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

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SWAT Conference, Jeju, 2025

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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

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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

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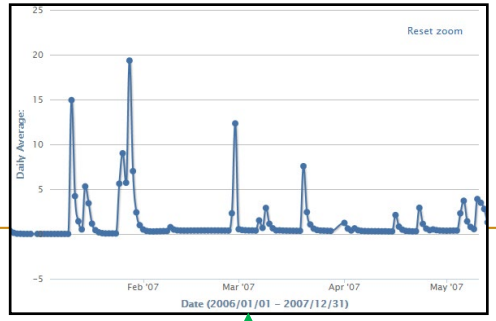
Climate Change and hydrology



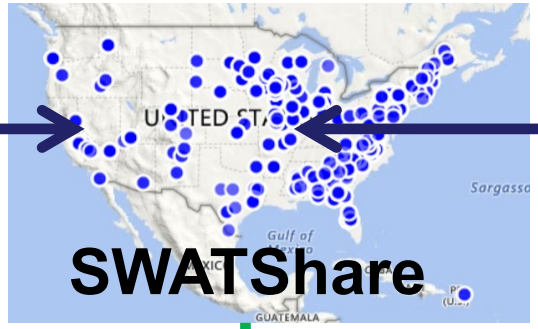
Agriculture and hydrology

User A

User B

HPC

Model execution and visualization



Upload

Upload

Model Sharing and collaboration

Model Sharing and collaboration

Search and Download

User C

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

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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

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SWATShare Demo

www.water-hub.org/swatshare

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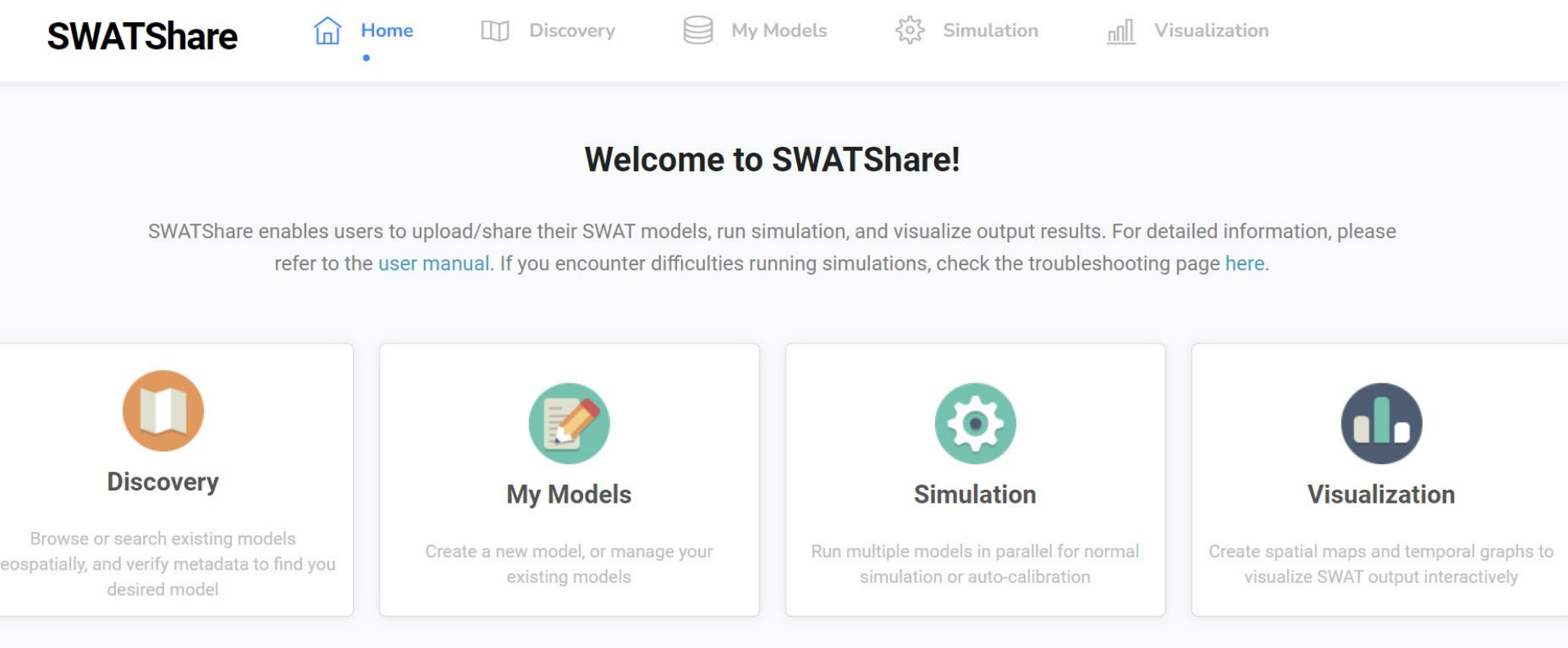
SWATShare Page



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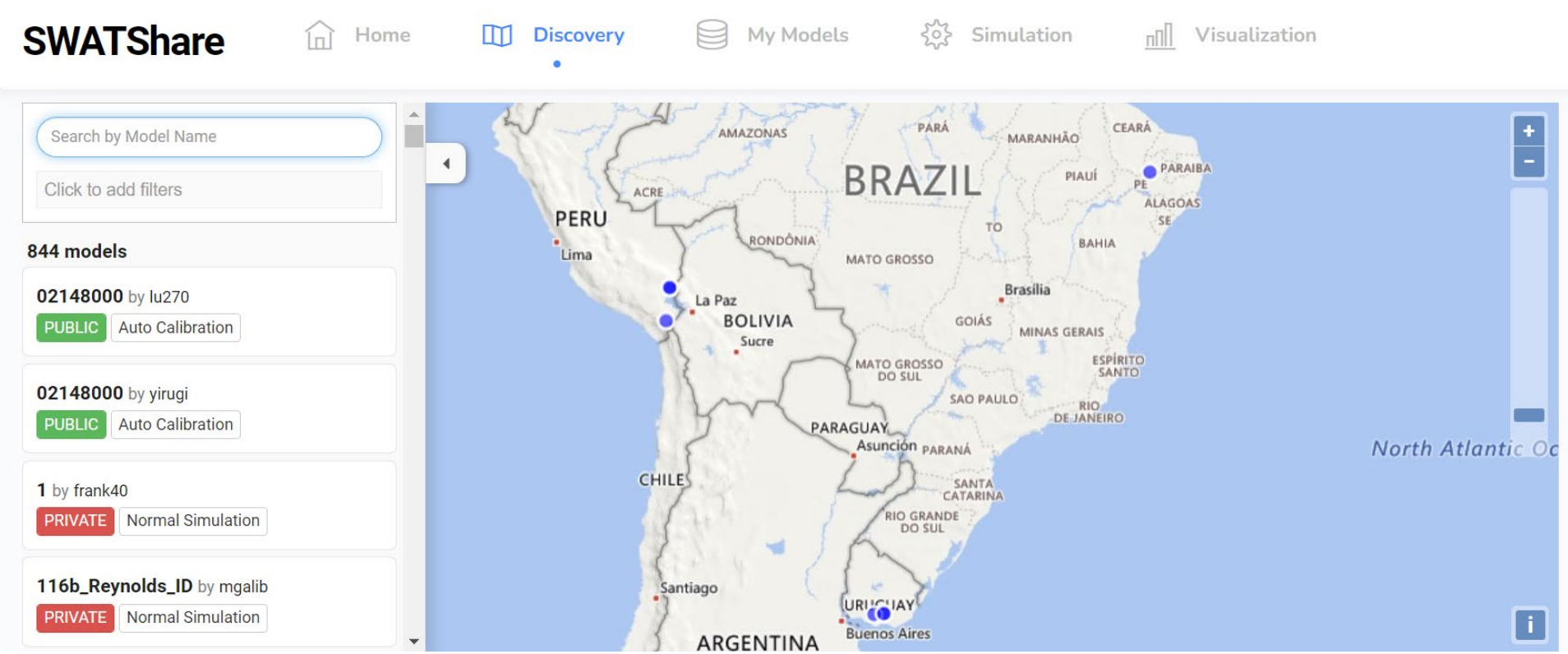
SWATShare Discovery Interface



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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	NLCD 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 objetive 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 delimitated 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	

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SWATShare Visualization

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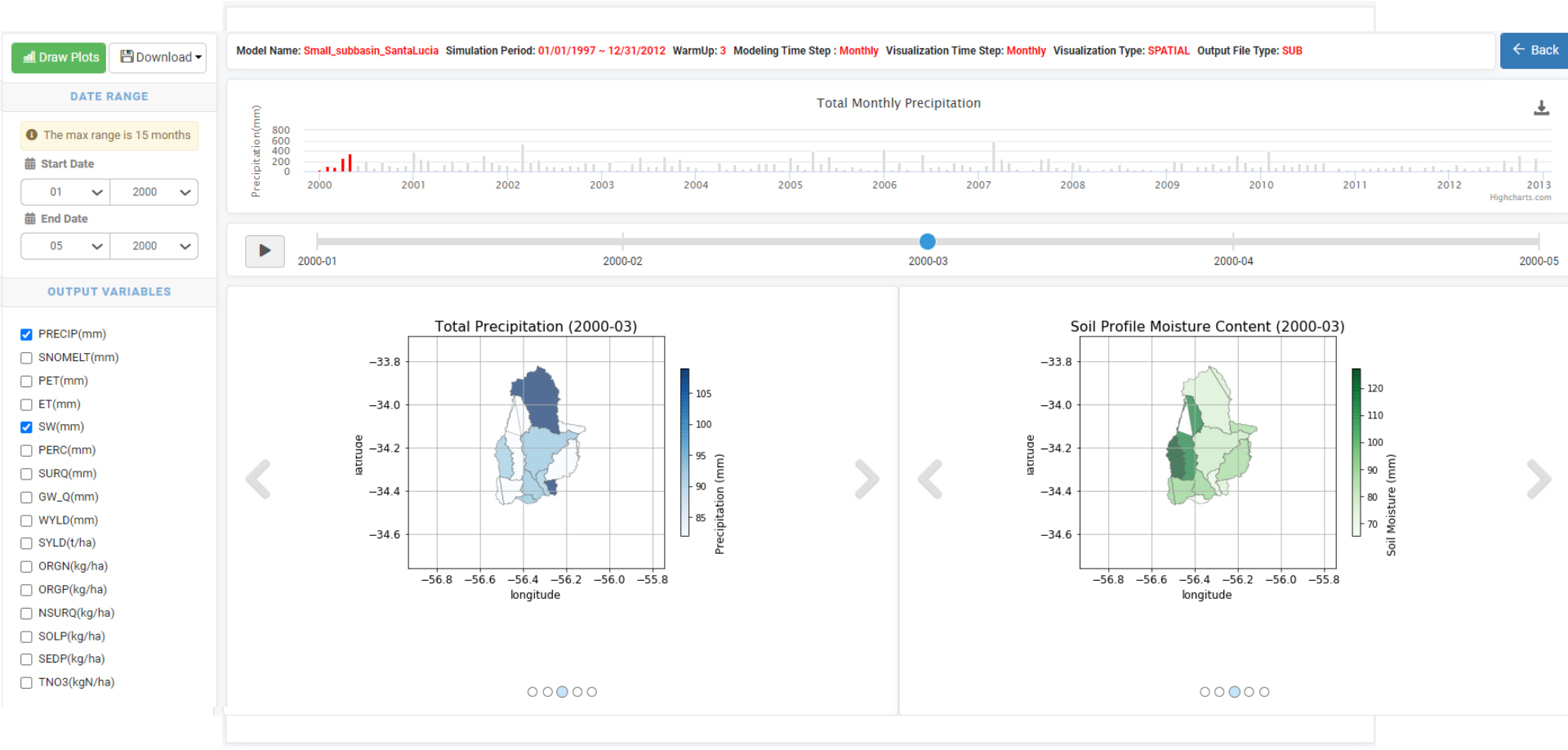
SWATShare Visualization



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SWATShare My Models

SWATShare | Home | Discovery | My Models | Simulation | Visualization

My Models

Create New Model

Show 10 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

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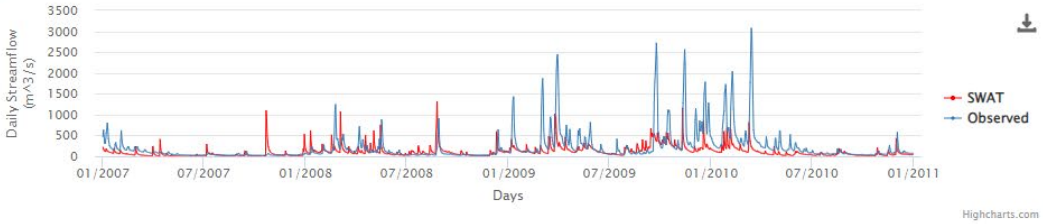
SWATShare Simulation

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
GW_DELAY.gw	Add	-10	10

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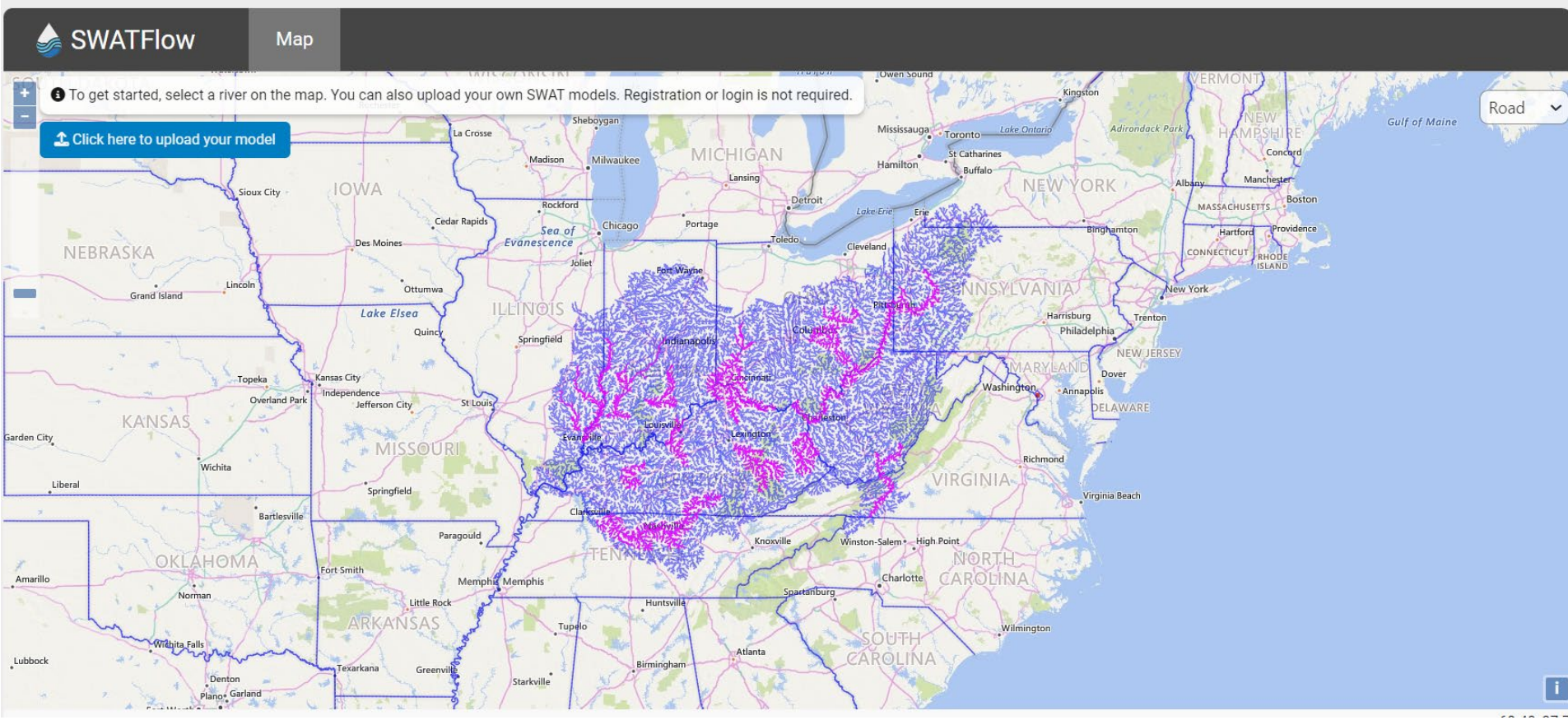
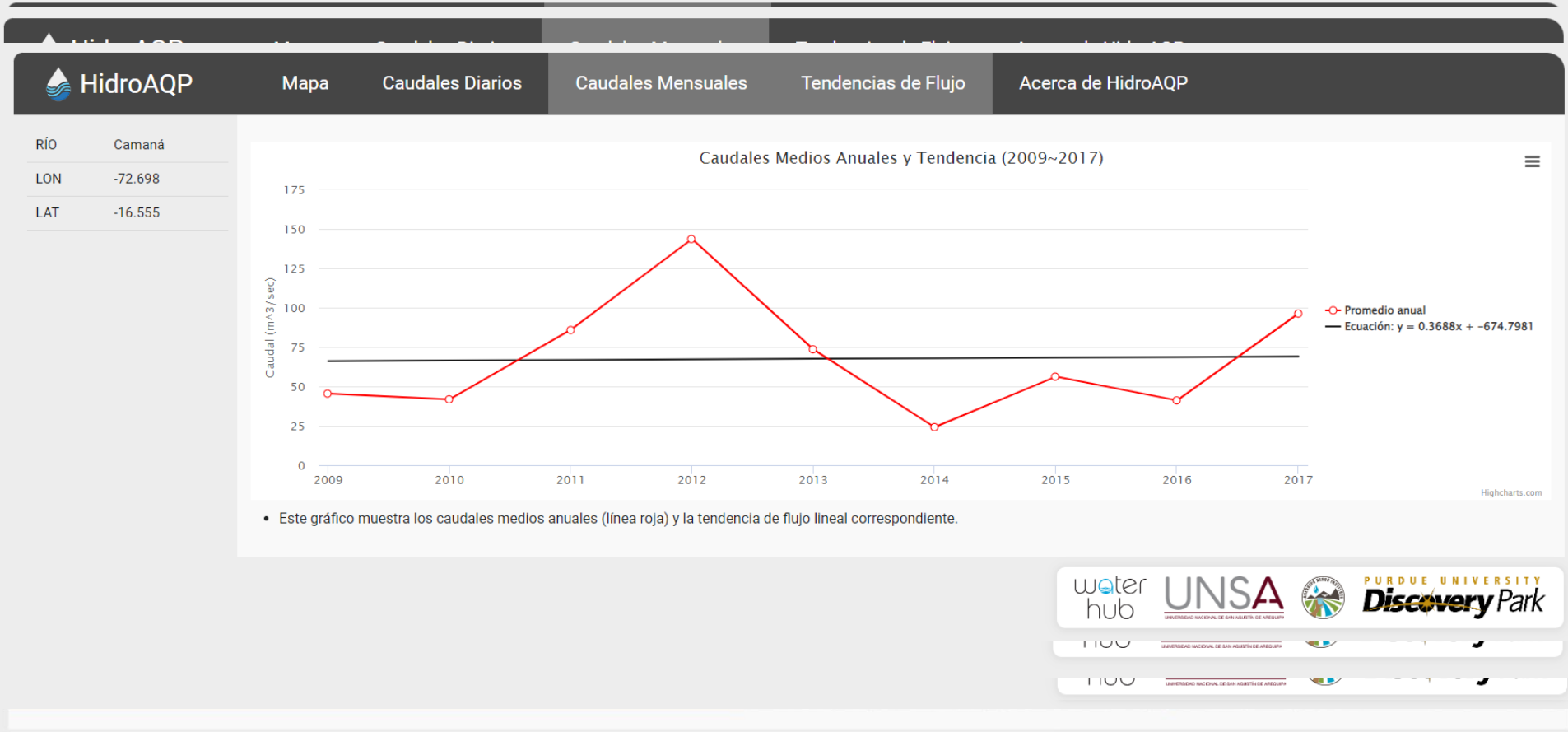
SWATFlow

- Simple tool for visualizing SWAT hydrograph for decision making



HidroAQP


HidroAQP
Mapa
Caudales Diarios
Caudales Mensuales
Tendencias de Flujo
Acerca de HidroAQP
RÍO Camaná
LON -72.698
LAT -16.555
Caudales Medios Anuales y Tendencia (2009~2017)
Caudal (m^3/sec)
175
150
125
100
75
50
25
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
Promedio anual
Ecuación: y = 0.3688x + -674.7981
Highcharts.com
• Este gráfico muestra los caudales medios anuales (línea roja) y la tendencia de flujo lineal correspondiente.

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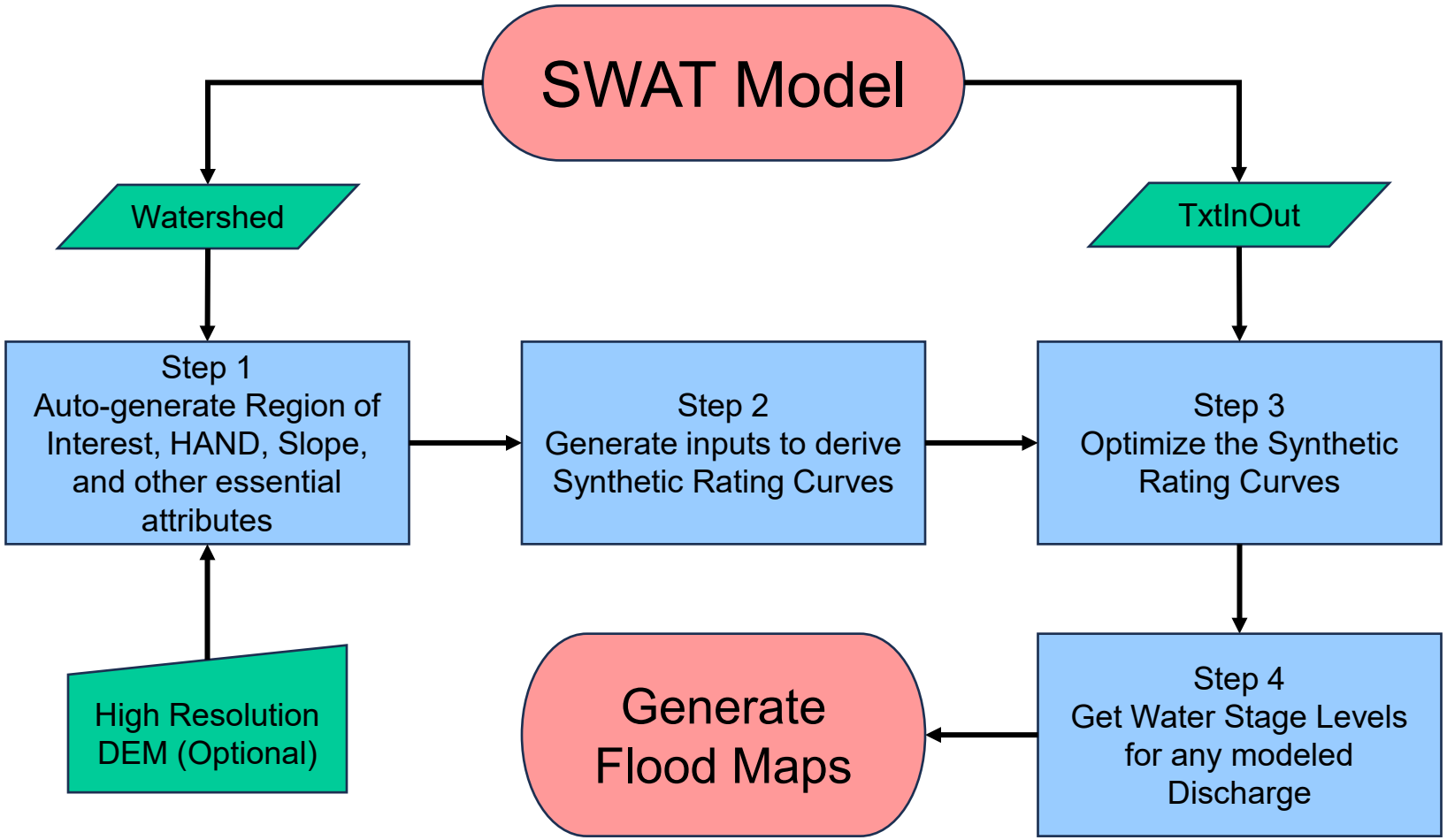
SWATFlood Workflow



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SWATFlood Demo

www.water-hub.org/swatflow#

Video

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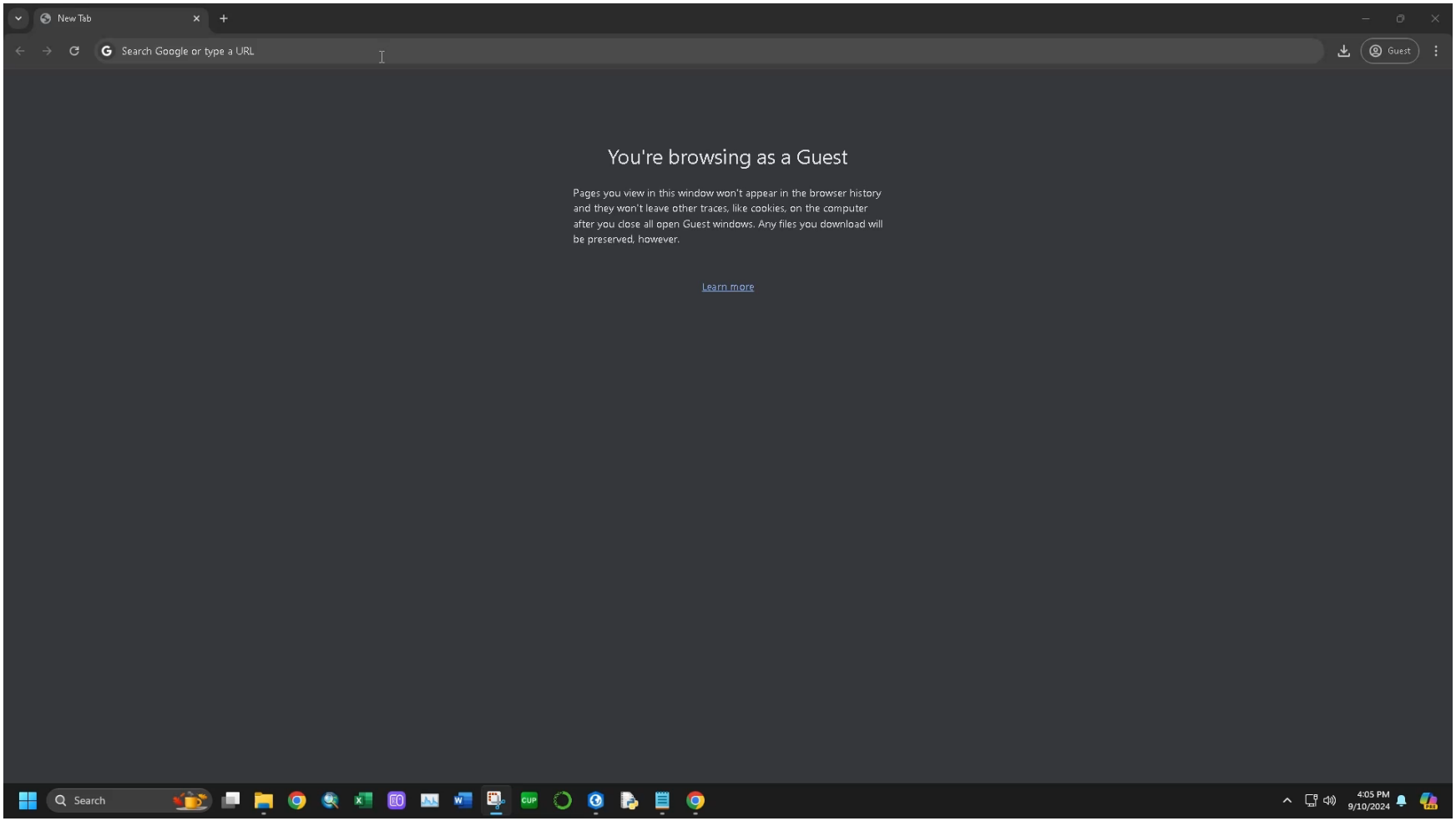

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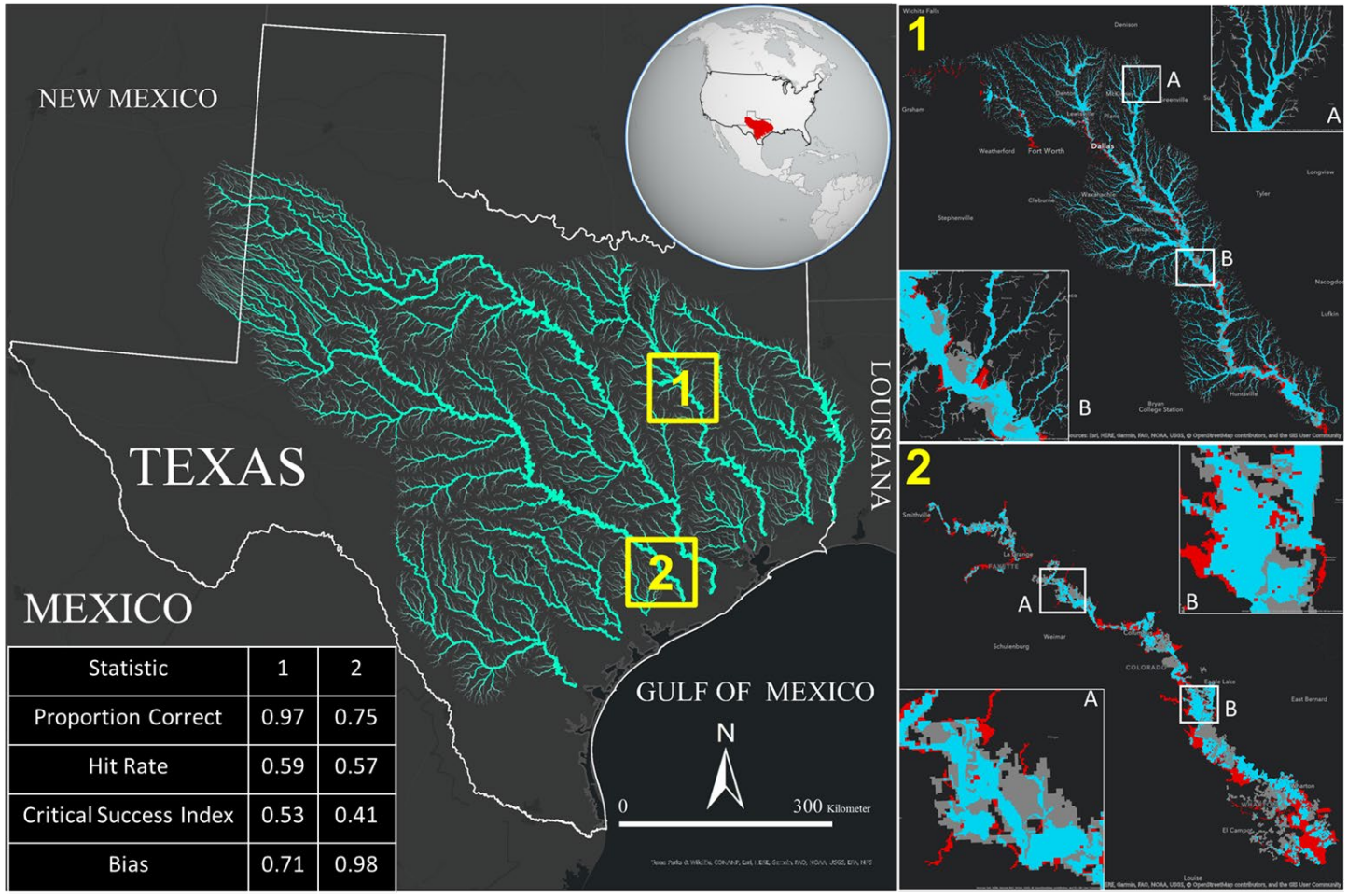
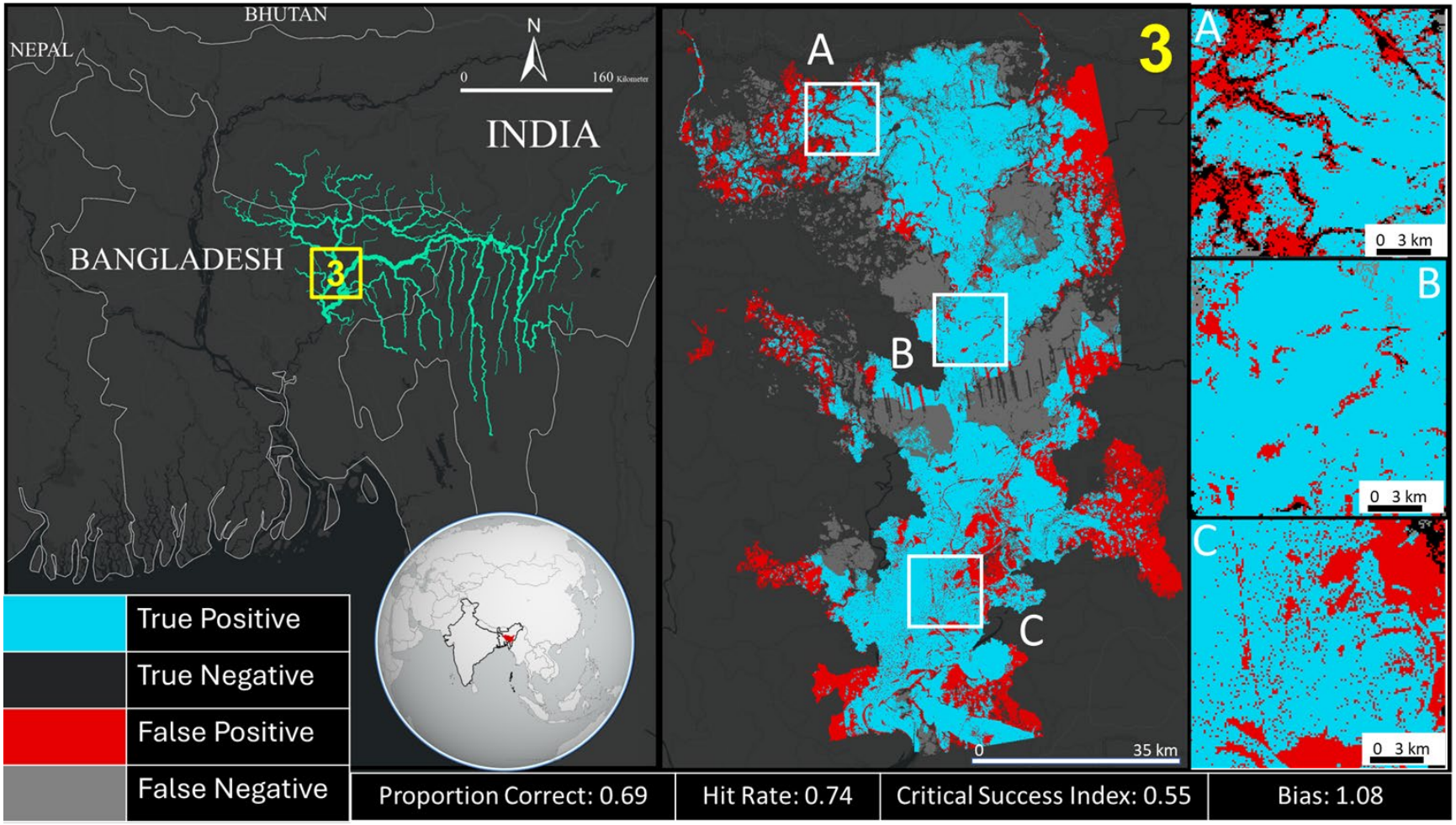
Initial Results - Flood Maps Evaluation for Texas



Statistic	1	2
Proportion Correct	0.97	0.75
Hit Rate	0.59	0.57
Critical Success Index	0.53	0.41
Bias	0.71	0.98

Initial Results - Flood Maps Evaluation for Bangladesh



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Evaluation Reference Data and Metrics

No	Event	Reference Data	Flood Region	SWAT Model
1	100-year	FEMA - BLE	Trinity River	Trinity Test Bed
2	Hurricane Harvey	Dartmouth Flood Observatory – Event 4510	Downstream Colorado River	Colorado Test Bed
3	July 2020 Floods	Remote Sensing - SAR	Bangladesh	(Biswas et al., 2020)

$$Proportion\ Correct = \frac{TP+TN}{TP+TN+FP+FN}$$

$$Hit\ Rate = \frac{TP}{TP+FN}$$

$$Critical\ Success\ Index = \frac{TP}{TP+FN+FP}$$

$$Bias = \frac{TP+FP}{TP+FN}$$

where, TP = True Positive, TN = True Negative, FP = False Positive and FN = False Negative.

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

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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!

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Questions?

www.water-hub.org/swatshare

Contact:

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