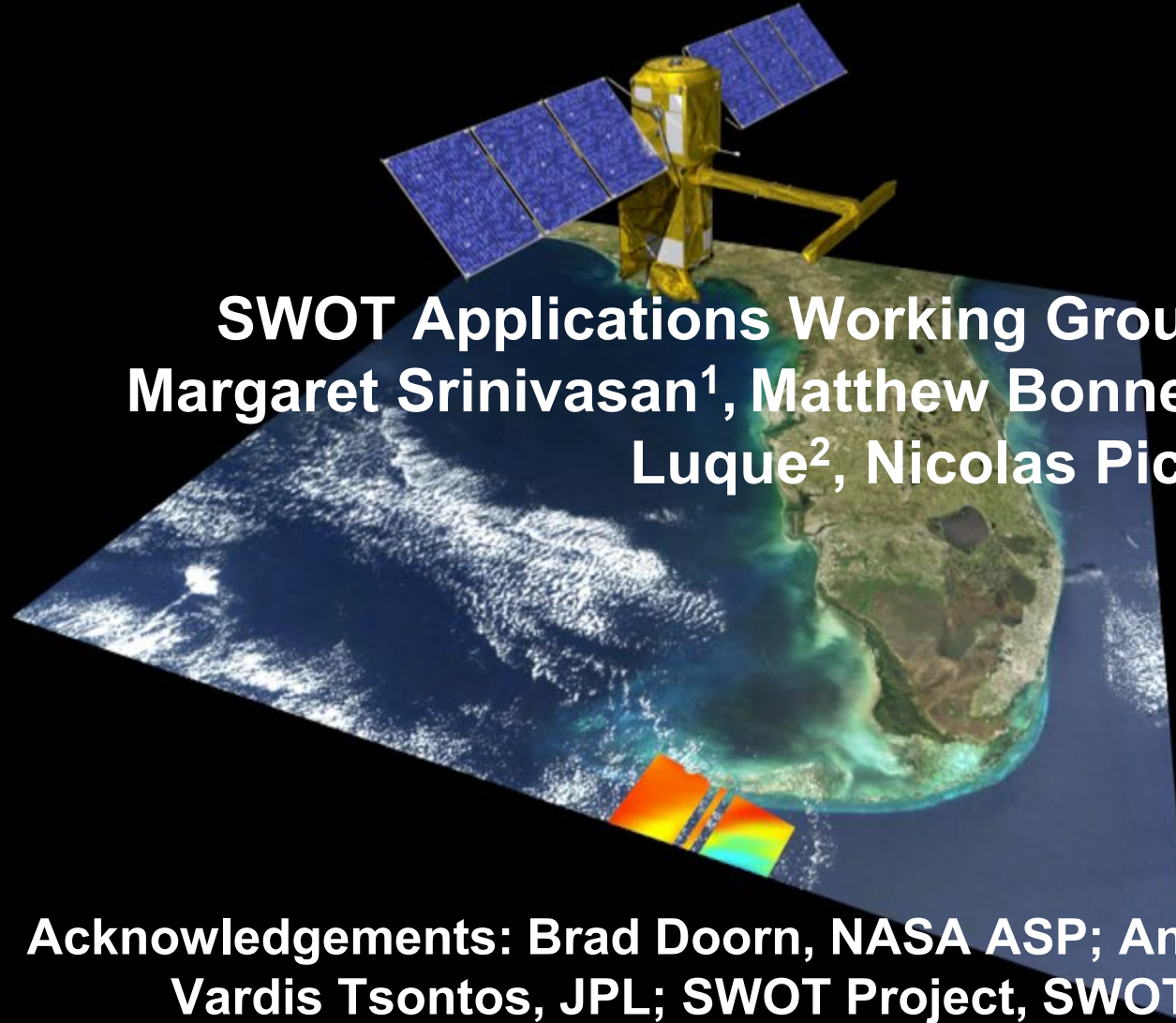




SWOT APPLICATIONS TEAM REPORT - 2022-2023



**SWOT Applications Working Group (SAWG) Leads:
Margaret Srinivasan¹, Matthew Bonnema¹, Santiago Peña-
Luque², Nicolas Picot²**

¹Jet Propulsion Laboratory
California Institute of Technology,
²CNES

**Acknowledgements: Brad Doorn, NASA ASP; Annick Sylvestre-Baron, CNES;
Vardis Tsontos, JPL; SWOT Project, SWOT Science Team, SAWG**

Supported by NASA Applied Science Program, CNES-French Investment Program



Programmatic Context

- **NASA Applied Sciences Program** – Brad Doorn, Program Executive for Water Resources
- **CNES, French Investment Program** – Annick Sylvestre-Baron, Program Manager
- **SWOT Project** – Project Managers Parag Vaze, JPL; Thierry Lafon/ Pierre Sengenes, CNES
- **SWOT Science Team** – Lee Fu, JPL; Tamlin Pavelsky, UNC; Rosemary Morrow, LEGOS; Jean-Francois Cretaux, LEGOS Science Leadership
- **SWOT Applications Working Group** – Margaret Srinivasan & Matthew Bonnema, JPL; Faisal Hossain, UW; Nicolas Picot & Santiago Peña-Luque, CNES; SWOT ST members; SWOT Project; PO.DAAC; interested colleagues



SWOT Applications Program Goals

- Maximize the societal impact of SWOT Goal: Operational applications
- Make data available and accessible to a broad community of users: SWOT Early Adopters
- Build awareness and literacy of the SWOT mission
- Support SWOT mission goals— communicate applications—critical information and outcomes

- *Why, what and how SWOT will measure*
- *Expected SWOT data -- format/structure and access*
- *Expected ancillary services and functions for data handling*
- *User-centric application potential & relevance to current missions/resources*



SWOT in the News

International

France

CNN
 Política Economía Deportes Pop Viajem & Gastron

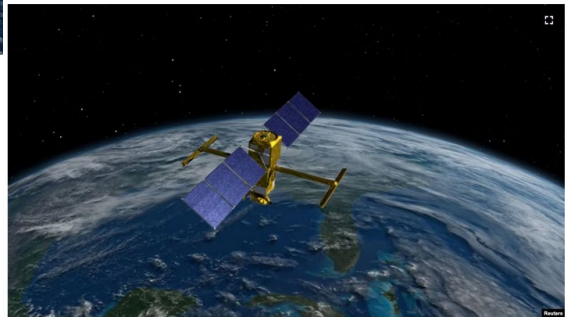
Nasa realizará primeira pesquisa global de águas a partir do espaço

Satélite de radar avançado foi projetado para fornecer aos cientistas uma visão sem precedentes do líquido vital que cobre 70% do planeta



Ilustração do radar SWOT NASA. Divulgado via REUTERS. Por Steve Gorman, da Reuters

VOA
 Satélite de la NASA reúne datos de toda el agua del planeta



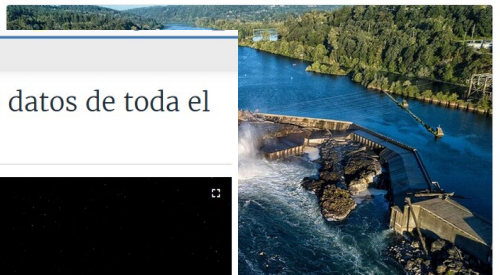
El avanzado satélite SWOT diseñado por la NASA en un dibujo de febrero de 2015.

INDIA TODAY
 News / SCIENCE / Satellite to find hidden reservoirs of freshwater from space

Satellite to find hidden reservoirs of freshwater from space

A joint satellite developed by the US and Europe will conduct a global freshwater survey to find hidden reservoirs of water.

Listen to Story Share



smaller waterways that are at least 330 feet (100

SCIENCES AVENIR

Espace Santé Nutrition Nature Animaux High-Tech Archéo Fondamental

riculture Climat Développement durable Expéditions Mers & océans Météo Nucléaire Plantes & végétaux

MERS ET OcéANS

Un satellite dévoile le monde des lacs, rivières et océans

Par Sylvie Rouat le 05.08.2023 à 09h00
 Lecture 3 min.

Swot va permettre d'étudier les ressources en eau continentales, mais aussi la dynamique des océans. Avec une précision plus de dix fois supérieure à celle obtenue par les autres satellites altimétriques actuellement en service.

Mexique : deux pseudo-momies d'extraterrestres présentées aux députés
 Le télescope James Webb détecte du méthane et du CO2 dans l'atmosphère d'une exoplanète
 Inondations dévastatrices en Liban - Les vagues de 7 mètres

Le Point
 Sciences & Innovations

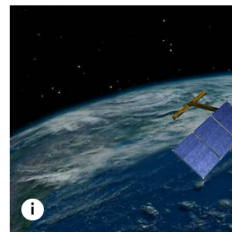
Swot, un satellite-vigie des eaux de surface de la Terre

La mission spatiale franco-américaine SWOT, dont le lancement est prévu jeudi, promet de révolutionner l'hydrologie

LADEPECHE.fr
 Accueil / France - Monde / Environnement

Balma. SWOT, un satellite qui veille sur le lac Saint-Clair

Par Ch...



Il suffit de scanner le flashcode avec son téléphone portable pour communiquer le niveau d

LesEchos
 FEM L&E Économie Politique Entreprises Finance-Marchés Bourse Monde Tech-Médias Start-up Régions Patrimoine

Le Cercle Leadership & management Livres Sciences & Prospectives Édits & Analyses En Vue Le Crible

SWOT, le satellite qui va révolutionner l'étude des lacs et des océans

Bientôt, la quasi-totalité de l'eau à la surface de la planète pourra être quantifiée et mieux étudiée grâce à la mission franco-américaine SWOT, dont le lancement est prévu jeudi. Un niveau de précision inédit qui sera d'une aide précieuse face au changement climatique.

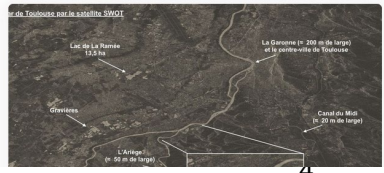
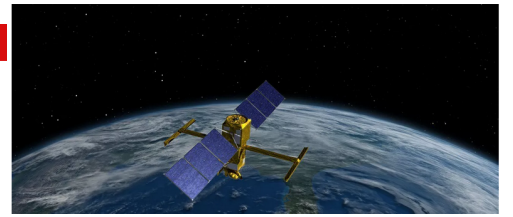
Le plus Commenter Partager Cimet Space 1

Le média de la vie locale

Les cours d'eau de la région toulousaine observés depuis l'espace par le satellite SWOT

Le canal du Midi, la Garonne ont été observés par le satellite international SWOT. Les premières images ont été révélées. Le but est de cartographier très précisément tous nos cours d'eau pour mieux gérer cette ressource vitale. C'est un enjeu capital en plein changement climatique.

Toulouse
 Vendredi 24 mars 2023 à 18:20
 Par France Bleu Occitanie

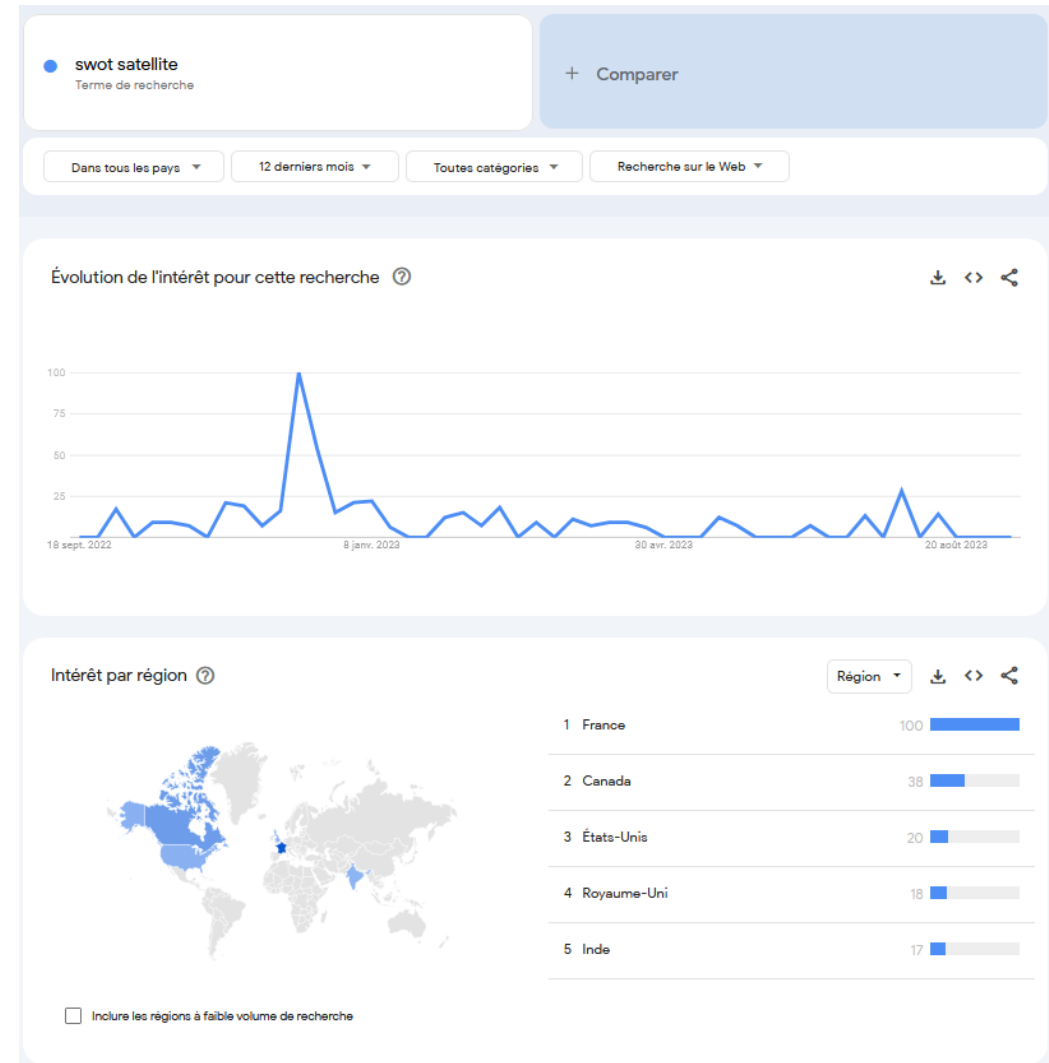


- Focus on oceanography & water resources
- Even local news (related to LOCSS too)



SWOT - Google trends

- Trend boom during launch
- Trends on contributing countries
 - France
 - Canada
 - USA
 - UK
- Trends on other countries
 - ❤ India





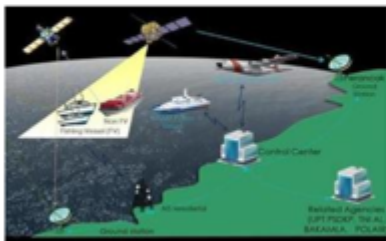
Applications End-Game...

- Establish a **self-sustaining mechanism for generation of SWOT success stories** that show SWOT value for issues of societal relevance
- Create **news headlines and press releases** on successful application of SWOT data serving societal needs

SWOT REVOLUTIONALIZES SUSTAINABLE FISHERIES

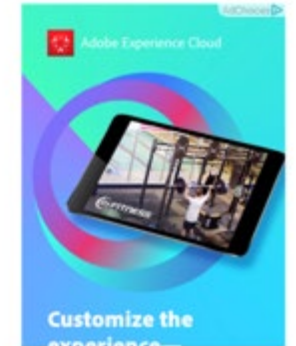
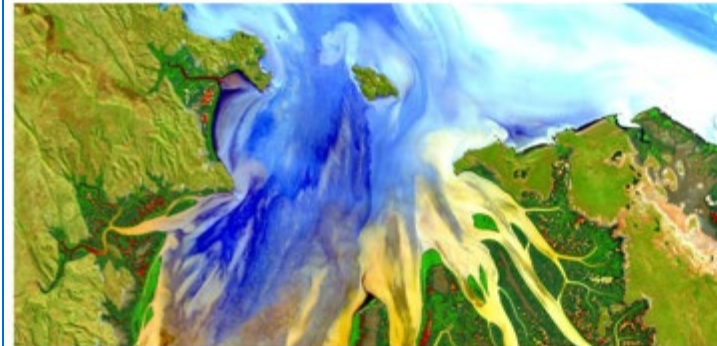
Smart satellite technology for inclusive & sustainable fishing practices in Indonesia

Published 26 January 2017
From: [UK Space Agency](#)



Credit: Inmarsat

SWOT IMPROVES LIVELIHOODS IN COASTAL FORESTS





SWOT Applications Activities 2013-2023

- **SWOT Applications Working Group (SAWG)**
- **Applications Mission Studies** – Demo of value for SWOT Project/ST
- **32 SWOT Early Adopters** - program launched in 2018 - 7 new from 2022
- **Training** (reports published/available online)
 - 9 Application Workshops 2015-2023 - Last held in Paris 2022
 - Support PODAAC & hydroweb.next
 - 3 Virtual Hackathons
- **Communications**
 - Applications web sites – JPL & UW
 - Quarterly telecons
 - Conference/ST participation
 - Launch – Media (video, article) & Outreach support
- **Publications**
 - 5 Quarterly SWOT Applications Newsletters (next: Sep 2023)
 - 11 wide-audience dissemination (BAMS, ASCE, EOS, AWRA, SERVIR, Remote Sensing)
 - 14 peer-reviewed research pubs by EA lead authors-8 directly related to EA Projects



SWOT Early Adopter Highlights

India Institute of Technology - Bombay (IITB)

Title: Examining the potential of SWOT mission in Hydrometeorology over India

Leads: J. Indu; Subimal Ghosh; Subhankar Karmakar

High frequency estimates of discharge and storage are needed in river-reservoir systems of Mahanadi and Ganga rivers to reduce and adapt to flood risks for stakeholders located in urban centers.

[Read More >](#)

Asia Disaster Preparedness Center (ADPC)

Title: Plugin SWOT to Enhance Water Resource Management in Lower Mekong

Leads: Susantha Jayasinghe (Technical Specialist); Chinapom Meechaiya (Hydrologist)

Rivers in Southeast Asia such as the Chindwin River in Myanmar, Tonle Sap River in Cambodia, the transboundary Mekong River and other major rivers in Lower Mekong countries, are prone to flooding. For flood preparedness and disaster response planning, stakeholders require accurate prediction, modeling or monitoring of inundation extent during flood events.

[Read More >](#)



SWOT Early Adopters

Where are SWOT Early Adopters?

Learn about this growing community working to incorporate future SWOT data into their activities. The locations of Early Adopters are shown in the map and their summaries are included below. View the [SWOT Early Adopters Guide](#).



32 SWOT Early Adopters

https://swot.jpl.nasa.gov/applications_ea.htm

Reservoir Management
Flood Prediction/Mapping
Monitoring Ungauged Basins
Transboundary Resource Management
Water Quality
Water Availability
Providing data or tools to applications users
Ocean Modeling and Predictions

- Early Adopters**
- Alexandria University, Egypt
 - ANA Brazil (Brazil National Water Agency)
 - Asian Disaster Preparedness Center (ADPC)/SERVIR-Mekong
 - BRL Ingénierie (BRLi)
 - Centre for Water Resources Development and Management (CWRDM), Kerala, India
 - Cleveland Water Alliance (CWA)
 - CLS
 - Compagnie Nationale du Rhône (CNR)
 - Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI)
 - Environment and Climate Change Canada (ECCC)
 - ESRI
 - FM Global
 - French National Research Institute (IRD)
 - FUNCEME
 - Geological Survey of Brazil (SGB)
 - ICUBE SERTIT
 - Indian Institute of Technology Bombay
 - Indian Institute of Technology Delhi
 - Magellium
 - Mercator Ocean
 - NASA Short-term Prediction Research and Transition (SPoRT) Center, Univ. Alabama
 - NOAA/CIRES University of Colorado Boulder
 - Northeastern University
 - Ohio State University
 - Pakistan Council of Research in Water Resources (PCRWR)
 - Stantec Consulting Services Inc. (Stantec)
 - Texas Water Development Board (TWDB), Austin, TX
 - U.S. Air Force Weather's Land Information System (LIS), Offutt AFB, NE
 - US Geological Survey (USGS)
 - University of Bonn and Helmholtz-Zentrum Geesthacht
 - vorteX.io
 - Water in Sight



National Water Agency Brazil (ANA)

LEADS/ROLE:

SWOT Spatial Database Merge: **Alexandre de Amorim Teixeira**

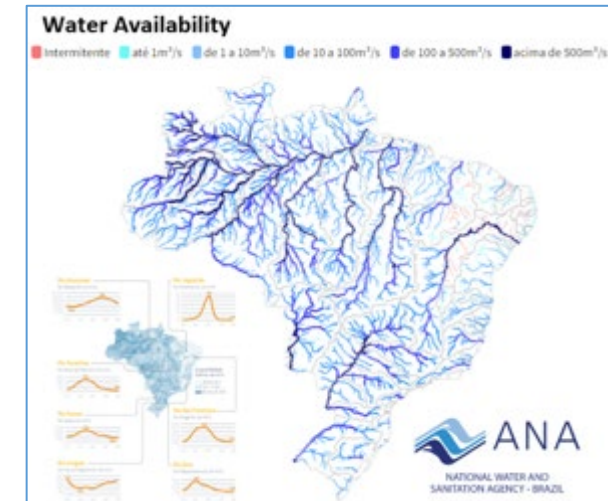
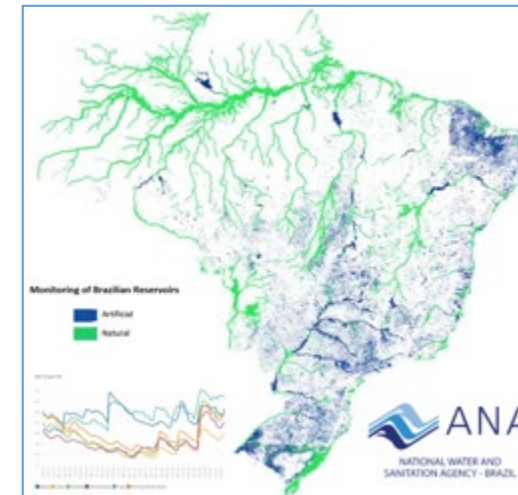
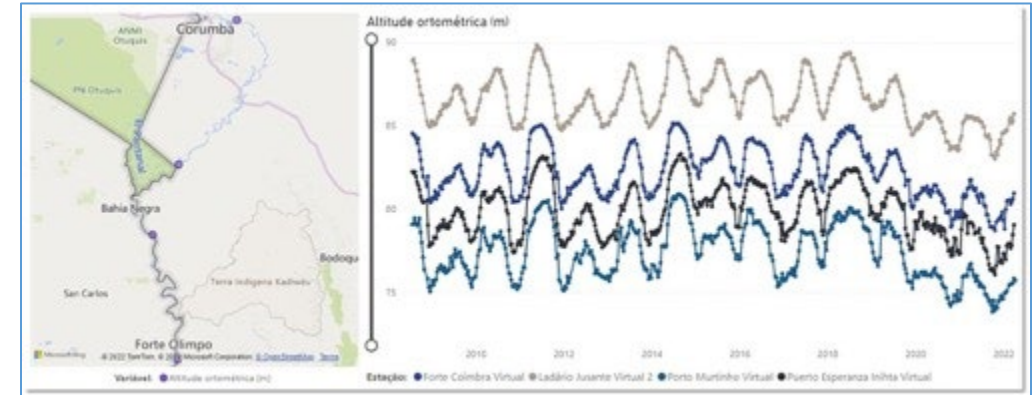
Discharge: **Alexandre Abdalla Araujo**

Climate Change: **Saulo Aires de Souza**

Flood Plain: **Vinícius Roman**

Hydrological Monitoring: **Dhalton Luiz Tosetto Ventura**

The National Water and Sanitation Agency of Brazil (ANA) proposed applications of early adopter activities for the SWOT (Surface Water and Ocean Topography) mission, namely the SWOT Spatial Database Merge, Hydrological Modeling, Reservoir Storage Data, Flood Plain, and Hydrological Monitoring. ANA aims to use SWOT data to improve hydrological models used in Brazil, evaluate and monitor reservoirs, determine flood reference levels and develop a flood vulnerability atlas. The SWOT data is expected to support ANA's hydrological studies and water resources decision-making.





Water in Sight

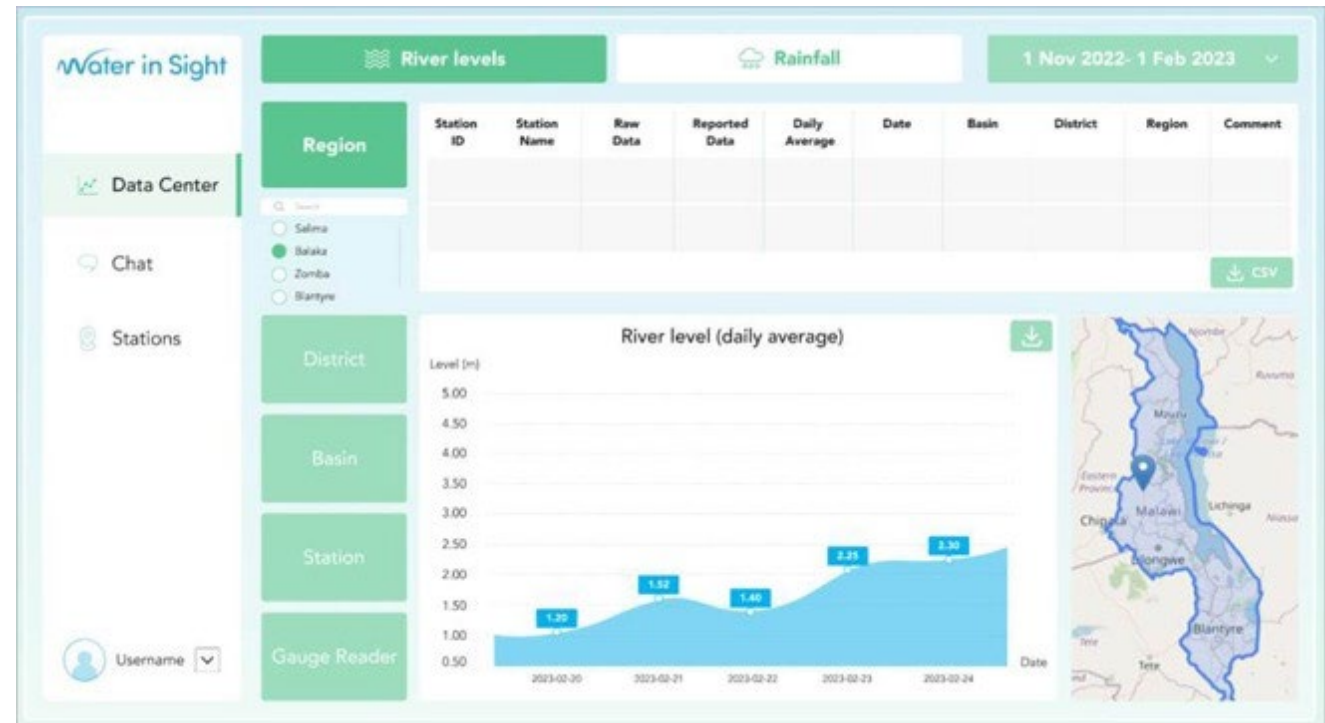
LEADS:

- Louise Croneborg-Jones
- Guy Schumann

Location: Sweden

Project Area: Africa

Swedish startup, Water in Sight Ltd has developed an SMS and WhatsApp service for hydrological gauge readers in least developed countries (LDCs) to send their manual observation measurements of river and rainfall levels to an online database for free – to harness scalable observations addressing the 70% gap of observation data. Operational hydrologists in government can access raw and quality-controlled data, capture subjective observations of flood thresholds and manage equipment inventory. The solution has been scaled to approximately 80 river and rainfall monitoring stations across Malawi, providing twice daily observations. In April 2023, a pilot for 15 synoptic stations kicked off in Mozambique and next, further validation will be done at river monitoring stations in Sierra Leone with their National Water Resources Management Agency.





Cleveland Water Alliance

Title: Exploring SWOT data integration with Cleveland Water Alliance Smart Lake Data

Organization: Cleveland Water Alliance (CWA)

Leads: Ge (Jeff) Pu; Ebie Holst

Summary

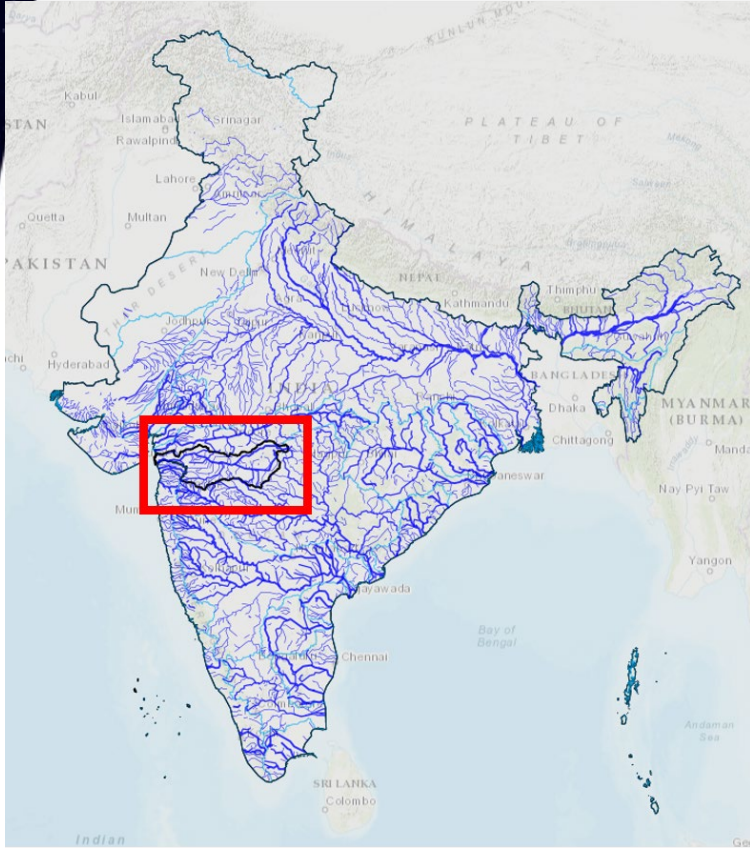
The Cleveland Water Alliance is developing a smart data platform that provides public access to web-streamed real-time and near real-time data on various Lake Erie environmental conditions using a network of smart water buoys, marine stations and other sensor devices across the Lake Erie Basin. The environmental conditions include wind, wave, solar radiation, air temperature, water temperature, Chlorophyll-a reflectance, Phycocyanin reflectance, dissolved oxygen, turbidity and pH. These data will collectively provide critical information for industry, utility, agriculture, maritime, research, and recreational interests across the region by enhancing our ability to provide functional, streamlined solutions for monitoring Lake Erie in ever-changing conditions. The data platform will utilize a map-based data dashboard to display real-time data. Streamed data will be managed using one of the ArcGIS Online data platforms (e.g., Web Experience Builder).



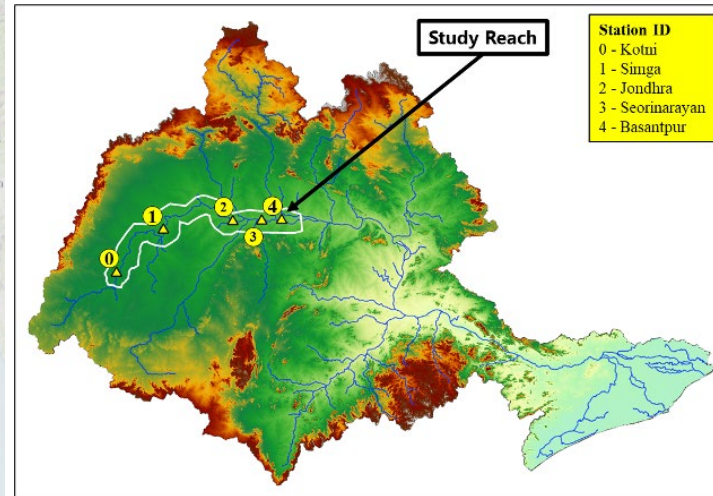
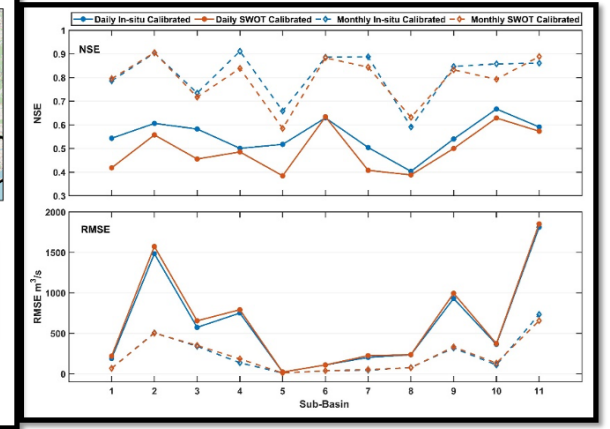
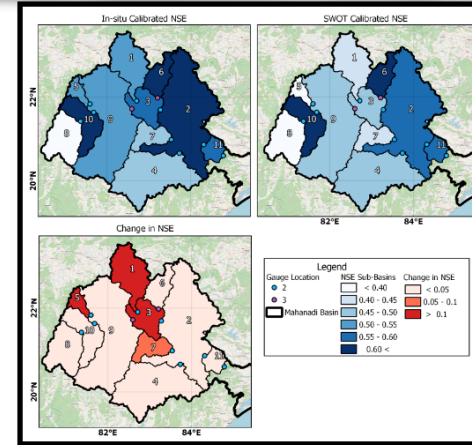


IIT - Bombay

LEADS: Indu Jaya, Manu Soman

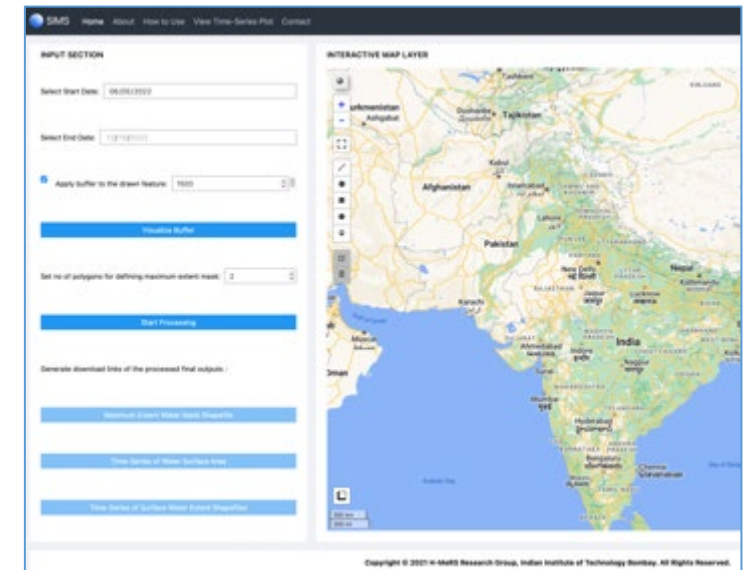


Floods on Indian Rivers through Discharge Estimation of SWOT



Extending historical gauge network over Indian river reaches utilizing SWOT mission

Will SWOT-type data be able to calibrate a hydrological model over the Indian Basin?



SIMS toolkit



Title: *Supporting SWOT Products in ArcGIS*

Organization: *ESRI*

Leads: *Nawajish Noman*



ArcGIS

Summary:

1. Ensure SWOT products can be read in ArcGIS using existing capabilities. New tools were created considering SWOT pixel cloud product in mind.
2. Understand various applications of SWOT products and evaluate how ArcGIS capabilities can be used for data visualization, exploration and analysis.
3. Demonstrate the capabilities and best practices using sample SWOT products.
4. Identify capability gap so that ArcGIS can be enhanced to better work with SWOT products.



Wednesday SAWG meeting highlights:

Open questions :

1. When/how to communicate complexities of SWOT products and their accuracies to SWOT Application User Community?
2. How to process feedback from Application User Community as they begin to use SWOT products?



SAWG STRATEGIC PLAN Thru 2025

2023-2024 (Data phase)

- Train a new generation of **diverse leadership** ready to lead SWOT application activities.
- Support development of **training materials**, multi-media tutorials, education activities
- Generate **high profile success stories** on how the SWOT mission adds value to stewardship of water resources and ocean applications.

2025 and beyond (Sustainability)



- Sustain the **infrastructure to support our community** where applications of SWOT data and success stories are **easy to find**, accelerate and scale globally by any entity addressing water issues.
- Support **operational synergy between SWOT and national/global discharge assimilation and modeling activities** (NOAA, NWM, ECMWF, etc.) and other missions (NISAR, GRACE FO, Sentinel series).



2023 SWOT Applications Workshop

- 7-8 December 2023 (week before AGU)
- Pasadena, CA & virtual (Caltech)
- Focus on use of SWOT
 - SWOT & Early Adopter updates
 - Guidance on navigating SWOT products
 - Modeling activities that may benefit from SWOT
 - Training on use of and access to SWOT data
- Emphasis on EA participation - in person or virtual!
- Data Products expected to be released prior to workshop
 - Welcome presentations on EA early impressions
 - Demos of using real data are expected to be available

Thank You!



- swot.jpl.nasa.gov/applications
- swot.cnes.fr/en/search/site/SWOT
- depts.washington.edu/saswe/swot/
- Questions?
 - matthew.g.bonnema@jpl.nasa.gov
 - margaret.srinivasan@jpl.nasa.gov
 - santiago.penaluque@cnes.fr
 - vardis.m.tsontos@jpl.nasa.gov

