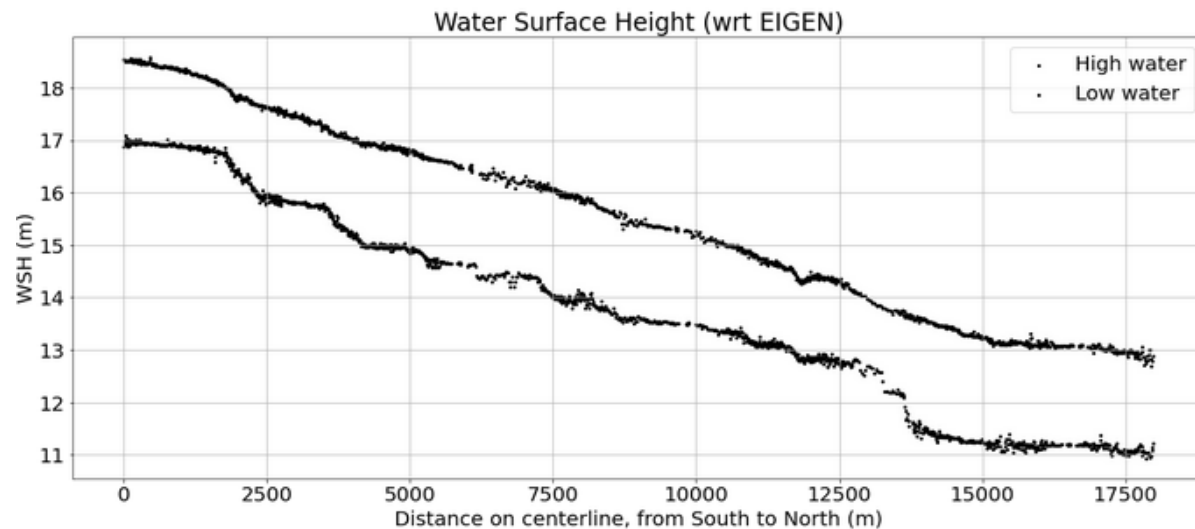
❖ **Lake Processing prototype over lakes**
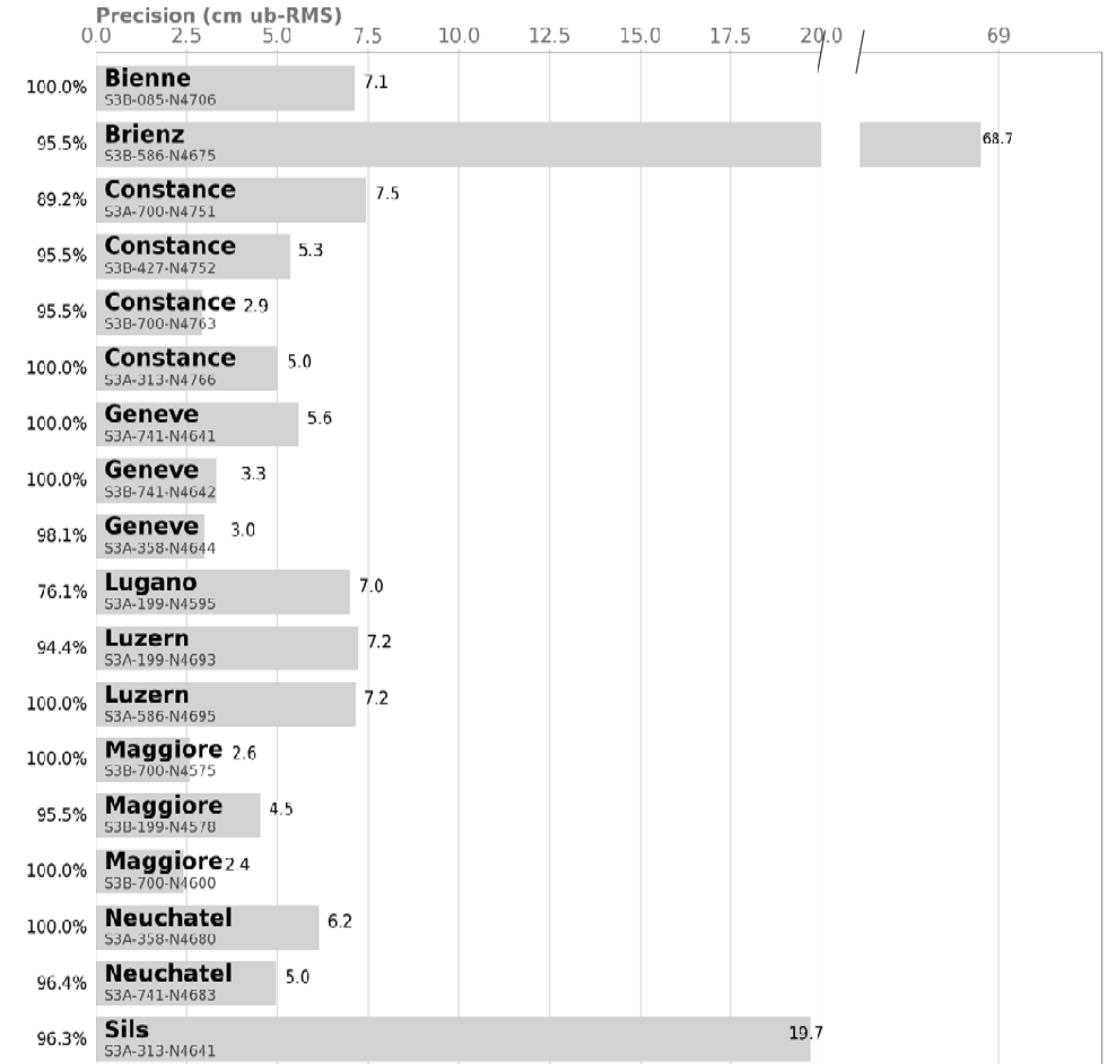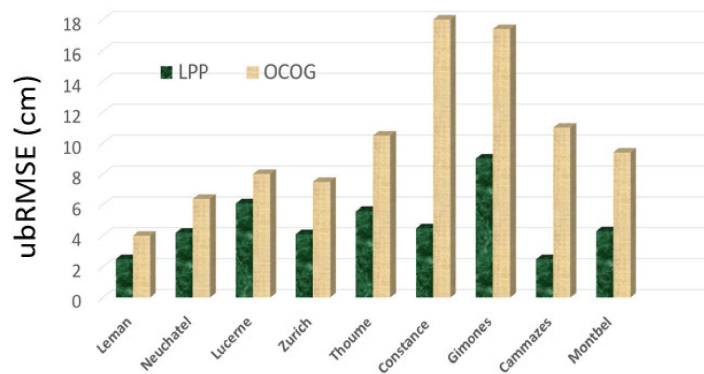
❖ **Make Use of Icesat-2 data over lakes and rivers**

➢ To compute the slope (as done by our German colleagues)

➢ To level gages (or to verify the quality of the levelling)

➢ To compare with SWOT data over selected low variability sites (lakes, …)

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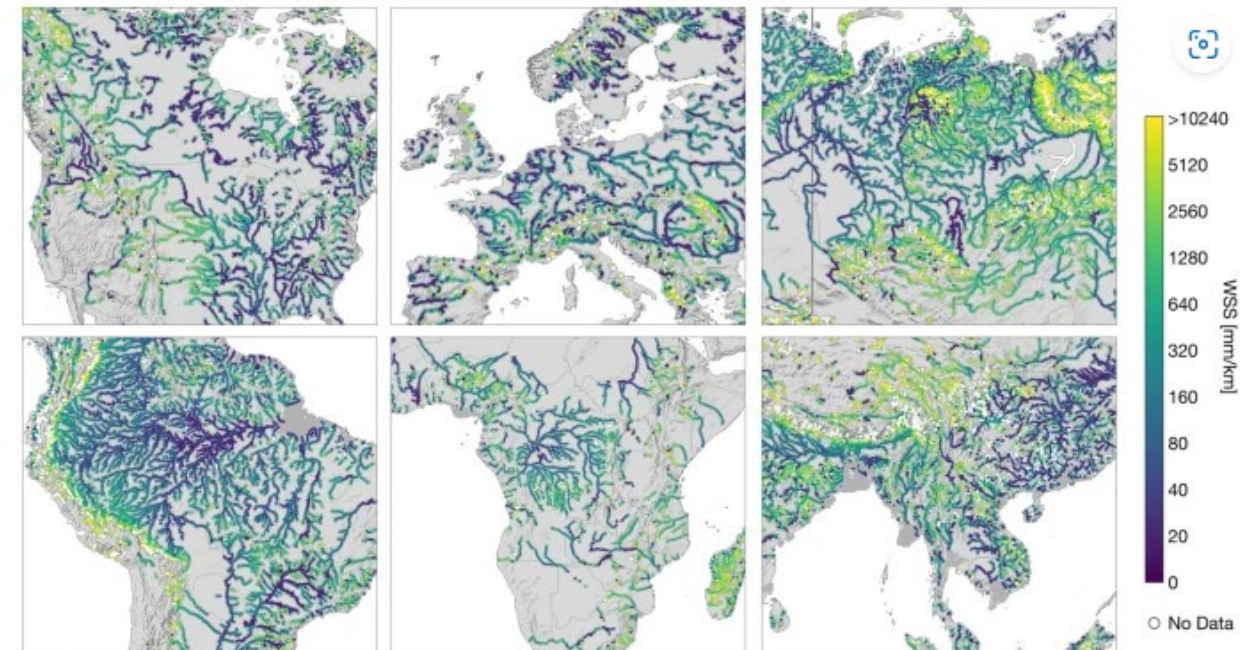
Data Descriptor | Open Access | Published: 06 June 2023

ICESat-2 river surface slope (IRIS): A global reach-scale water surface slope dataset

Daniel Scherer ✉, Christian Schwatke, Denise Dettmering & Florian Seitz

Scientific Data **10**, Article number: 359 (2023) | Cite this article

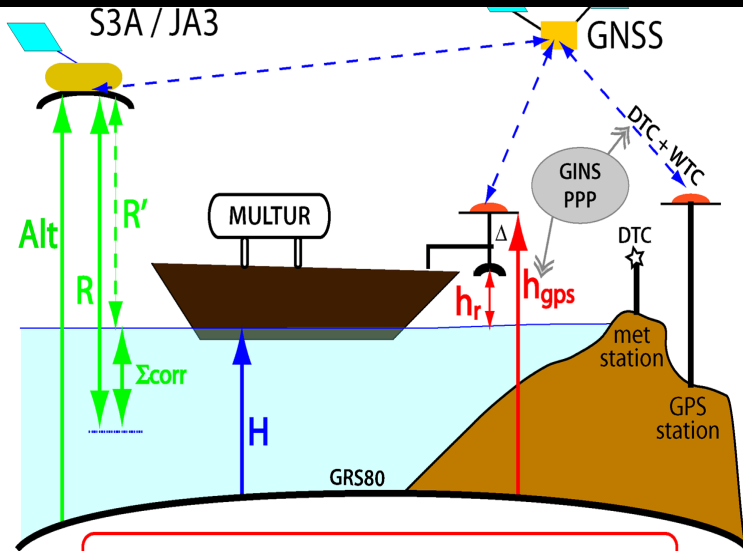**1029** Accesses | **4** Altmetric | Metrics

Fig. 3

Detailed views of the averaged combined WSS for North America, Europe, and Siberia (upper f.l.t.r.), South America, Central Africa, and East Asia (lower f.l.t.r.).

- ❖ Our **French Tier 1 sites** will be maintained, as well as the team to process and analyze the data :
  - ❖ Garonne River
  - ❖ Rhine River and surrounding lakes
  - ❖ Issyk Kul lake

- ❖ The in situ network over those sites might will be adapted in front of SWOT results. Some additional Drone flights will be performed to complement the river slope measurements available so far

- ❖ We will benefit from the St3TART project data collected over other sites : Rhine river in Germany, Pô and Tiber Rivers in Italy, …

- ❖ S3-NGT CNES project will provide access to additional CalVal sites over Germany and Italy
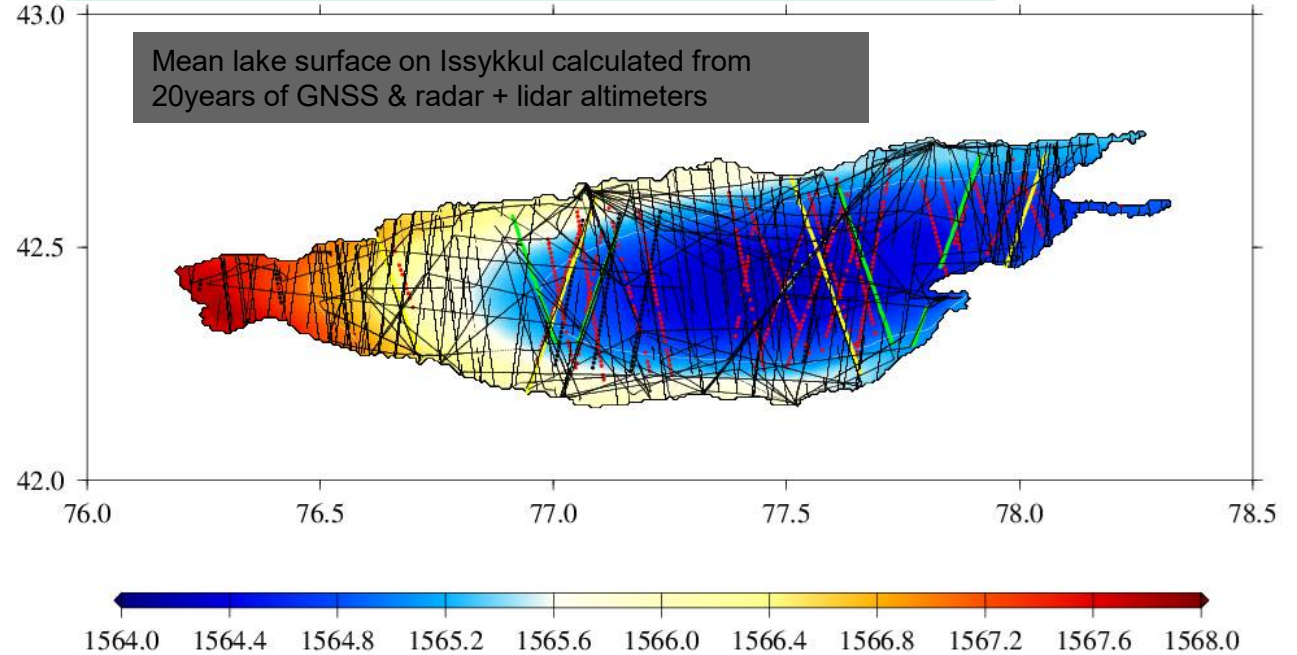
On site Cal / Val (Tier 1): Lake Issykkul

S3A / JA3
GNSS

Alt   R'

R

Σcorr

H

MULTUR

GINS
PPP

DTC + WTC

DTC

h_r h_{gps}

met station

GPS station

GRS80

Altimetry : $H = Alt - R' = Alt - (R - \Sigma corr)$

Validation : $H = h_{gps} - (h_r + \Delta)$

SURFACE moyenne ISSYKKUL : ICJESGT (1km)

Field campaigns in 2025-2028 are planed

Mean lake surface on Issykkul calculated from 20years of GNSS & radar + lidar altimeters

1564.0   1564.4   1564.8   1565.2   1565.6   1566.0   1566.4   1566.8   1567.2   1567.6   1568.0

- Calibration of absolute Height
- Phase Screen Calibration (small dynamic & MLS known very precisely)
- Atmospheric corrections using GPS ground network
- Validation of ocean and land processing simultaneously
- EM bias (possibly dependent on incidence angle) estimation would be possible
- Potential validation of Karin SWH and Wind estimation
- Use of the GPS CalNaGeo carpet (already on site)

On site Cal / Val: French lakes

❖ Citizen Science (LOCSS and OECS) initiative will be maintained and additional sites will be equipped

❖ Some sites will be equipped also with pressure transducers

❖ These are nearly the **unique small lakes** with in situ data available so far

❖ We will perform bathymetry measurements over selected sites with ADCP means

❖ The collaboration with TOSCA CalVal team will continue. We have an impressive set of sites with different characteristics that needs to be maintained

GEOGRAPHICAL DISTRIBUTION

WSE REFERENCE DATA

PLD lakes with ground truth available for WSE validation (leveled gauges only)

❖ Results over Tier 1 sites demonstrate that it is not that easy. Again SWOT is not noisy enough … ☺ We were pretty well prepared to collect the required in situ data, we were not much prepared to see so accurate SWOT data.

> ❖ Procedures will be adapted on sites characteristic (a lake is obviously different from a river / canal, we need to account for the river morphology, …)
>
> ❖ Perform more comparisons at Pixel Cloud level
>
> ❖ Implement specific SWOT data processing over Rivers and/or Lakes (refer to the presentation over Rhine River later on)
>
> ❖ Continue the validation of the performances over Lakes and contribute to the analysis over Rivers lead by NASA
>
> ❖ Compare our results with JPL and PIs one's