

SWAT-FLOOD: A globally applicable flood inundation mapping framework using SWAT Models

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Background

- SWATShare – a collaborative platform for publishing SWAT models
- SWATFlow – online platform for publishing SWAT output and visualization
- SWATFlood – online platform for mapping floods

NSF Awards: 835822; 2118329

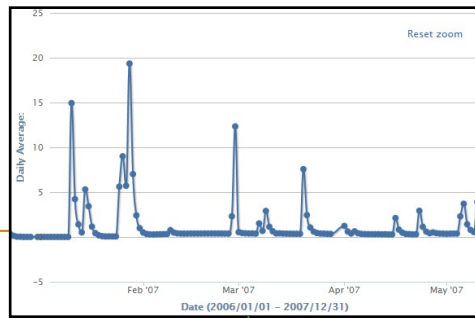
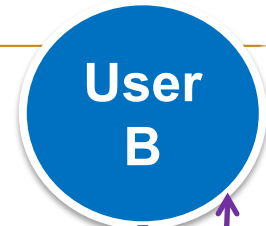
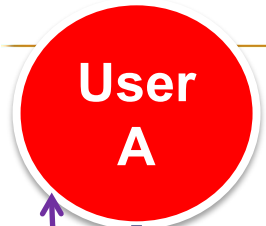


What is SWATShare

- SWATShare enables
 - Searching for existing SWAT models
 - Downloading of previously created SWAT models and their outputs by the community
 - Publishing and sharing of your own SWAT models with the community
 - Execution of single or multiple normal simulations, sensitivity analysis and calibration runs
 - Visualization of outputs
- Computations are enabled by using distributed computing resources

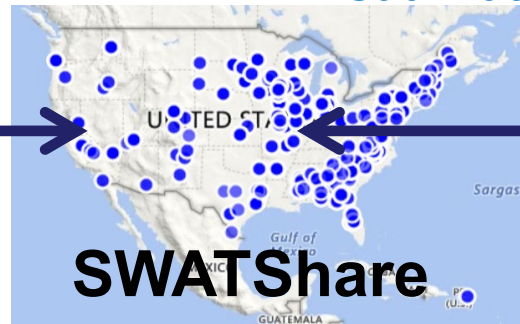
*Climate Change
and hydrology*

*Agriculture and
hydrology*



HPC

**Model
execution and
visualization**



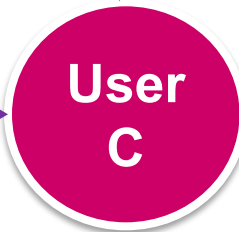
Upload

Upload

*Model Sharing
and
collaboration*

*Model Sharing
and
collaboration*

**Search and
Download**



*Model parameter sensitivity to processes in semi-arid and agricultural watersheds
Evaluation of model uncertainty under different geographic and climate settings*

Why SWATShare?

- Saves time and money
- Facilitates collaboration among all users
- Can bring rewards and recognition in the form of publications and community access
- Provides a platform for your model repository
- May provide avenue to keep your models updated by other users
- Provides access to HPC resources for your SWAT models

SWATShare Demo

www.water-hub.org/swatshare

SWATShare Page

SWATShare



Welcome to SWATShare!

SWATShare enables users to upload/share their SWAT models, run simulation, and visualize output results. For detailed information, please refer to the [user manual](#). If you encounter difficulties running simulations, check the troubleshooting page [here](#).



Discovery

Browse or search existing models geospatially, and verify metadata to find you desired model



My Models

Create a new model, or manage your existing models



Simulation

Run multiple models in parallel for normal simulation or auto-calibration



Visualization

Create spatial maps and temporal graphs to visualize SWAT output interactively

SWATShare Discovery Interface

SWATShare

Home

Discovery

My Models

Simulation

Visualization

Search by Model Name

Click to add filters

844 models

02148000 by lu270

PUBLIC Auto Calibration

02148000 by yirugi

PUBLIC Auto Calibration

1 by frank40

PRIVATE Normal Simulation

116b_Reynolds_ID by mgalib

PRIVATE Normal Simulation



SWATShare Discovery (Private Models)

Huancane by luismachaca

PRIVATE



https://mygeohub.org/groups/water-hub/swatshare?model_id=e0870f349a94ae65122ae9d0648c92c

[Copy Link](#)

Owner	luismachaca
Creators	luismachaca
Contributors	
Keywords	
Last Modified	1/25/2024, 9:13:38 AM



Boundary (Centroid) -7761464.67463,-1680627.9865

Model Metadata

Watershed Name	Huancane
Simulation Type	Normal Simulation
DEM Resolution (m)	90
DEM Source	USGS
Land use Data	NL CD 1992

Extracted Metadata

Runoff Calculation Method	Curve Number
Flow Routing Method	Variable Storage
PET Estimation Method	Penman-Monteith
Rainfall Time Step	Daily
Routing Time Step	Daily

SWATShare Discovery (Public Models)

Small_subbasin_SantaLucia by enervifa PUBLIC



https://mygeohub.org/groups/water-hub/swatshare?model_id=9b894b040de76fd100b9fc6bcc608d81 Copy Link

Copy
Visualize
Export ▾

The objective of this model was to locate areas of interest where glyphosate was higher exported. Please feel free to contact me in any case. The total area delimited in red corresponded to 1692 km². During this process, 11 sub-basins were delimited by SWAT given topology and streamflow direction. Initially, a total of 361 HRUs within the study area were calculated by the model. Then, that number was reduced after selecting the dominant HRU for each sub-basin and work only with representative feature (11 HRUs). The model was run for the period 1997-2012 considering daily streamflow and climate data daily availability. After looking at a good hydrologic behaviour in the simulation output, the model was calibrated for two stations, the reservoir outlet and the whole basin outlet for the period 2000-2006. This model is not published yet, but we hope it will be at the short term.



Boundary (Centroid) -6271238.11126,-4058831.25374

Owner enervifa

Creators enervifa

Contributors Willlem Vervoort, Angela Gorggolione, Victor Sposito, Robert Faggian

Keywords

SWATShare Visualization

SWATShare

- [Home](#)
- [Discovery](#)
- [My Models](#)
- [Simulation](#)
- [Visualization](#)

[Draw Plots](#) [Download](#)

Model Name: **Small_subbasin_SantaLucia** Simulation Period: 01/01/1997 ~ 12/31/2012 WarmUp: 3 Modeling Time Step : **Monthly** Visualization Time Step: **Monthly** Visualization Type: **TEMPORAL** Output File Type: **RCH**

[← Back](#)

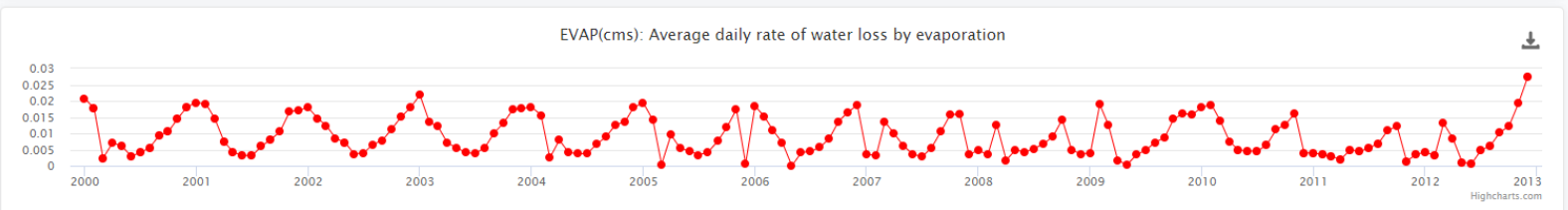
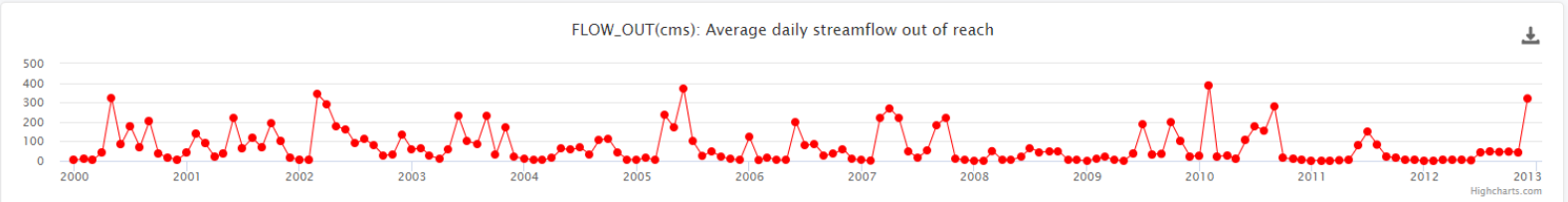
DATE RANGE

Start Date
01 2000

End Date
12 2012

OUTPUT VARIABLES

- FLOW_IN(cms)
- FLOW_OUT(cms)
- EVAP(cms)
- TLOSS(cms)
- SED_IN(tons)
- SED_OUT(tons)
- ORGN_IN(kg)
- ORGN_OUT(kg)
- ORGP_IN(kg)
- ORGP_OUT(kg)
- NO3_IN(kg)
- NO3_OUT(kg)
- NH4_IN(kg)
- NH4_OUT(kg)
- NO2_IN(kg)



SWATShare Visualization

Draw Plots
 Download

← Back

DATE RANGE

ⓘ The max range is 15 months

Start Date: 01 2000

End Date: 05 2000

OUTPUT VARIABLES

- PRECIP(mm)
- SNOMELT(mm)
- PET(mm)
- ET(mm)
- SW(mm)
- PERC(mm)
- SURQ(mm)
- GW_Q(mm)
- WYLD(mm)
- SYLD(t/ha)
- ORGN(kg/ha)
- ORGP(kg/ha)
- NSURQ(kg/ha)
- SOLP(kg/ha)
- SEDP(kg/ha)
- TNO3(kgN/ha)

Model Name: Small_subbasin_SantaLucia Simulation Period: 01/01/1997 ~ 12/31/2012 WarmUp: 3 Modeling Time Step : Monthly Visualization Time Step: Monthly Visualization Type: SPATIAL Output File Type: SUB

Total Monthly Precipitation

2000-01 2000-02 2000-03 2000-04 2000-05

Total Precipitation (2000-03)

Soil Profile Moisture Content (2000-03)

SWATShare My Models

My Models

[+ Create New Model](#)

Show entries

Search all columns:

Sharable	Model Name	Model Type	Simulation Period	Last Modified Time
PUBLIC	Cedar_Creek_Indiana_calibration1	Auto Calibration	01/01/2004 ~ 12/31/2010	7/9/2021, 1:19:00 PM
PUBLIC	Cedar_Creek_Indiana	Auto Calibration	01/01/2004 ~ 12/31/2010	3/30/2021, 2:34:22 PM
PUBLIC	Test	Auto Calibration	01/01/2005 ~ 12/31/2010	8/27/2020, 6:39:23 PM
PRIVATE	Flat_test	Normal Simulation	01/01/1984 ~ 12/31/2010	2/2/2020, 4:35:11 PM
PUBLIC	cahaba_calibrated	Auto Calibration	01/01/2005 ~ 12/31/2010	4/23/2019, 10:18:06 AM
PUBLIC	cahaba_swat	Auto Calibration	01/01/2005 ~ 12/31/2010	4/7/2019, 7:38:18 PM
PUBLIC	StevensCreek	Normal Simulation	01/01/2001 ~ 12/31/2010	4/26/2018, 4:02:36 PM
PRIVATE	calib_test	Normal Simulation	01/01/2005 ~ 12/31/2009	7/19/2017, 11:43:26 AM
PUBLIC	cedar_0614	Normal Simulation	01/01/2004 ~ 12/31/2010	6/14/2017, 1:59:09 PM
PUBLIC	cedar_t	Normal Simulation	01/01/2004 ~ 12/31/2010	Invalid Date

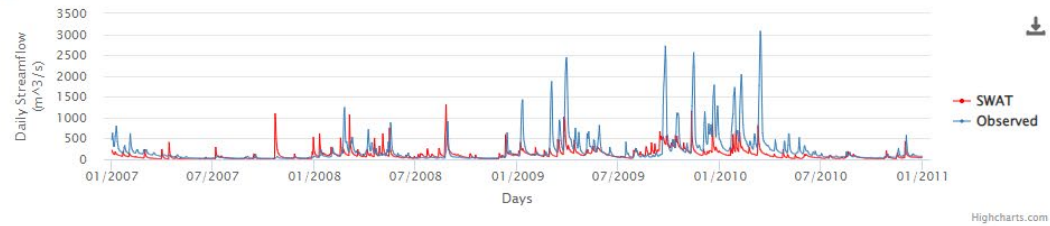
Showing 1 to 10 of 29 entries

[Previous](#)
[1](#)
[2](#)
[3](#)
[Next](#)

SWATShare Simulation

Calibration Visualization

Objective Variable Streamflow Reach 5



Sub-basin 5

KGE	0.04
NSE	0.11
R ²	0.2
PBIAS	-47.5

Simulation Log

[Download Log](#) or [Load here](#)

WARNING

The simulation log may contain large size of data.
Loading it here may slow down the browser.

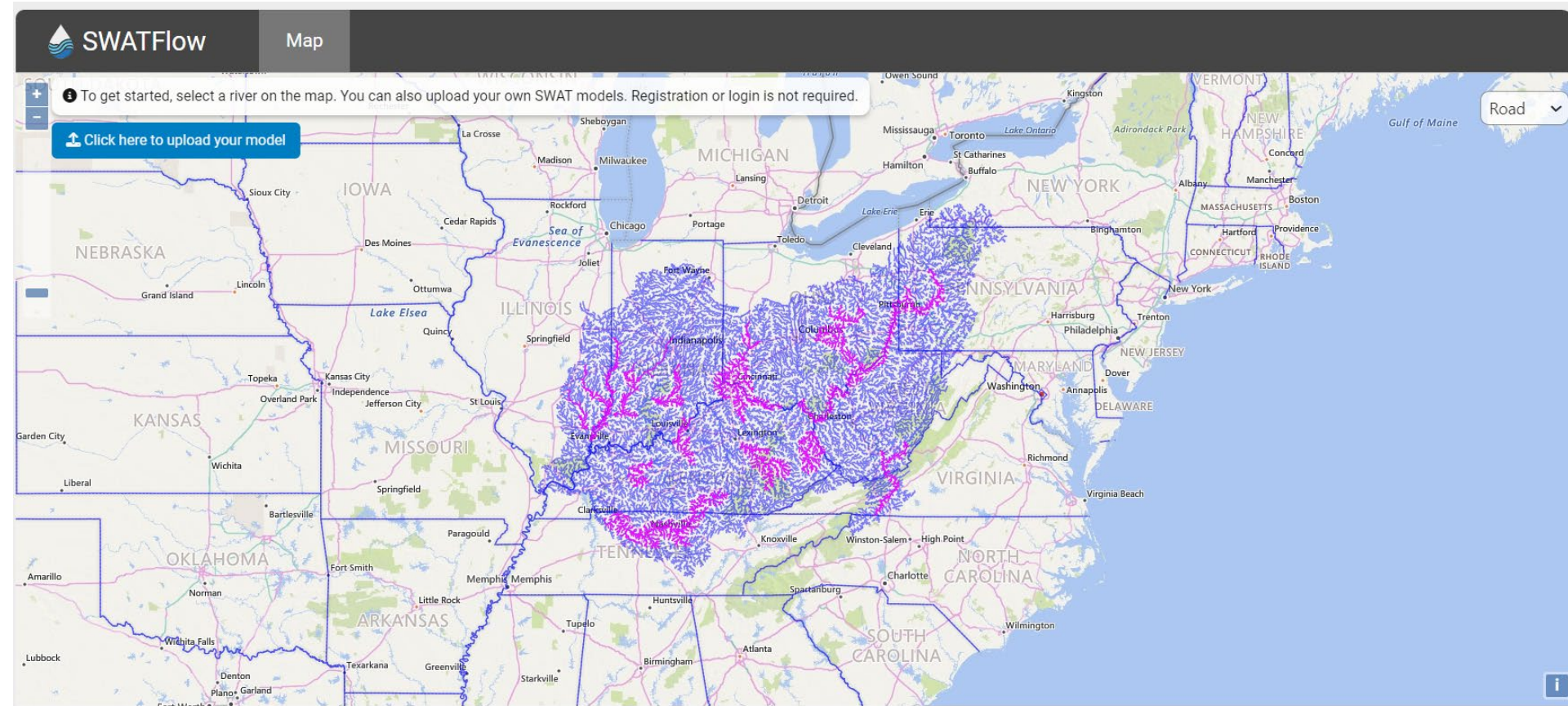
Water Quality

- Sediment
- Total Phosphorus
- Nitrate

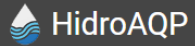
ESCO.hru	Replace	0.01	1	
ESCO.hru	Replace	0.01	1	
GW_DELAY.qw	Add	-10	10	

SWATFlow

- Simple tool for visualizing SWAT hydrograph for decision making



HidroAQP



Mapa

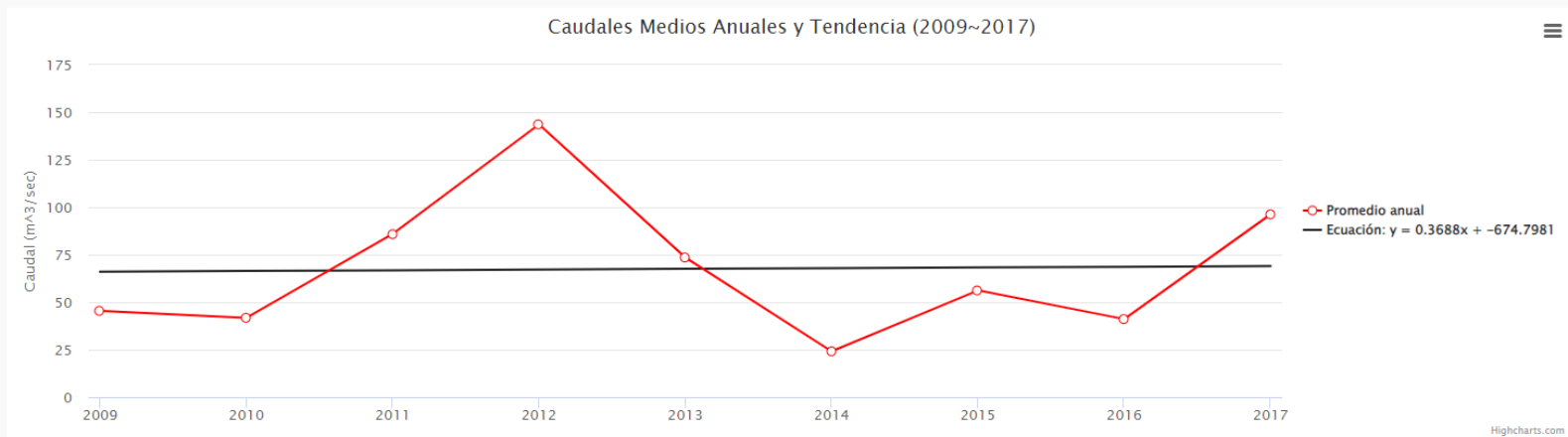
Caudales Diarios

Caudales Mensuales

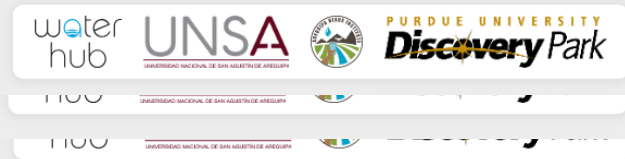
Tendencias de Flujo

Acerca de HidroAQP

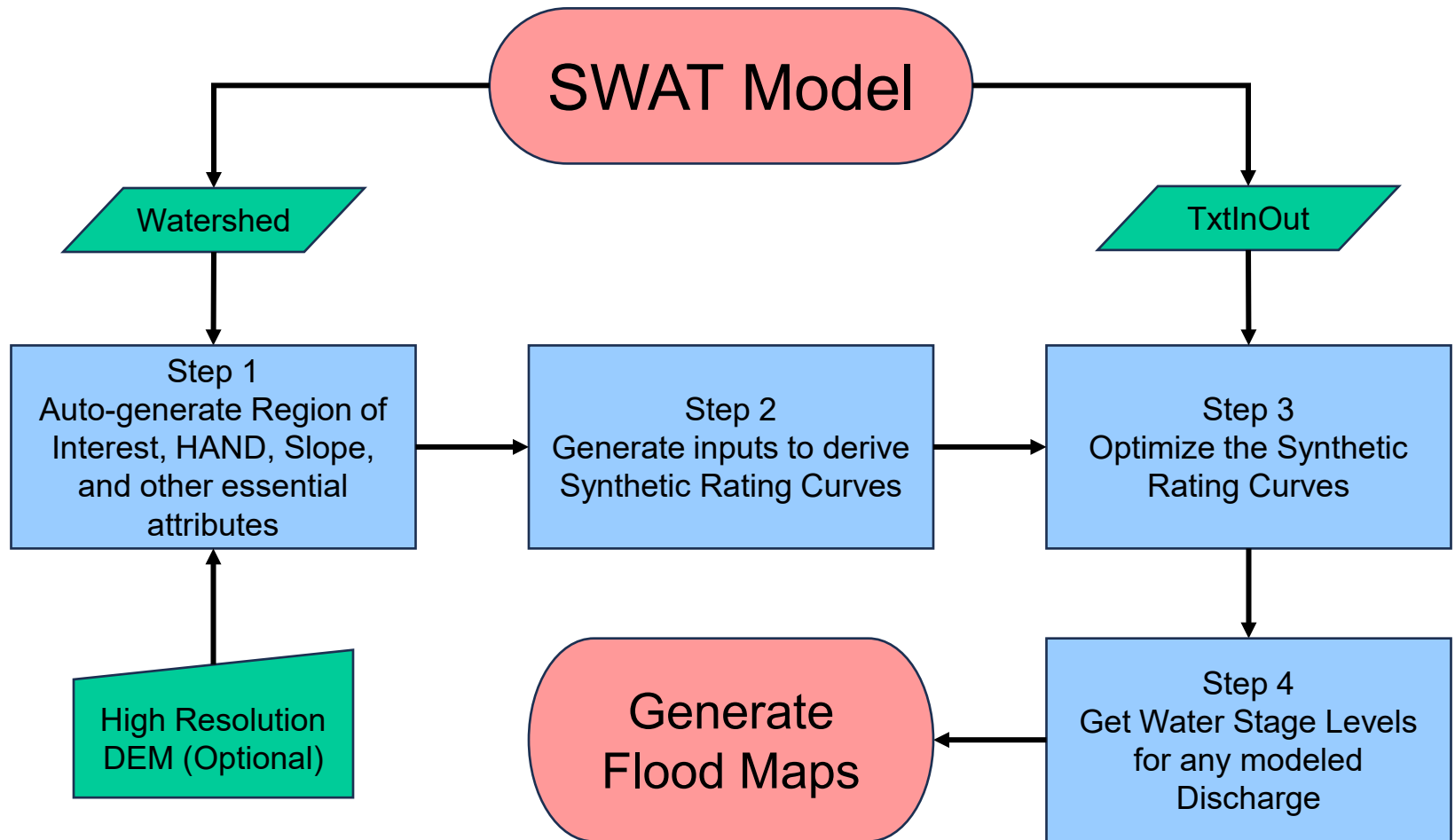
Río	Camaná
LON	-72.698
LAT	-16.555



- Este gráfico muestra los caudales medios anuales (línea roja) y la tendencia de flujo lineal correspondiente.



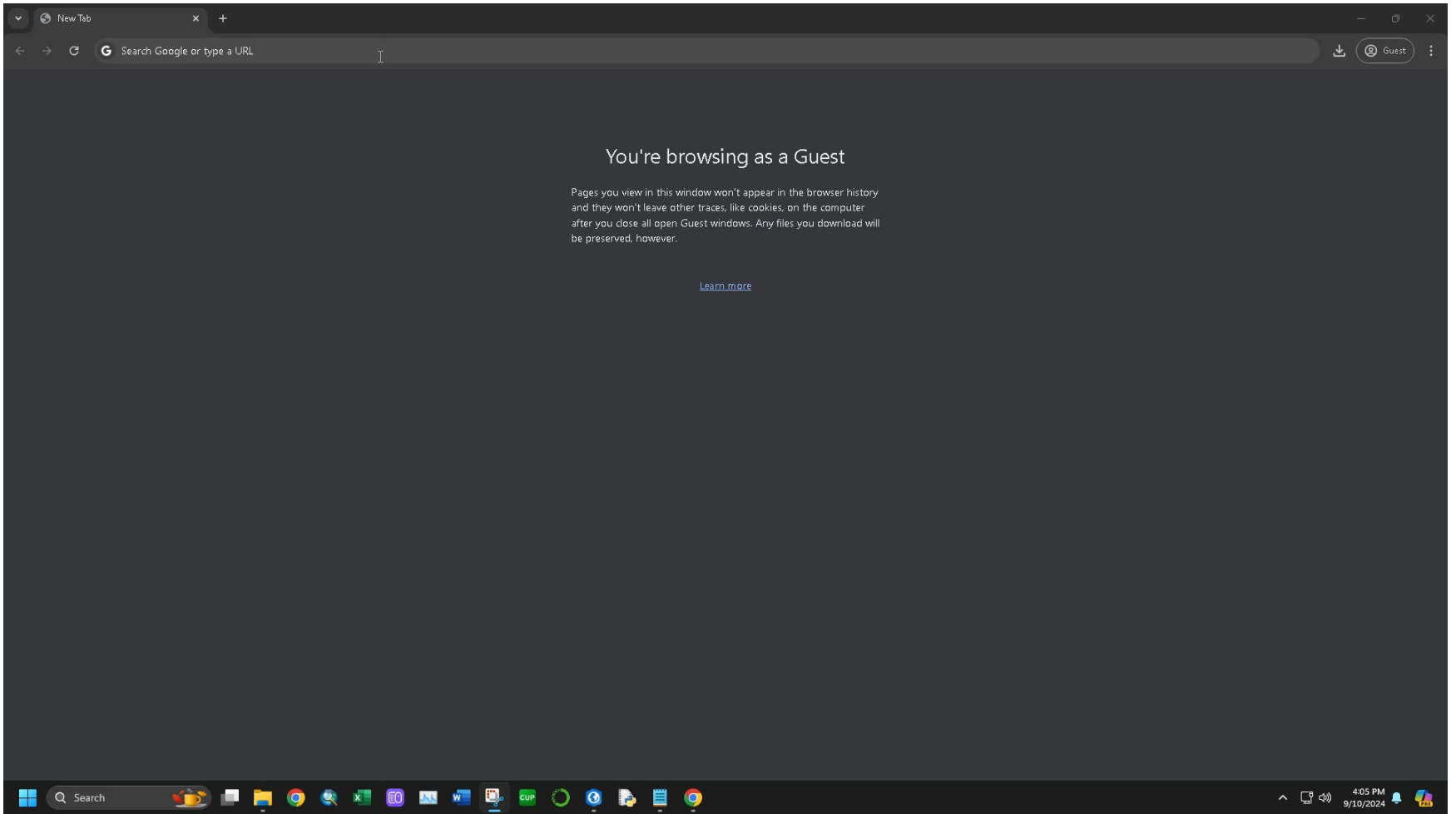
SWATFlood Workflow



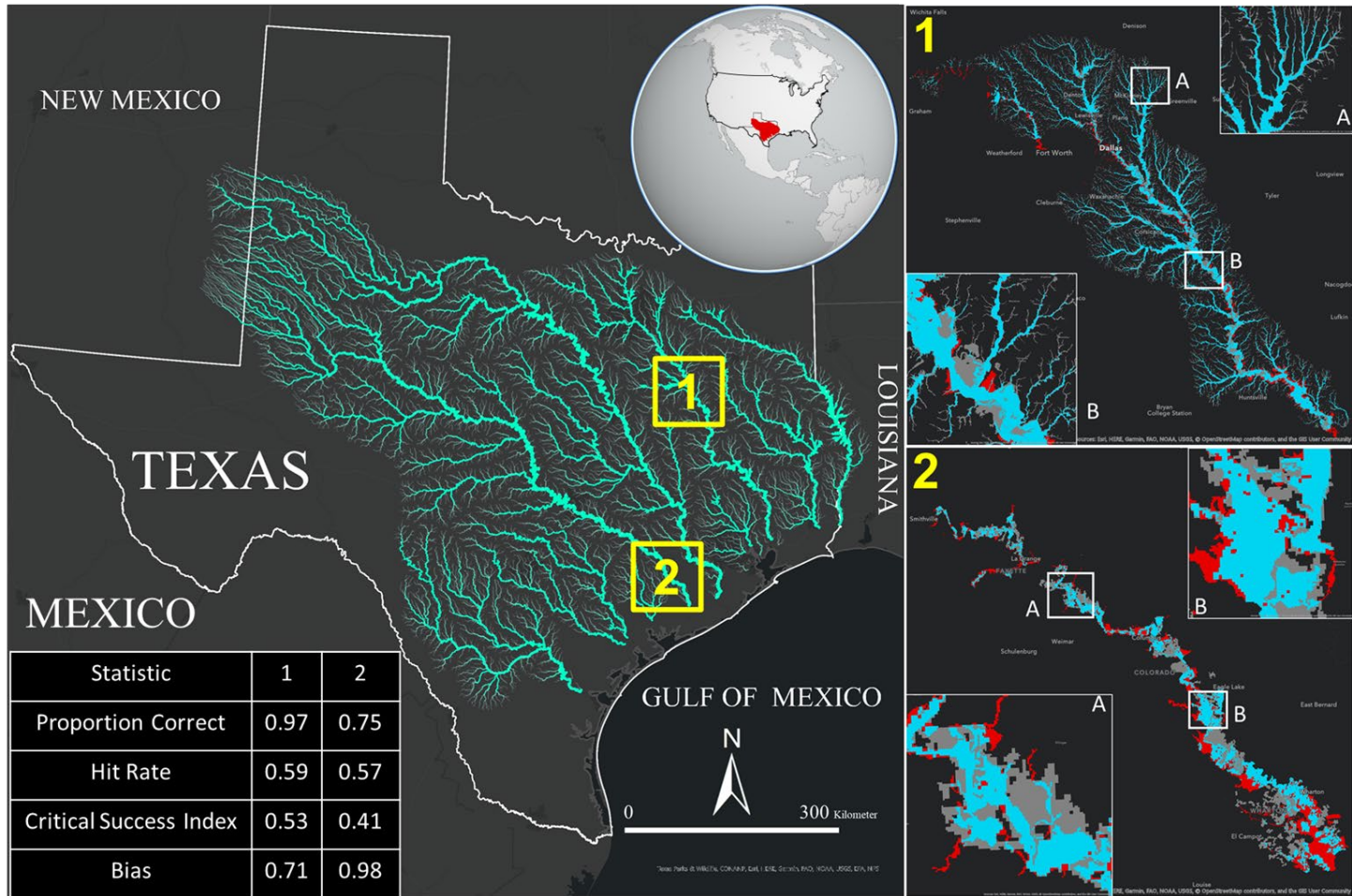
SWATFlood Demo

www.water-hub.org/swatflow#

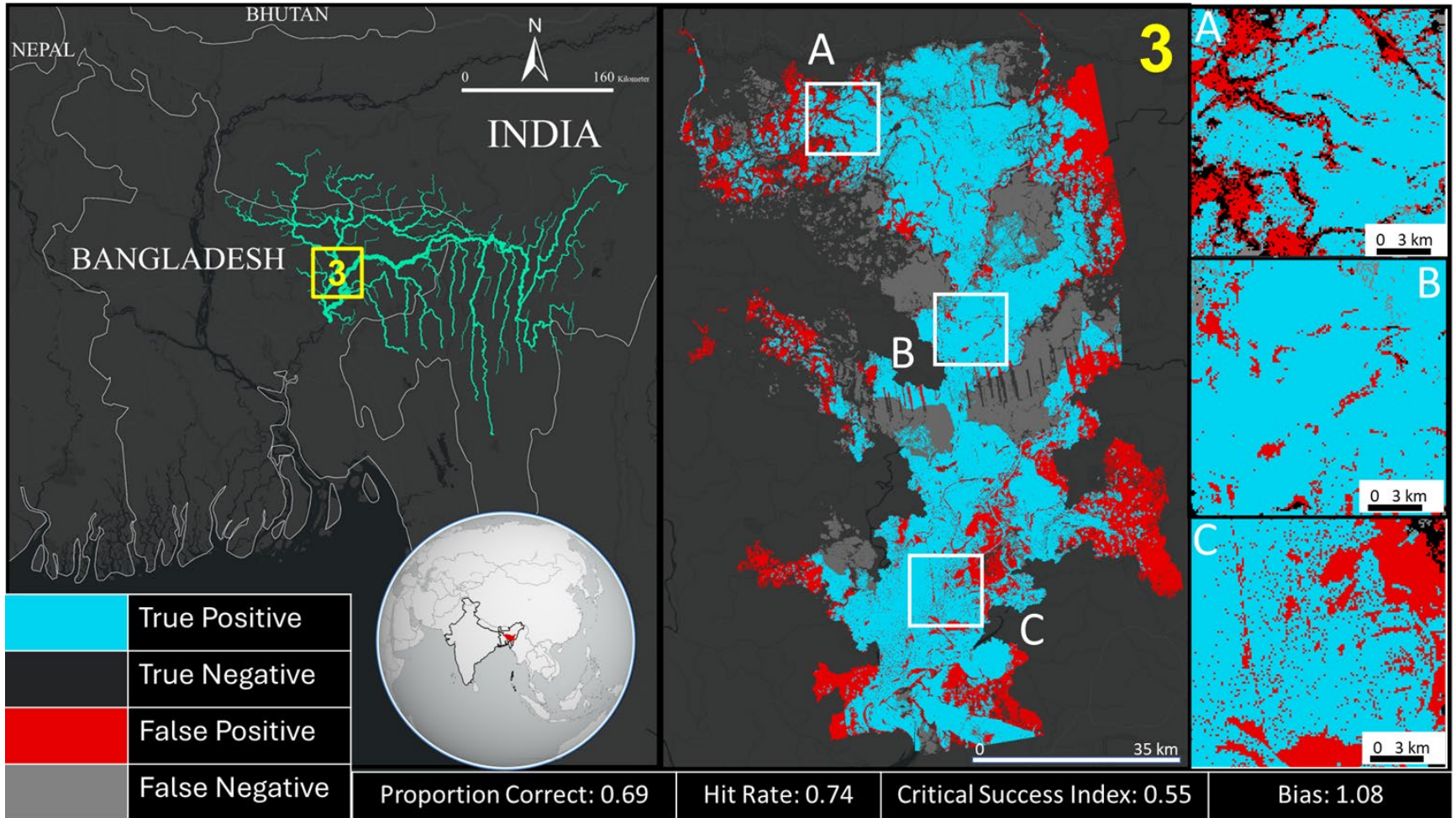
[Video](#)



Initial Results - Flood Maps Evaluation for Texas



Initial Results - Flood Maps Evaluation for Bangladesh



Evaluation Reference Data and Metrics

No	Event	Reference Data	Flood Region	SWAT Model	$\textit{Proportion Correct} = \frac{TP+TN}{TP+TN+FP+FN}$
1	100-year	FEMA - BLE	Trinity River	Trinity Test Bed	$\textit{Hit Rate} = \frac{TP}{TP+FN}$
2	Hurricane Harvey	Dartmouth Flood Observatory – Event 4510	Downstream Colorado River	Colorado Test Bed	$\textit{Critical Success Index} = \frac{TP}{TP+FN+FP}$
3	July 2020 Floods	Remote Sensing - SAR	Bangladesh	(Biswas et al., 2020)	$\textit{Bias} = \frac{TP+FP}{TP+FN}$ <p>where, TP = True Positive, TN = True Negative, FP = False Positive and FN = False Negative.</p>

References:

Biswas, N. K., Hossain, F., Bonnema, M., Aminul Haque, A. M., Biswas, R. K., Bhuyan, A., & Hossain, A. (2020). A computationally efficient flash flood early warning system for a mountainous and transboundary river basin in Bangladesh. *Journal of Hydroinformatics*, 22(6), 1672–1692. <https://doi.org/10.2166/hydro.2020.202>

Summary

- SWATShare is a community tool for publishing, sharing and making your SWAT model FAIR resource
- SWATFlow and SWATFlood extends SWATShare to a decision making tool in easy steps without any additional effort
- We hope the SWAT community can try, use, accept, adopt and make these tools their own!

¡Muchas gracias!
¿Qué preguntas?

www.water-hub.org/swatshare

Contact:

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<http://web.ics.purdue.edu/~vmerwade>