



# Water Data Utilization and Capacity Building in the Mekong Region: Improved Hydrologic Decision Support for the Mekong Basin

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# Objectives

Introduction of multiple hydroclimatic applications designed to collect, analyze, and manage water and water-related data (e.g., climate, weather, land cover, soils) for the purpose of reducing water-related risks, and improving regional responses to environmental emergencies.



This animation shows rain data collected by the GPM Core Observatory and the partner satellites currently in orbit on March 17, 2014. The end of the animation focuses in on a storm system that moved over the eastern United States, showing GPM Microwave Imager data of rain and snow rates. This is the first time a single satellite has collected simultaneous data on rain and snow for a single storm.

**Animation Credit:**

**NASA's Scientific Visualization Studio**  
**Data provided by the joint NASA/JAXA GPM mission**

- **NASAaccess & SWAT-online software programs were developed for hydroclimatic applications.**
- **The web apps and software packages presented are modular and can be hosted anywhere (public or private servers).**
- **The NASAaccess tools presented give easy access and retrieval capabilities to weather and climate data for any watershed.**
- **The tools presented provide formatted data that can be seamlessly ingested into any hydrological model.**




# NASAaccess (Tethys Web Tool & R Package)

NASAaccess is a software tool built in R software program that streamlines the retrieval and processing of the global National Aeronautics and Space Administration (NASA) earth observation data products for use in hydrological models such as SWAT , VIC, RHESSys, ...etc.

(<https://imohamme.github.io/NASAaccess/index.html>)



GitHub

 NASA Access

**Select Watershed Boundary**  

lower\_mekong

⊕ Upload New Watershed

**Select DEM**  

LowerMekong\_dem

⊕ Upload New DEM

**Select Date Range**  

Jun 1, 2011

 to 

Oct 31, 2011

**Select Data**

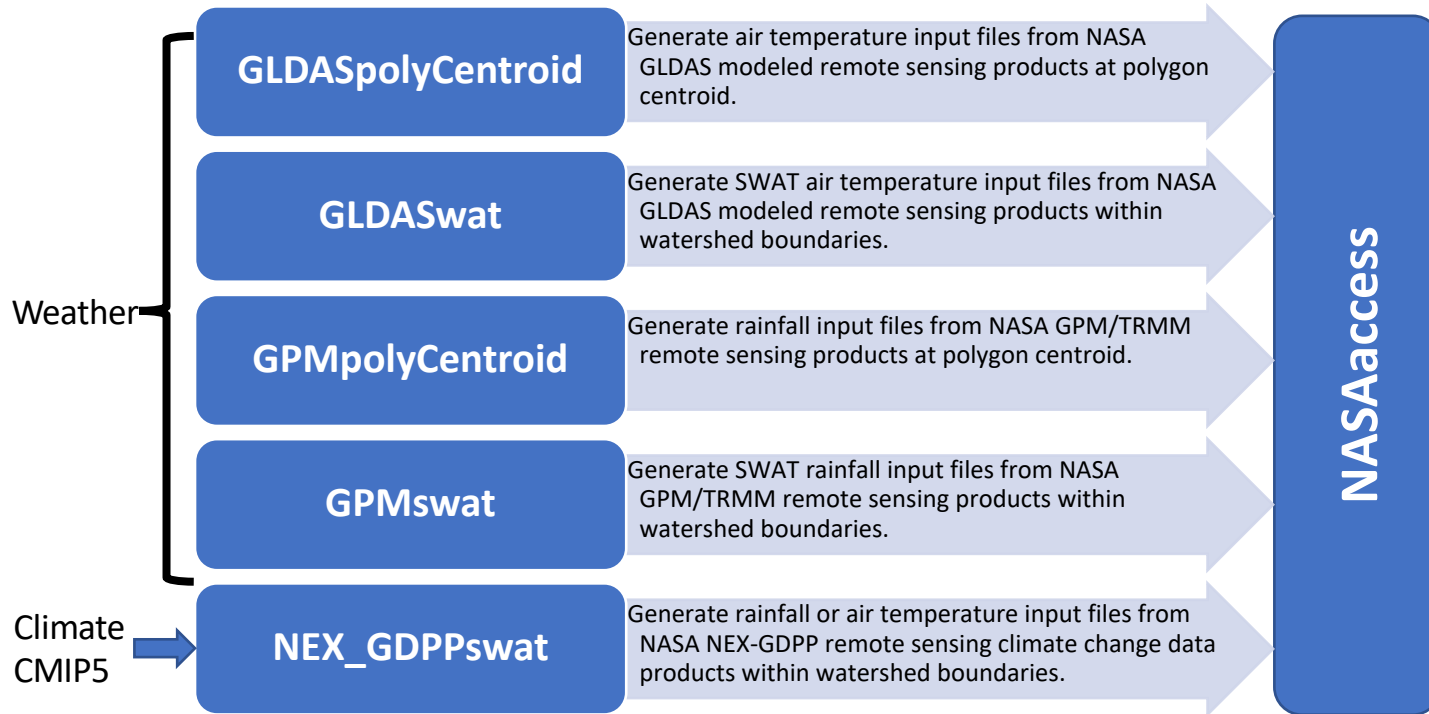
Dataset	Information
<input type="checkbox"/> GLDAS Poly Centroid	Generate air temperature input files as well as air temperature stations file from NASA GLDAS remote sensing products.
<input checked="" type="checkbox"/> GLDAS SWAT	Generate SWAT air temperature input files as well as air temperature stations file from NASA GLDAS remote sensing products.
<input type="checkbox"/> GPM Poly Centroid	Generate rainfall input files as well as rain station file from NASA GPM remote sensing products.
<input checked="" type="checkbox"/> GPM SWAT	Generate SWAT rainfall input files as well as rain stations file from NASA GPM remote sensing products.

Run NASAaccess

Download Data

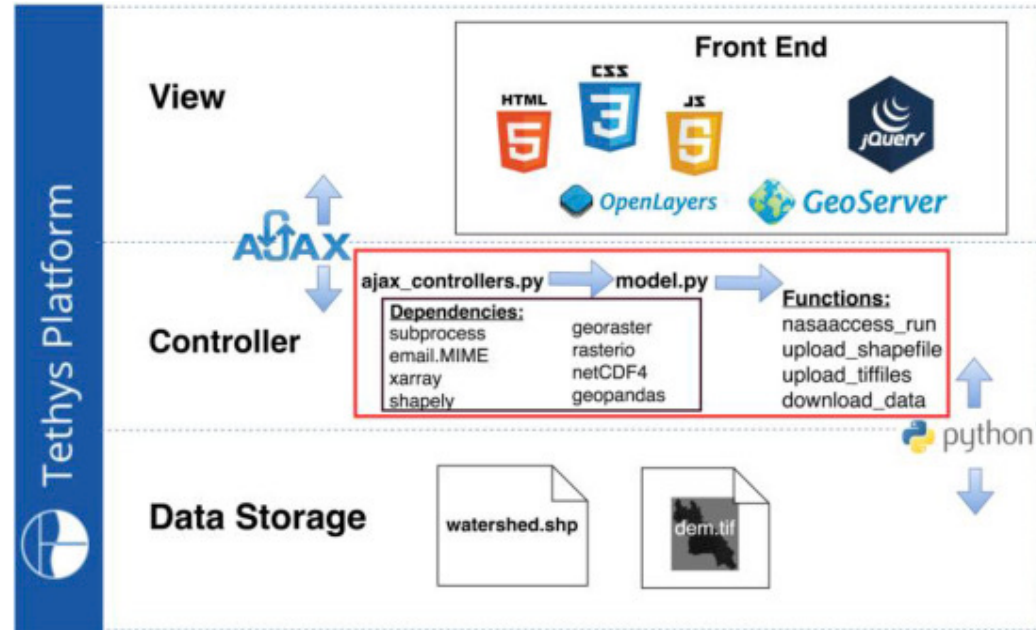


# NASAaccess ...



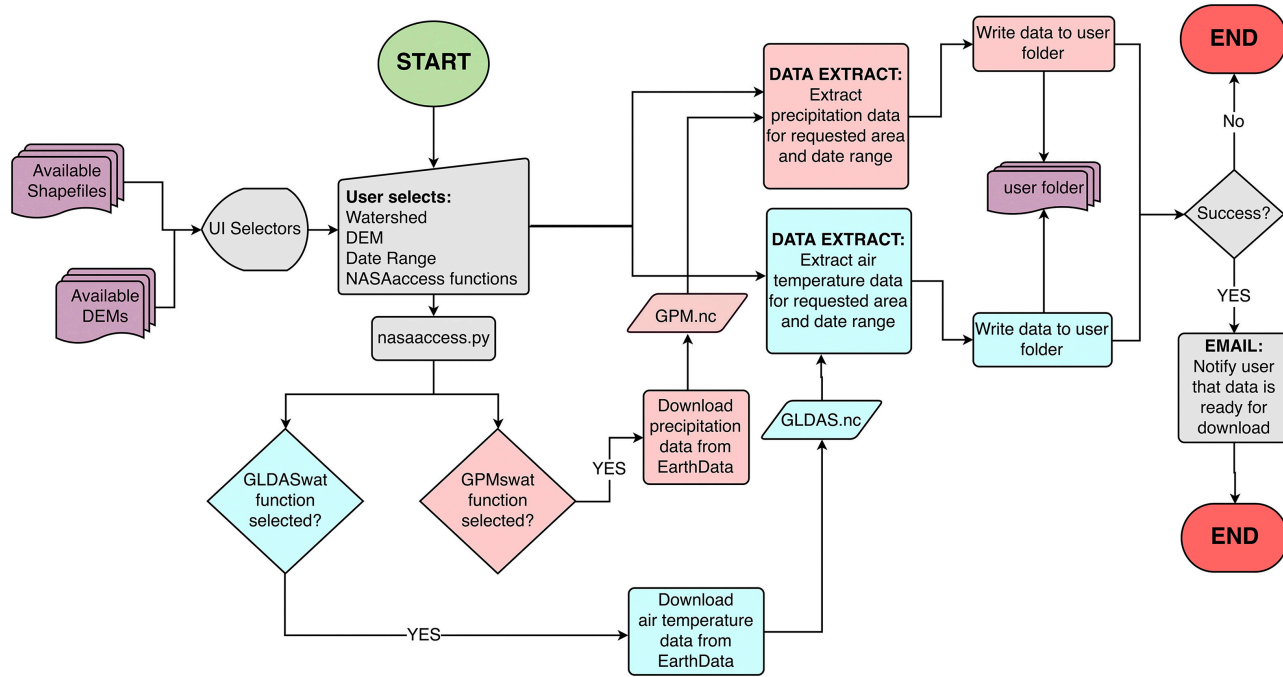
# NASAaccess Tethys Organization

- Scientists can leverage the wealth of already developed Python packages along with their own customized scripts to control the data retrieval, processing, and analysis functions.



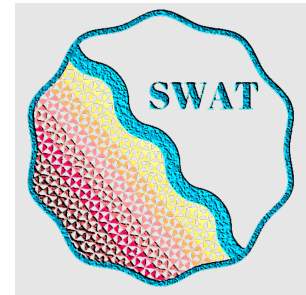
*Model-View-Controller (MVC)*

# NASAaccess Tethys Web App Flowchart



# What is SWAT-Online Framework?

- SWAT-online represents an effort to lower technical barriers for the SWAT model through using open-source web development, web services, and cloud storage technologies.
- SWAT-online is a Tethys App for visualizing and sharing inputs/outputs of any SWAT Model project.



## Select Watershed

Lower Mekong

## Toggle Layers

Basins

On

Stations

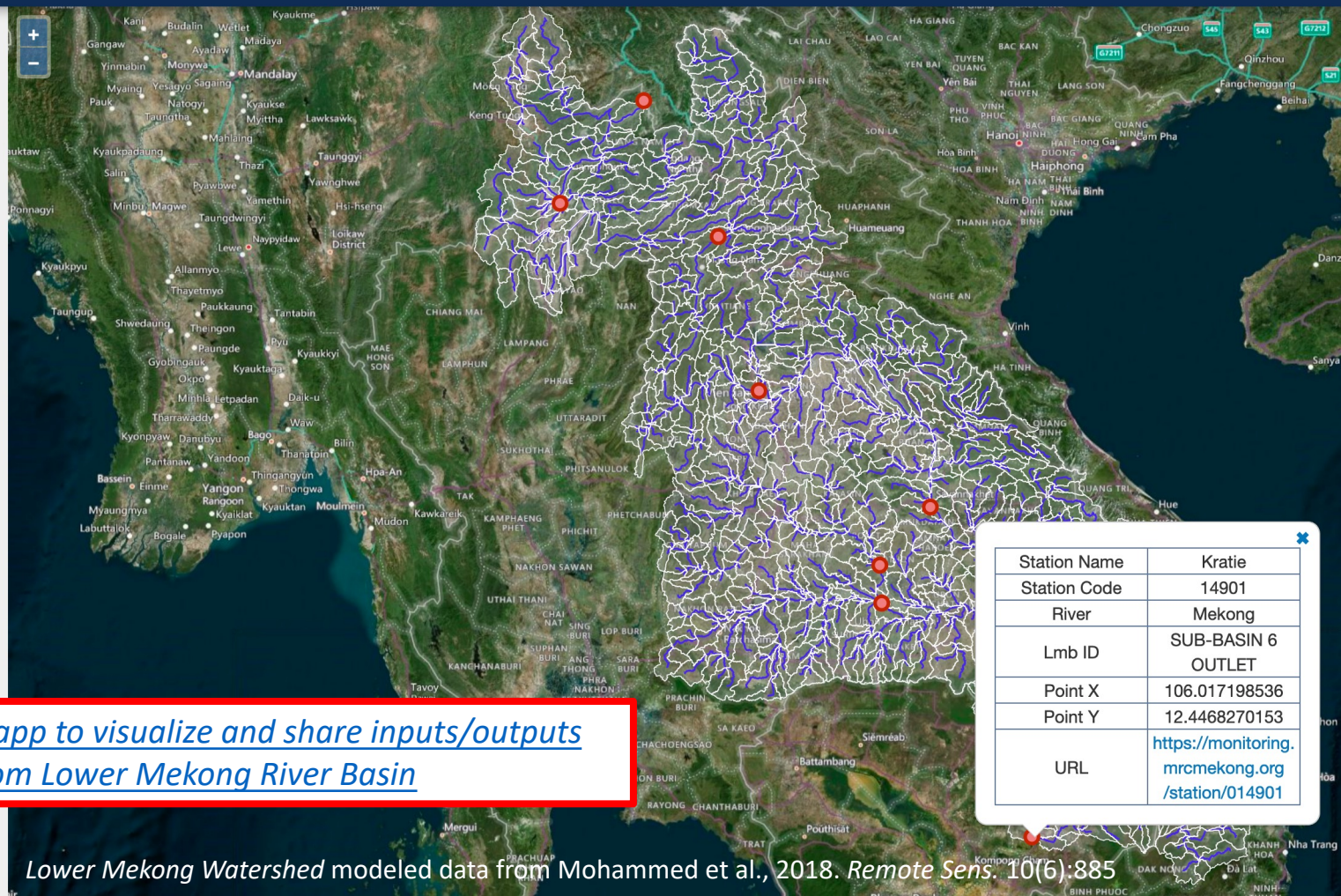
On

Watersheds

On

Supplementary Layers

Land Use/Land Cover Soil None

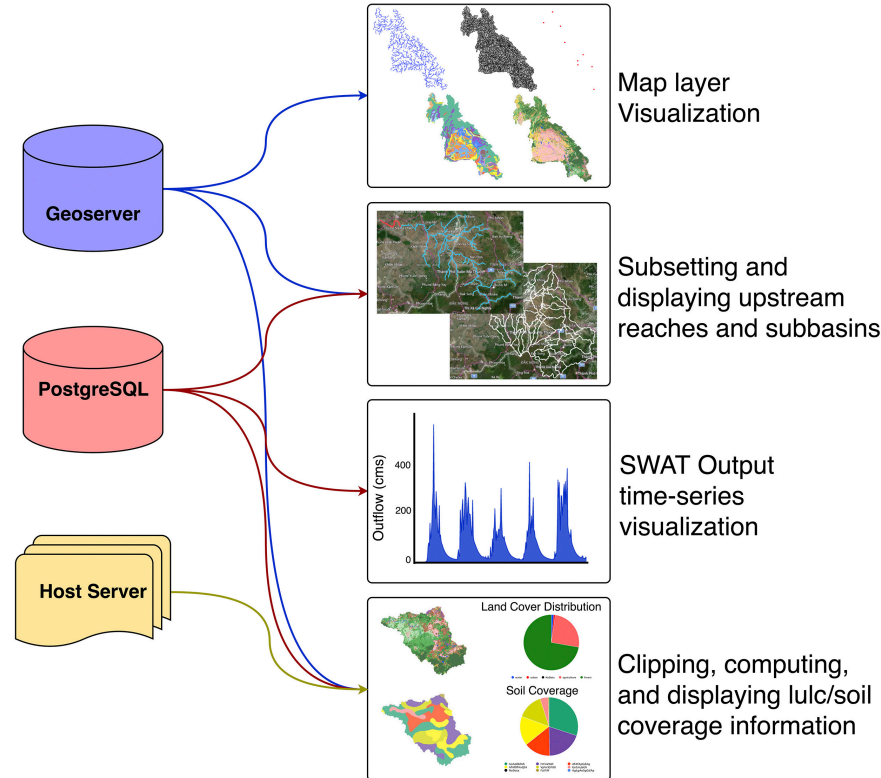


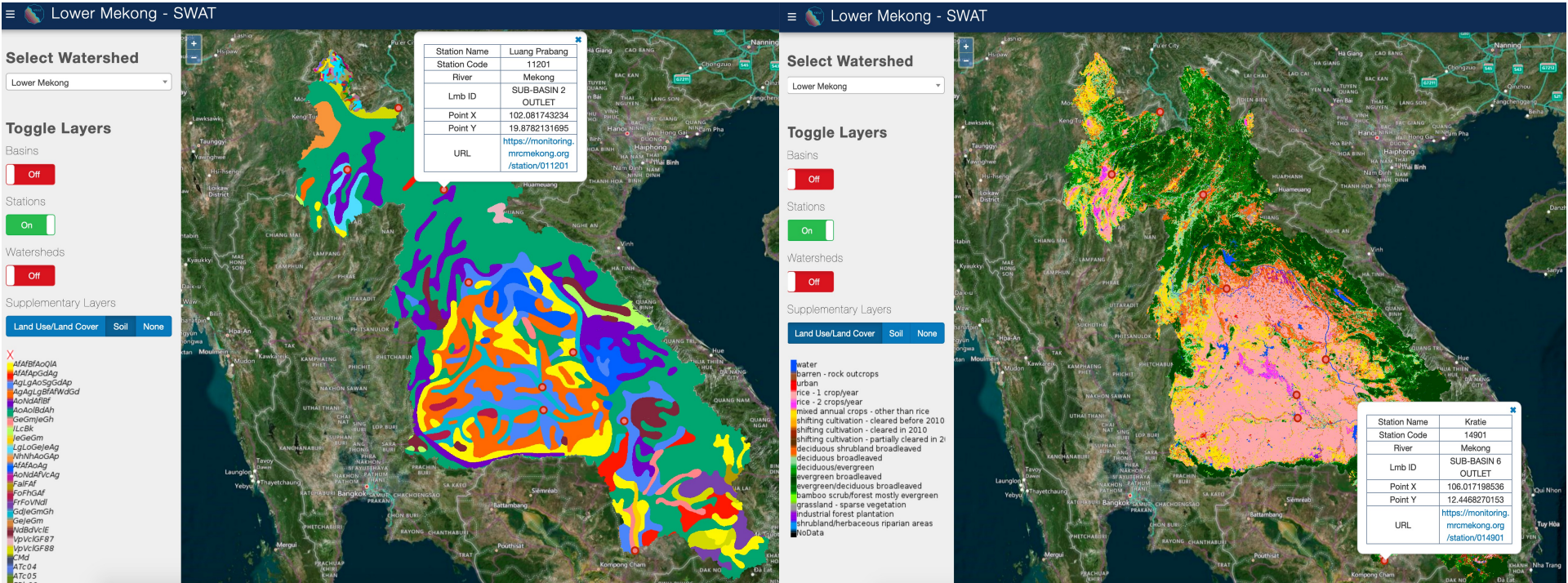
*A Tethys web app to visualize and share inputs/outputs from Lower Mekong River Basin*

Station Name	Kratie
Station Code	14901
River	Mekong
Lmb ID	SUB-BASIN 6 OUTLET
Point X	106.017198536
Point Y	12.4468270153
URL	<a href="https://monitoring.mrcmekong.org/station/014901">https://monitoring.mrcmekong.org/station/014901</a>



# SWAT-Online Visualization Methods

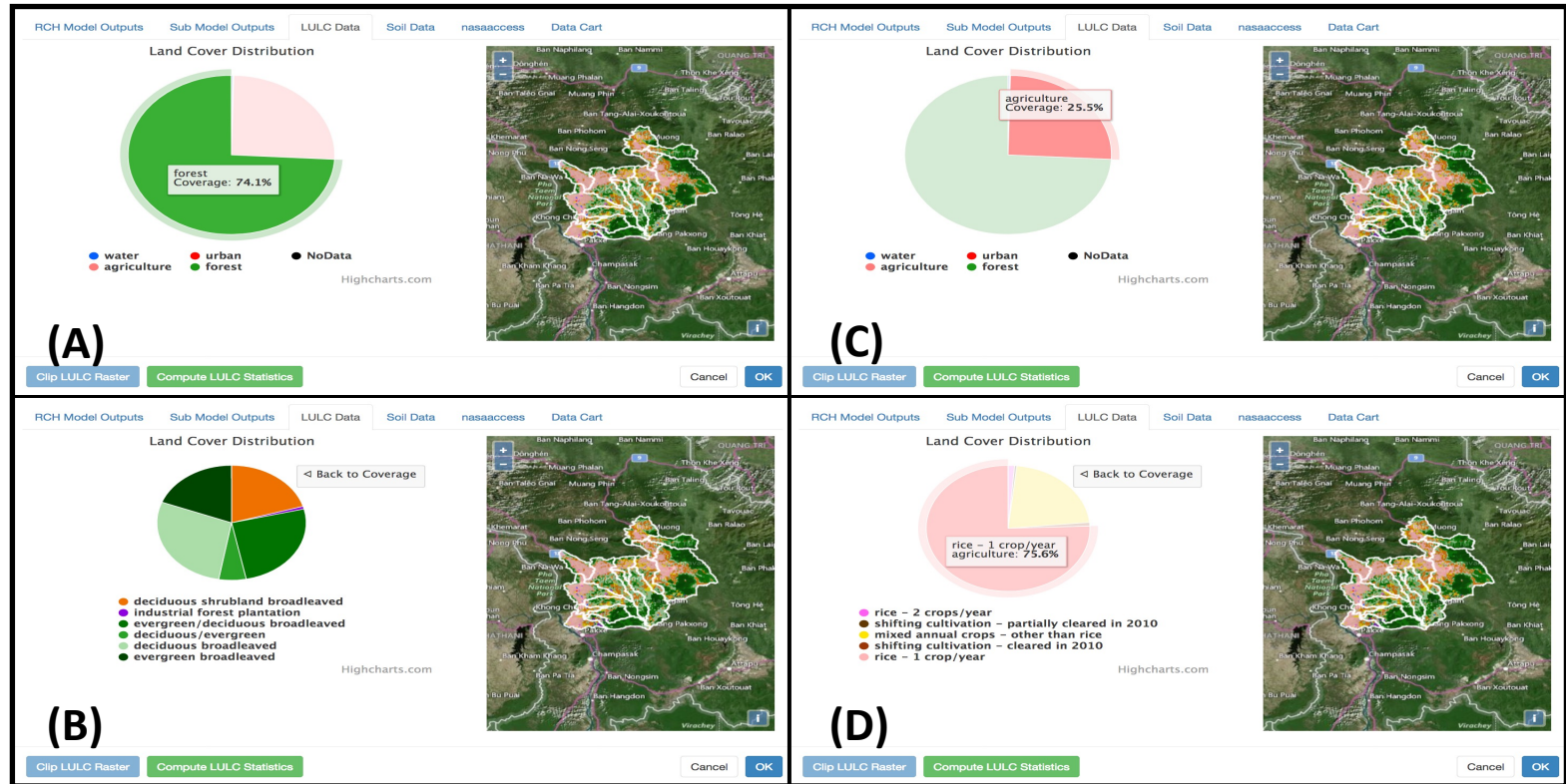




Easy access to various input raster data such as Soils and Land Use Land Cover



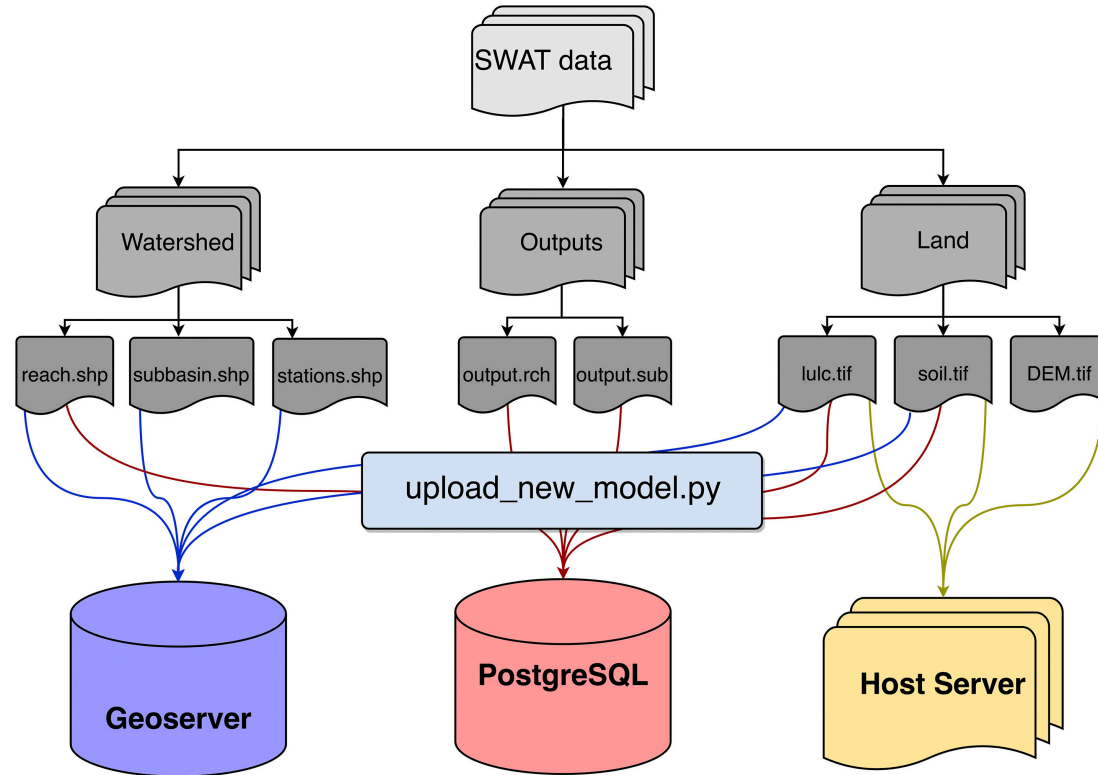
# SWAT-Online Clipping, Computing and Displaying Raster Information



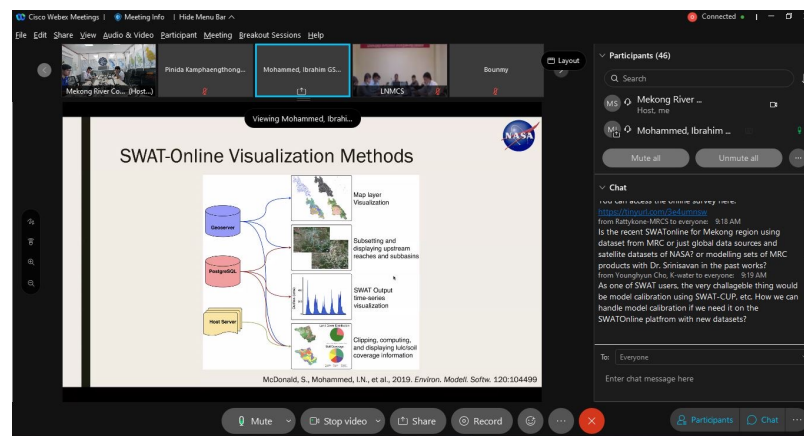
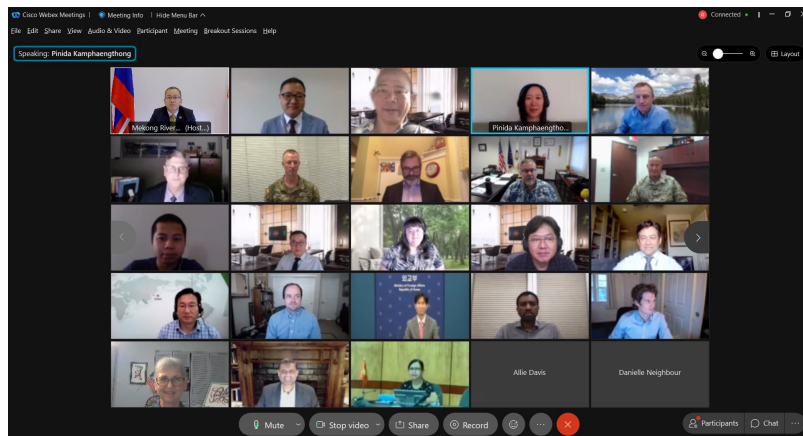
# SWAT-Online Time-series Visualization



# SWAT-Online Upload and Storage Methods



# Capacity Building Training Program for MRC



*Training on introduction to NASA's satellite data access (NASAaccess), SWAT-Online, and the use of satellite remote sensing in hydrology attended by 65 participants from different agencies and organizations in the Mekong region.*



# Summary



NASAaccess



SWAT-Online Lower Mekong

Bridging the gap for non-technically trained stakeholders and decision makers charged with water, climate and environmental management decisions.

Saving time for scientists tasked with analyzing weather and climate data as well as developing hydrological models.

Readiness for addressing the needs of the AGU community.



# Thank You!



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# References

- **Mohammed, I. N.**, Bolten, J. D., Lakshmi, V., and Pinida L. Kamphaengthong, (2021). Introduction to SWAT-Online & NASAaccess (Module 1), Water Data Utilization and Capacity Building in the Mekong Region: Improved Hydrologic and Hydraulic Decision Support for the Mekong Basin, 23 July, Virtual and hosted by Mekong River Commission Secretariat. [[PDF](#)]
- **Mohammed, I. N.** (2019). "NASAaccess: Downloading and reformatting tool for NASA earth observation data products." R package  
<https://imohamme.github.io/NASAaccess/index.html>
- McDonald, S., **Mohammed, I. N.**, Bolten, J. D., Pulla, S., Meechaiya, C., Markert, A., et al. (2019). Web-based decision support system tools: The Soil And Water Assessment Tool Online visualization and analyses (SWATOnline) and NASA earth observation data downloading and reformatting tool (NASAaccess). *Environmental Modelling & Software*, 120, 104499. <https://doi.org/10.1016/j.envsoft.2019.104499>
- **Mohammed, I. N.**, Bolten, J., Srinivasan, R., & Lakshmi, V. (2018). Improved hydrological decision support system for the Lower Mekong River Basin using satellite-based earth observations. *Remote Sensing*, 10(6), 885. <https://doi.org/10.3390/rs10060885>