







A Hosted Analytic Collaborative Framework for Global River Water Quantity and Quality from SWOT, Landsat, and Sentinel-2

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Rivers \rightarrow Water Supply

Preferably: clean and abundant



Our ACF is a global water quality and quantity engine

Discharge (quantity) from SWOT (TRL 7) Suspended sediment (quality) from Landsat/S2 via computer vision (TRL 4) Entirely cloud based and operation ready by the end of our project



Discharge: the basic idea



McFLI: Mass conserved Flow Law Inversion *Gleason et al., EOS 2017*



SWOT: purpose built for river discharge

Maps like this will soon be common

Millions of individually modelled rivers

This is a preview of SWOT using Landsat



Our ACF produces SWOT discharge data

Technology Readiness Level (TRL) 7

In AWS

Hooked into PO.DAAC





Sediment concentration: the basic idea

Rivers carry sediments

 hydrosedimentology

 Human factors impact sediment transport storage → e.g. Dams



Vorosmarty et al. 2003

 Rivers balance themselves to carry sediments to the best of their capacity → Erosion and Sedimentation

Suspended Sediment Concentration

- Concentration of sediments suspended in rivers
- Measured in situ in some stations
- Goal: use Harmonized Landsat Sentinel data as source to calculate SSC



SWOT Rivers (SWORD) >50m

Altenau et al., 2021



Suspended Sediment Concentration

- How?
- Uniting the best of Machine Learning Techniques
- Classical ML Multi Layer Perceptron
- Computer Vision coupled with CNNs
- Unite forces with SWOT

Computer Vision for SSC



SSC

- Context
- TRL 4

[1] Isikdogan, L. F., Bovik, A., & Passalacqua, P. (2019). Seeing through the clouds with deepwatermap. IEEE Geoscience and Remote Sensing Letters, 17(10), 1662-1666.

[2] Ronneberger, O., Fischer, P., & Brox, T. (2015). U-net: Convolutional networks for biomedical image segmentation. In Medical Image Computing and Computer-Assisted Intervention-MICCAI 2015: 18th International Conference, Munich, Germany, October 5-9, 2015, Proceedings, Part III 18 (pp. 234-241). Springer International Publishing.

Readiness

- Our discharge systems are mature, tested, and verified by the SWOT project team and science team
- Our SSC systems are novel and maturing rapidly as we collaborate between hydrology and computer science
- We expect a fully operational cloud based system by 2025

Benefits

- Data fusion to deliver a societal good
- Community driven- avoids duplication of products and ensures a 'one stop shop' for SWOT discharge and SSC
- Meets a direct need of the science community
- Fully cloud based, fungible and flexible

Concluding remarks

- Will provide the first global base of sediment flux → huge leap
- Sediment and discharge in PO.DAAC
- Interdisciplinary team



Thank you!





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