

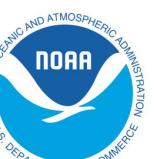
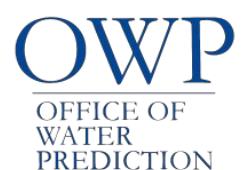


Cooperative Institute for Research to Operations in Hydrology (CIROH)



Dan Ames
BYU
Professor

Arpita Patel
AWI – UA - DevOps
Manager &
Enterprise Architect



CIROH DevCon 2025

CIROH Hydroinformatics
& Research
Cyberinfrastructure
Tools & Technologies

Accelerating Hydrologic Research
Across 28 institutions



2025 CIROH Developers Conference sponsors:





CIROH 2024 Productivity Measures

82

Published Journal Articles



58

New Data Sets



605

Presentations



93

New Software Tools/Systems



132

User-Inspired Projects



454

Faculty and Research Staff



35

States Directly Benefitting
from Research Products

185

Post Docs and Graduate Students

\$113M

Research Funding

What CIROH Offers You!

OUTREACH & EDUCATION

- DocuHub, Portal, HydroLearn, Research Paper

4

Community engagement
and educational
resources

HYDROLOGY MODELING

- Community NextGen, NGIAB, Evaluation, Visualization
- Calibration, DataStream, Community FIM

3

Modeling frameworks
for hydrologic
simulations

DATA & APPLICATIONS

- Portal, HydroShare, AWS S3, On-Prem Storage

2

Data storage and
sharing platforms
for research data

INFRASTRUCTURE

- GitHub, DockerHub, Cloud - AWS, GoogleCloud, 2i2c JupyterHub
- On-premise: Pantarhei, Wukong, OpenStack, NSF ACCESS

1

Cloud and on-premises
services and collaboration
tools for development

DEVCON 2025

Part 1: CIROH
Cyberinfrastructure DevOps

CIROH Cyberinfrastructure DevOps Team



Partners

UA OIT



2i2c



Google Cloud



Google Cloud

AWS



Microsoft Azure



NSF



Sponsor

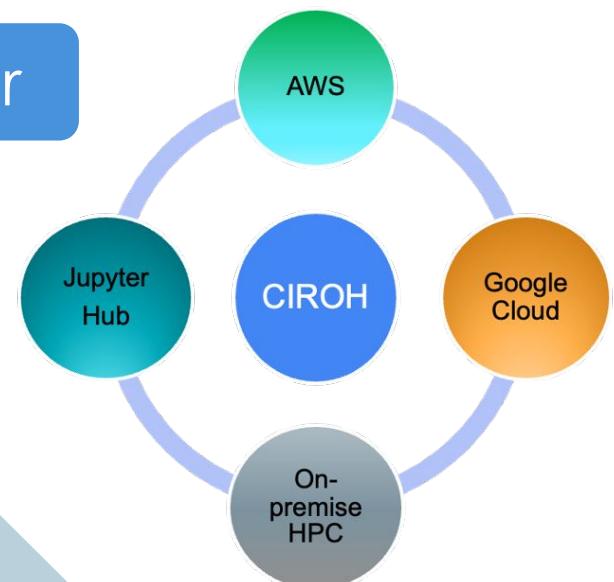
Sponsor



2025 CIROH Developers Conference sponsors:



THE UNIVERSITY OF ALABAMA | Alabama Water Institute



DevCon IT Support

CIROH DevCon 2025

Infrastructure is

LIVE!

12 Workshops



CIROH 2i2c JupyterHub on Google Cloud

Platform for interactive computing

131 attendees



NSF ACCESS JetStream2

NextGen water modeling

105 NextGen inst.



AWS

Cloud infrastructure platform

100 attendees



Google Cloud BigQuery

Data analytics platform

50 attendees

12

Total Workshops

200

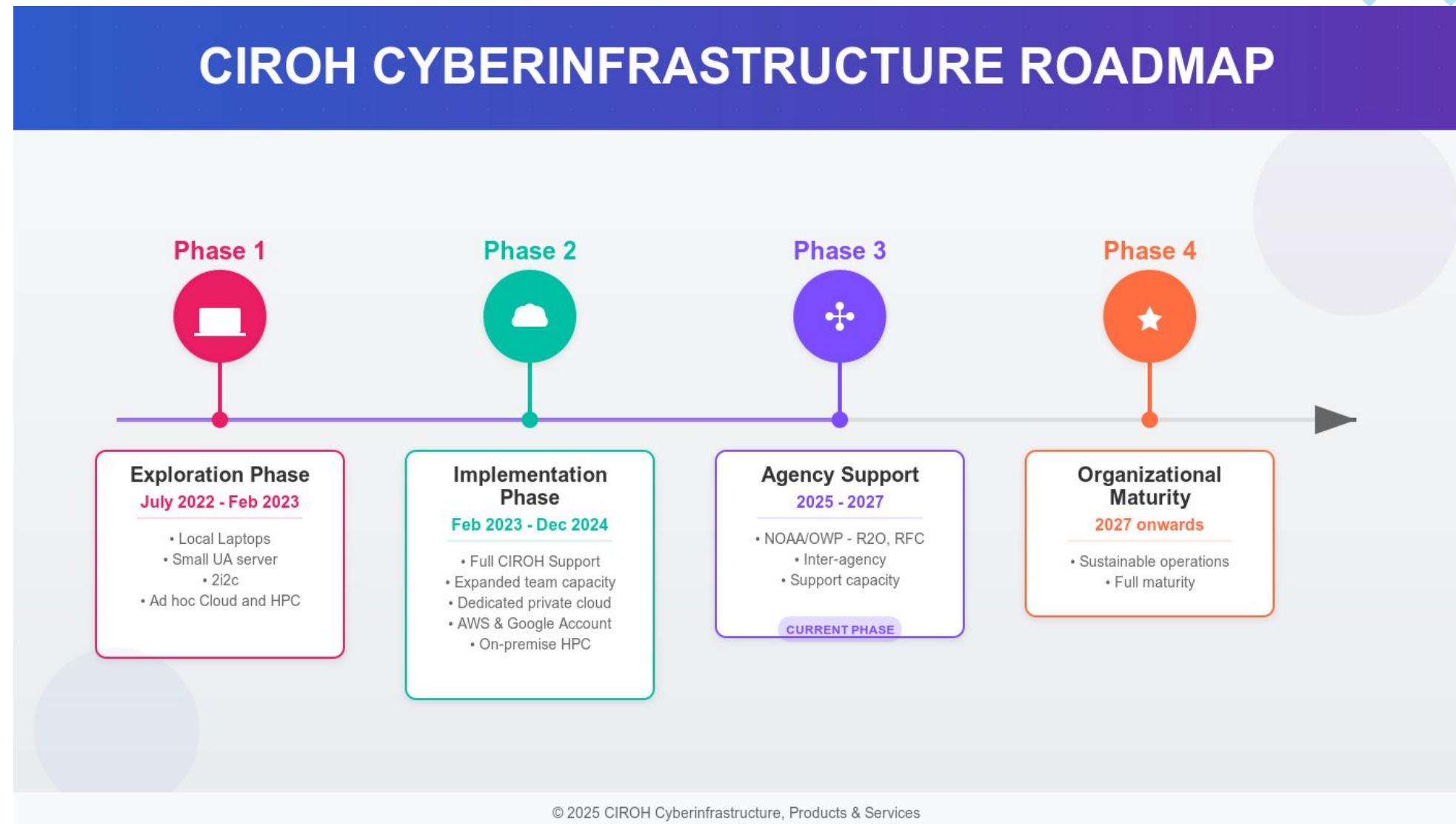
Total Attendees

4

Cloud Platforms

Ready to power
water science innovation!

How did we get here?



CIROH Cyberinfrastructure (CI)

Research Impact

400+

Active Researchers

130

Research Projects

Empowering innovation through collaboration



AWS

Active Projects

24
60

Active Users



On-premise HPC

Active Projects

20
50

Active Users



Google Cloud Platform

Active Projects

50
171

Active Users



NSF Access

Active Projects

7
27

Active Users

Key Projects using CIROH CI

Few Key Projects using CIROH's CI

AWS

NextGen In A Box (NGIAB) CI
UA and Lynker

Research DataStream
UA and Lynker

TEEHR
RTI

Tethys Platform
BYU

WaterNode
UA

GCP

NWM BigQuery API
BYU

HydroShare Integration with 2i2c
Powered by Google Cloud

CIROH 2i2c JupyterHub (Prod, Staging)
UA

CIROH 2i2c Workshop Hub
UA

Pantarhei

Deep Learning Modeling and Data Assimilation for NextGen
UA

CONUS-scale Operational Snow Modeling
University of Utah

ML for heterogeneous modeling and streamflow prediction
UA

SWEML
UA

Wukong

Data Assimilation Methods on Standardized Testbed
PSU

Multi-model Mosaics for Operational Prediction
PSU

ML-based Flood Inundation Mapping Framework
PSU

Other Projects deployed on CIROH AWS via Tethys Portal

Native Applications

Built using [Tethys Portal](#)

Application	Description
 TethysDash	Interactive dashboard for hydrological data visualization
 Water Data Explorer	Multi-source water data analysis tool
 HydroCompute Demo	University of Iowa's statistical analysis showcase
 SWEML	Snow Water Equivalent visualization platform
 Grace Groundwater Tool	GRACE satellite data analysis for groundwater
 Snow Inspector	MODIS satellite snow cover analysis
 CSES	National Water Model evaluation system

👉 Access all native apps: [Tethys Portal](#)

CIROH Cyberinfrastructure DevOps

Key Initiatives



DevCon

2023, 2024, 2025



Education Programs

Summer Institute 2024, 2025
REU 2024, 2025



Various CIROH Projects

Research & Development Initiatives



User Support

- AWS Office Hours
- Slack and Email Support
- DocuHub Monthly Blog and News Updates

CIROH JupyterHub Images

jupyterhub Home Token

Server Options

Small

5GB RAM, 2 CPUs



Image

NextGen National Water Model(NWM)

SHAP for ML Interpretation

TEVA for Feature Selection

LightGBM for Forecast

ML for Hydro Model Outputs

HydroGeoSpatial Modeling

NextGen National Water Model(NWM)

Medium

11GB RAM, 4 CPUs



Image

Large

24GB RAM, 8 CPUs



Image

NextGen National Water Model(NWM)

Huge

52GB RAM, 16 CPUs



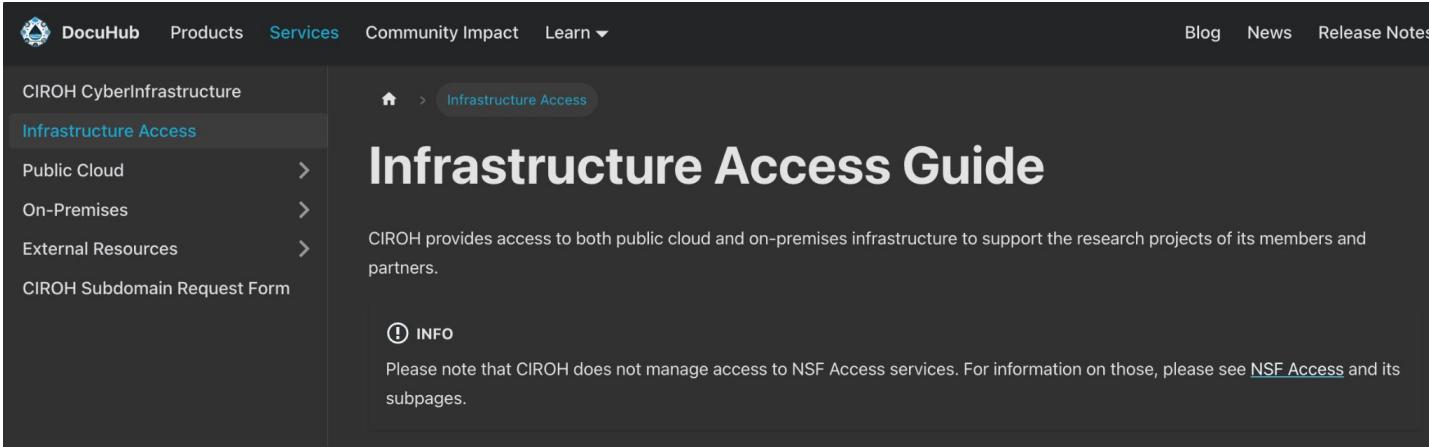
Image

NextGen National Water Model(NWM)

Start

Available to
any CIROH
researcher
(free)

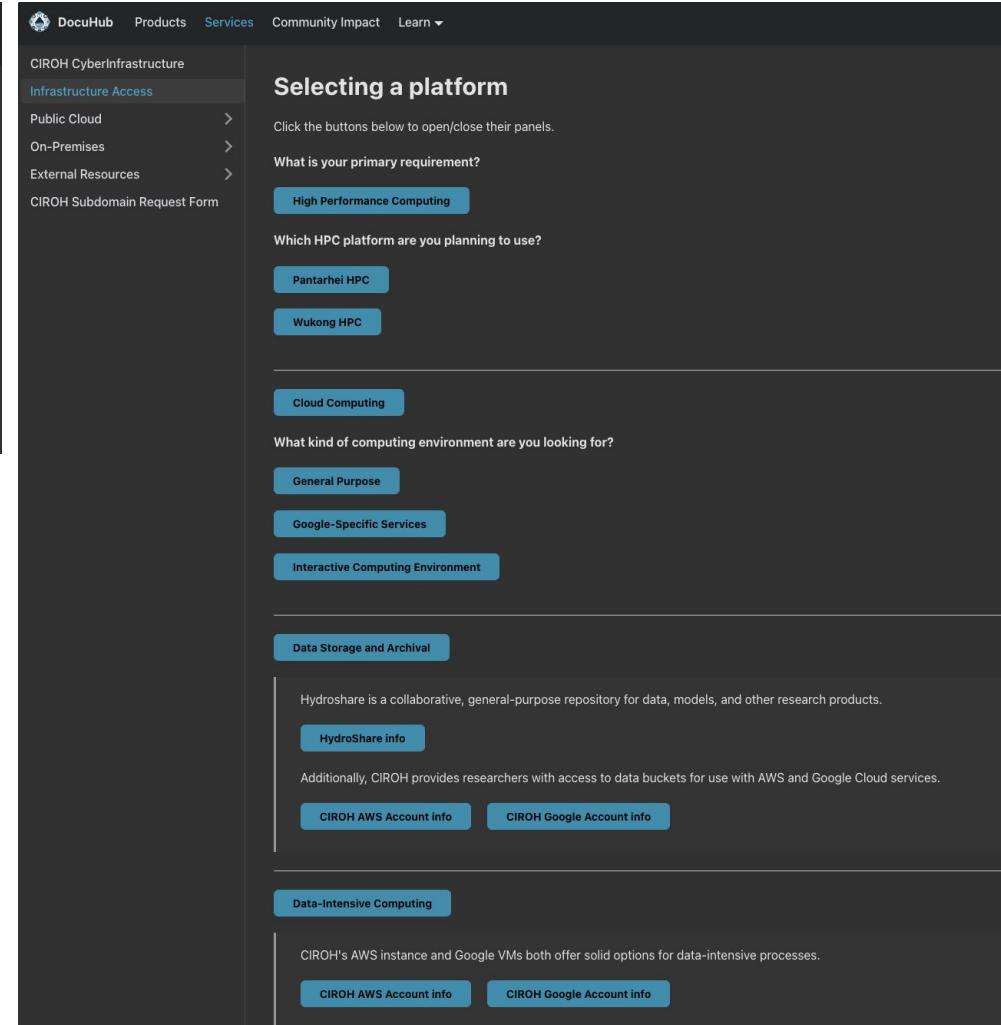
How to get access?



The screenshot shows the CIROH website's navigation bar with links for DocuHub, Products, Services (highlighted), Community Impact, Learn, Blog, News, and Release Notes. The main content area is titled "Infrastructure Access Guide". It features a breadcrumb trail: Home > Infrastructure Access. Below the title, a sub-section "CIROH CyberInfrastructure" has "Infrastructure Access" selected. A sidebar on the left lists "Public Cloud", "On-Premises", "External Resources", and "CIROH Subdomain Request Form". The main content area contains a note: "CIROH provides access to both public cloud and on-premises infrastructure to support the research projects of its members and partners." A "INFO" icon with a note states: "Please note that CIROH does not manage access to NSF Access services. For information on those, please see [NSF Access](#) and its subpages."

1. [docs.ciroh.org](#)

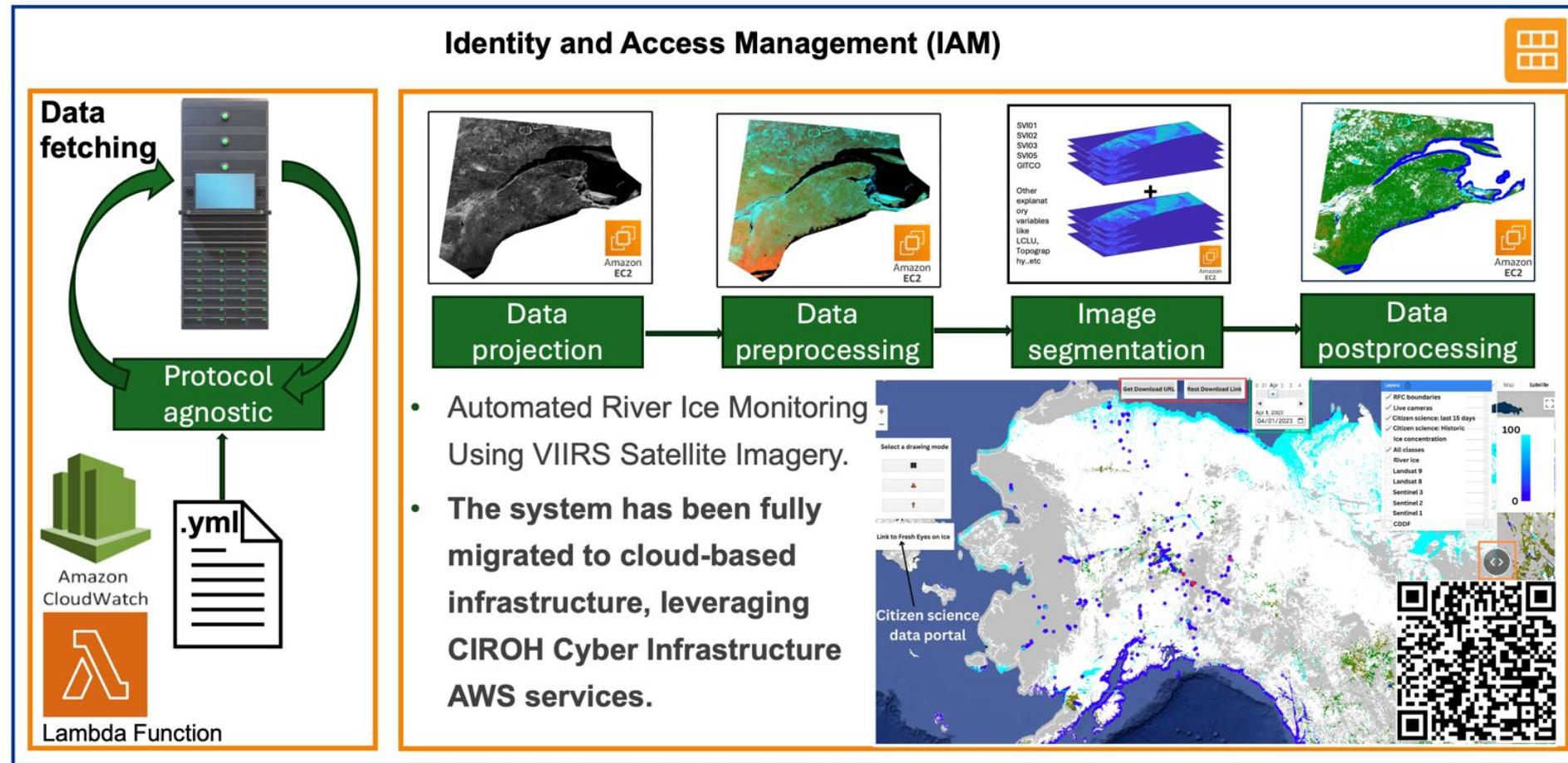
2. Go to “Services”



The screenshot shows the "Selecting a platform" section of the Infrastructure Access page. It includes a note: "Click the buttons below to open/close their panels." A question "What is your primary requirement?" has "High Performance Computing" selected. Another question "Which HPC platform are you planning to use?" lists "Panarhei HPC" and "Wukong HPC". A section for "Cloud Computing" lists "General Purpose", "Google-Specific Services", and "Interactive Computing Environment". A section for "Data Storage and Archival" lists "HydroShare info". A note states: "Hydroshare is a collaborative, general-purpose repository for data, models, and other research products." A section for "Data Intensive Computing" lists "CIROH AWS Account Info" and "CIROH Google Account Info". A note states: "Additionally, CIROH provides researchers with access to data buckets for use with AWS and Google Cloud services." A final note at the bottom states: "CIROH's AWS instance and Google VMs both offer solid options for data-intensive processes."

Real-time satellite monitoring of river ice conditions on CIROH AWS

Advancing Research in Cold Regions Hydrology to Support the Modeling and Mapping of Ice-induced Flood Inundation



DEVCON 2025

Part 2: UA HPC Update

The Future : UA HPC \$96M HPC Facility at UA



High Performance Computing and Data Center Construction Ready to Begin

November 12, 2024 • Written by Jessica Nelson • 2 min read



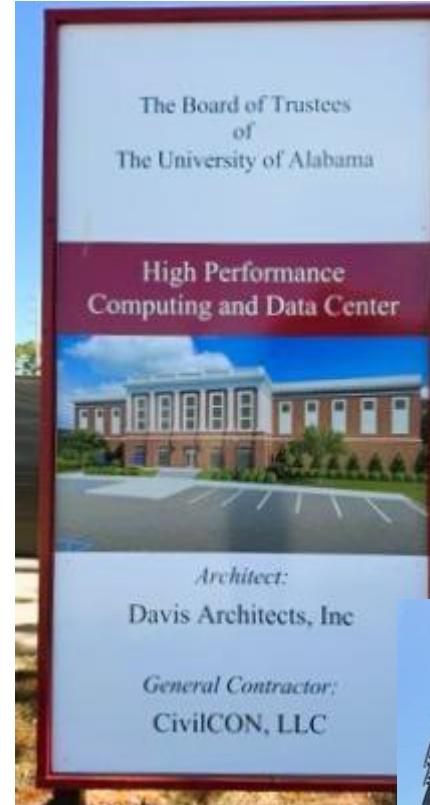
The University of Alabama Board of Trustees gave final approval on Friday for the plans to build the new [High Performance Computing and Data Center](#) on the eastern edge of campus. Construction can now begin with a projected completion date in late 2026.



NATIONAL INSTITUTE OF
STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE



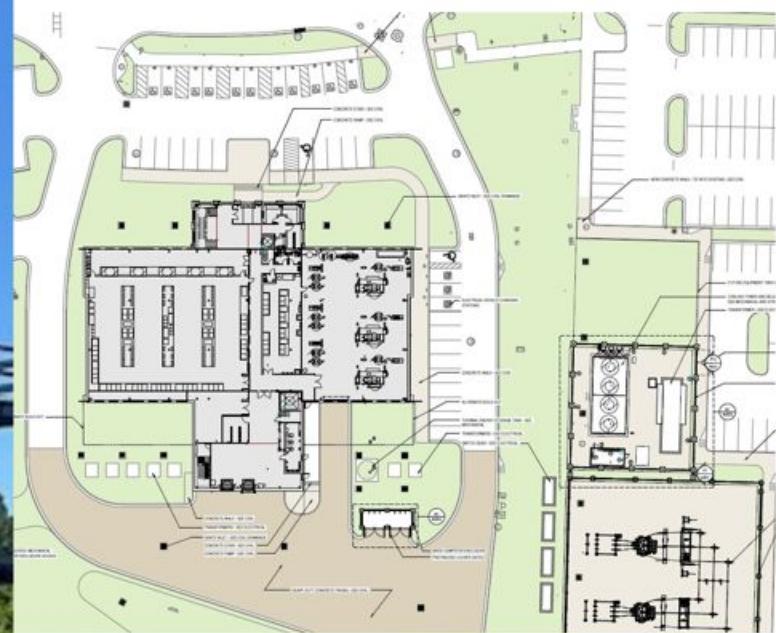
hpc.ua.edu



Opens
January
2027



UA HPC Facility





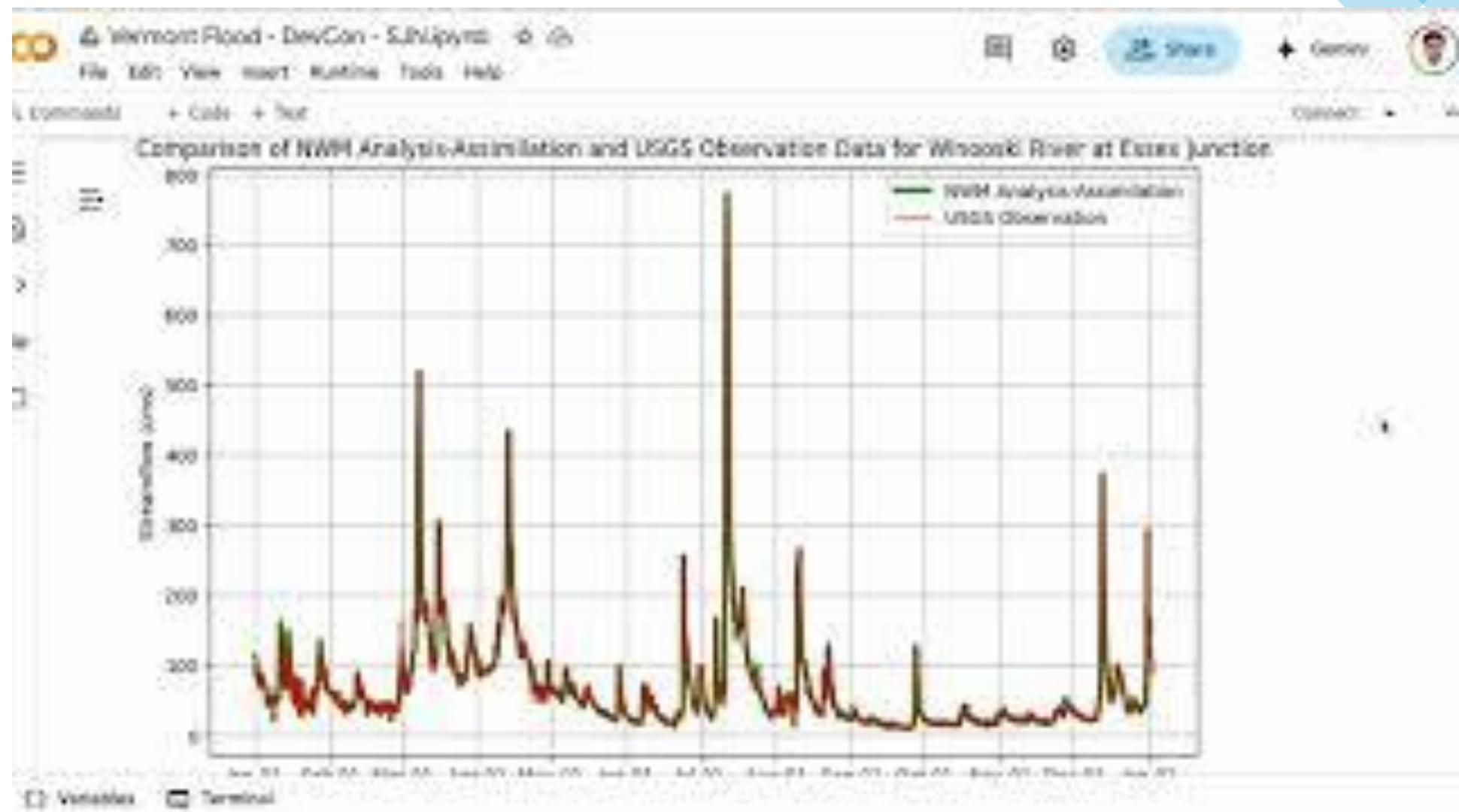
DEVCON 2025

Part 3: DATA & APPLICATIONS

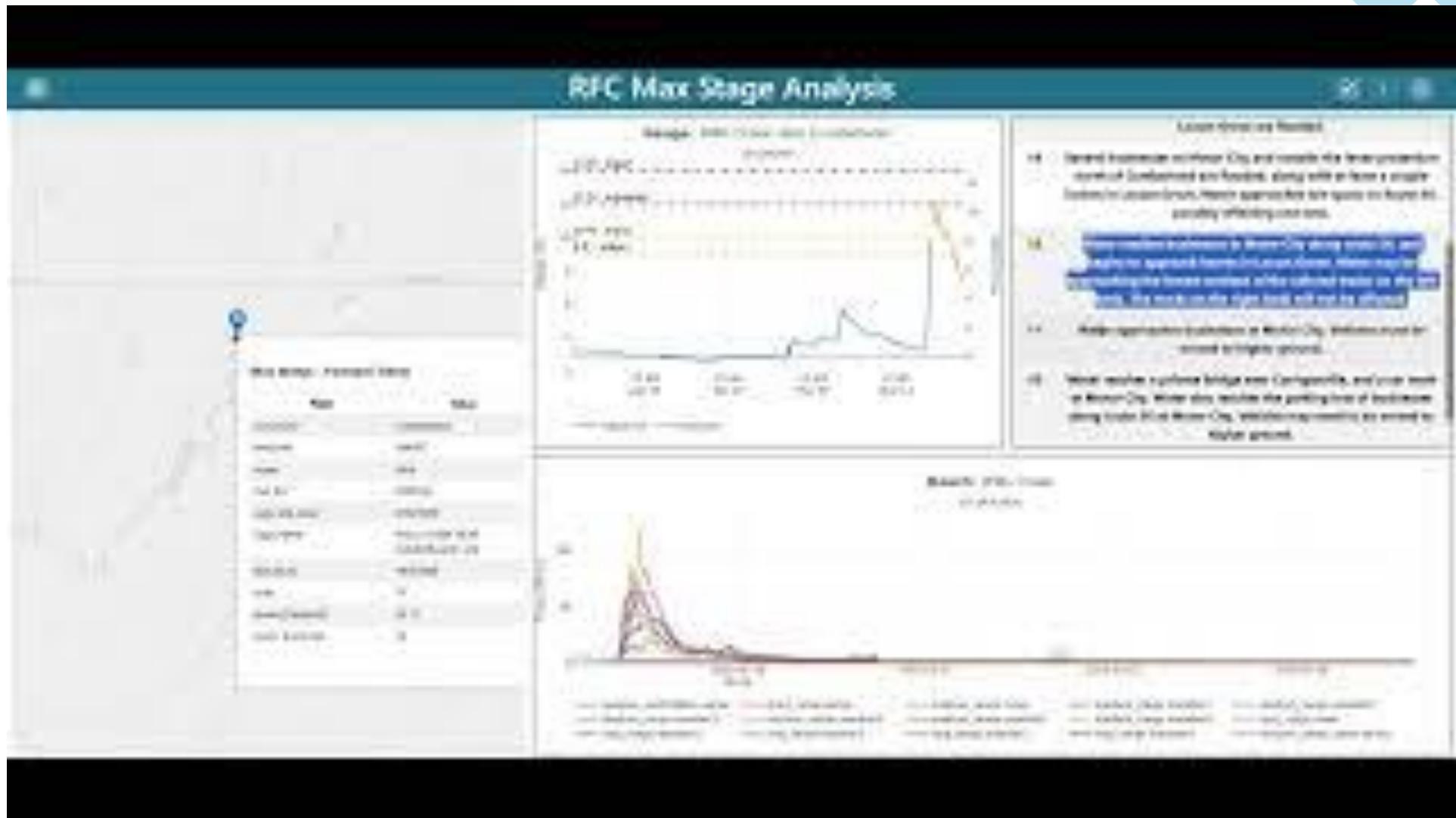
DEVCON 2025 - NWM BIGQUERY API



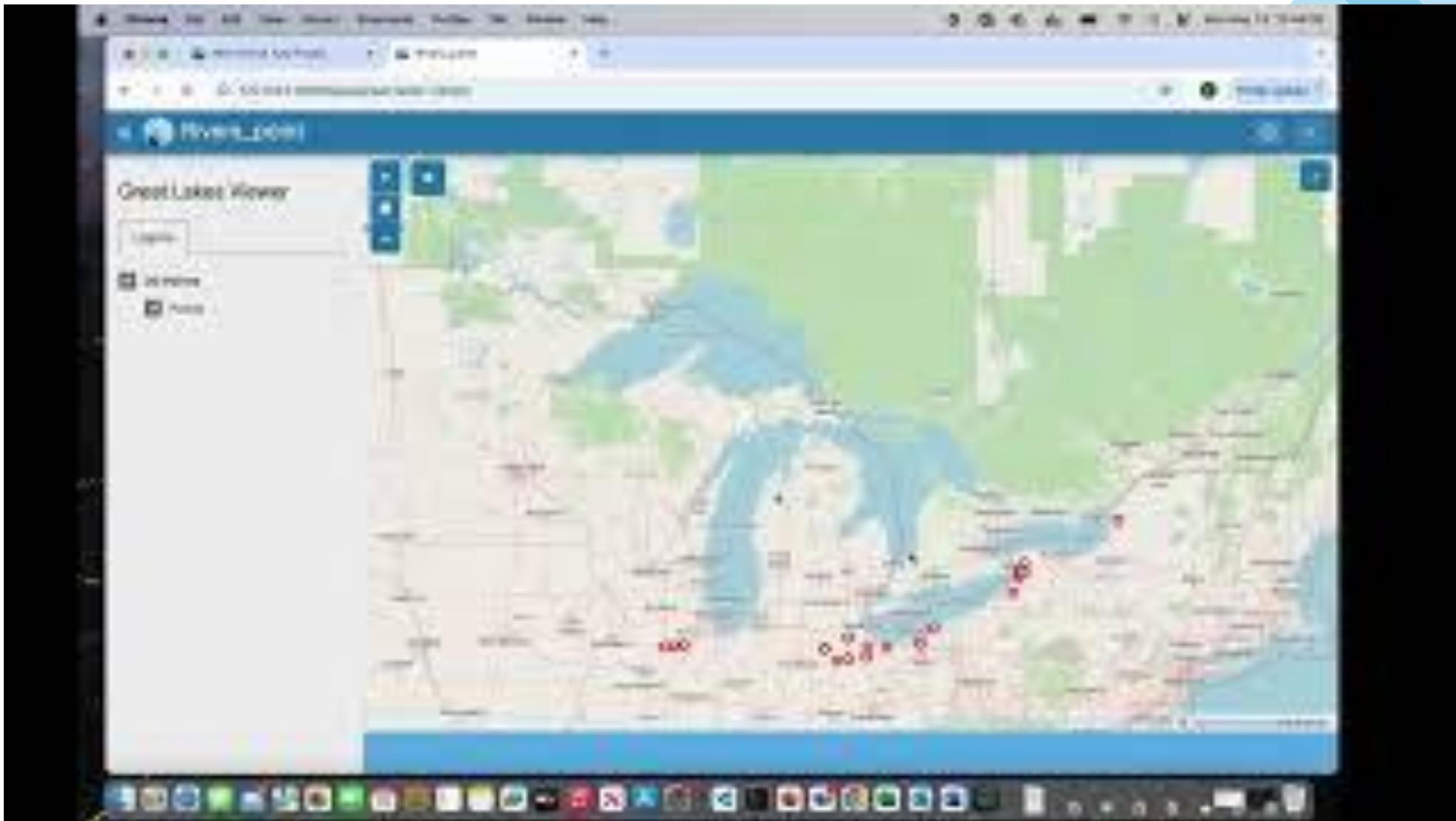
DEVCON 2025



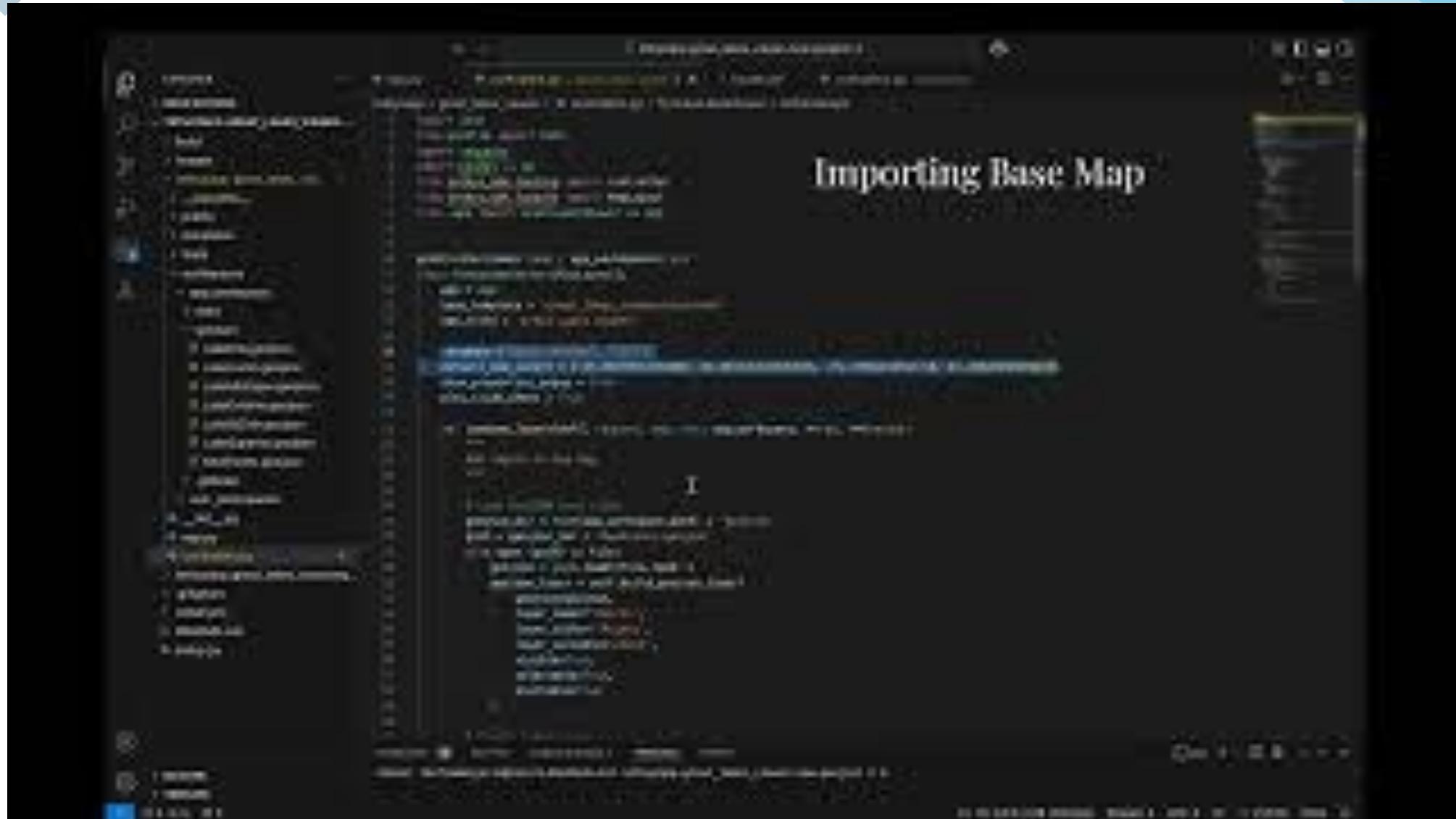
DEVCON 2025 - TETHYS APP



DEVCON 2025 - RIVERS_POINTS



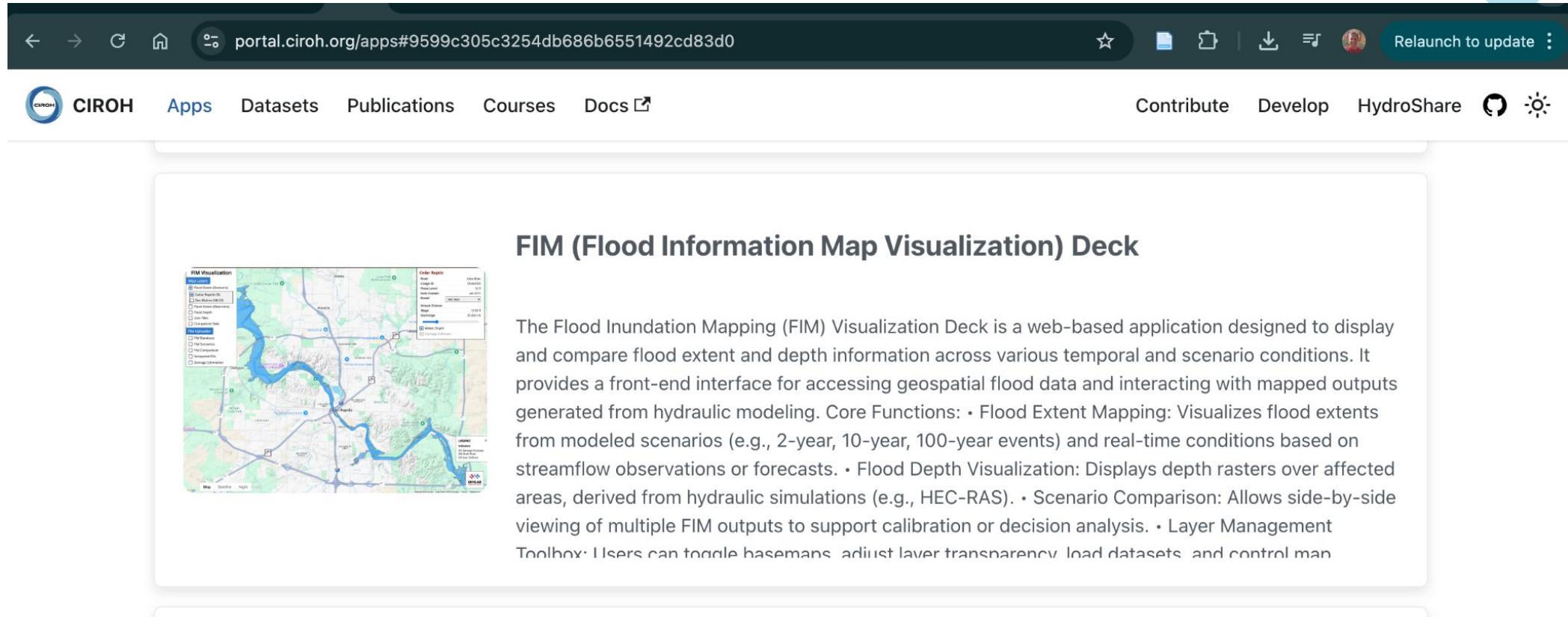
DEVCON 2025 - RIVERS_POINTS



DEVCON 2025



DEVCON 2025



The screenshot shows a web browser window for the CIROH portal (portal.ciroh.org/apps#9599c305c3254db686b6551492cd83d0). The main content area displays the "FIM (Flood Information Map Visualization) Deck". On the left, there is a map of a river system with flood extent overlays for different scenarios. The right side contains descriptive text about the application's features.

FIM (Flood Information Map Visualization) Deck

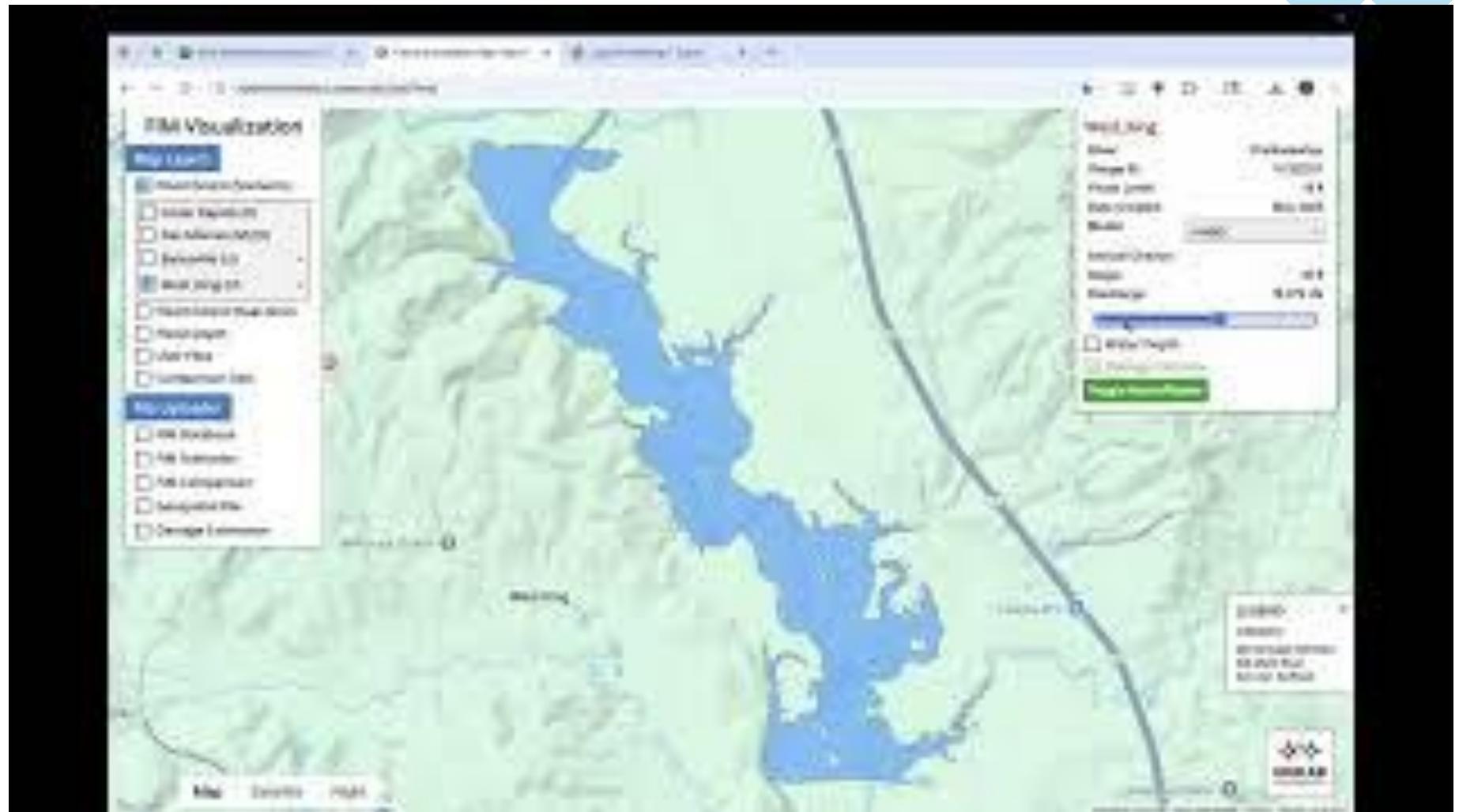
The Flood Inundation Mapping (FIM) Visualization Deck is a web-based application designed to display and compare flood extent and depth information across various temporal and scenario conditions. It provides a front-end interface for accessing geospatial flood data and interacting with mapped outputs generated from hydraulic modeling. Core Functions:

- Flood Extent Mapping: Visualizes flood extents from modeled scenarios (e.g., 2-year, 10-year, 100-year events) and real-time conditions based on streamflow observations or forecasts.
- Flood Depth Visualization: Displays depth rasters over affected areas, derived from hydraulic simulations (e.g., HEC-RAS).
- Scenario Comparison: Allows side-by-side viewing of multiple FIM outputs to support calibration or decision analysis.
- Layer Management Toolbox: Users can toggle basemaps, adjust layer transparency, load datasets, and control map

FLOOD IMPACT MAP COMMON DATABASE

DEVCON 2025

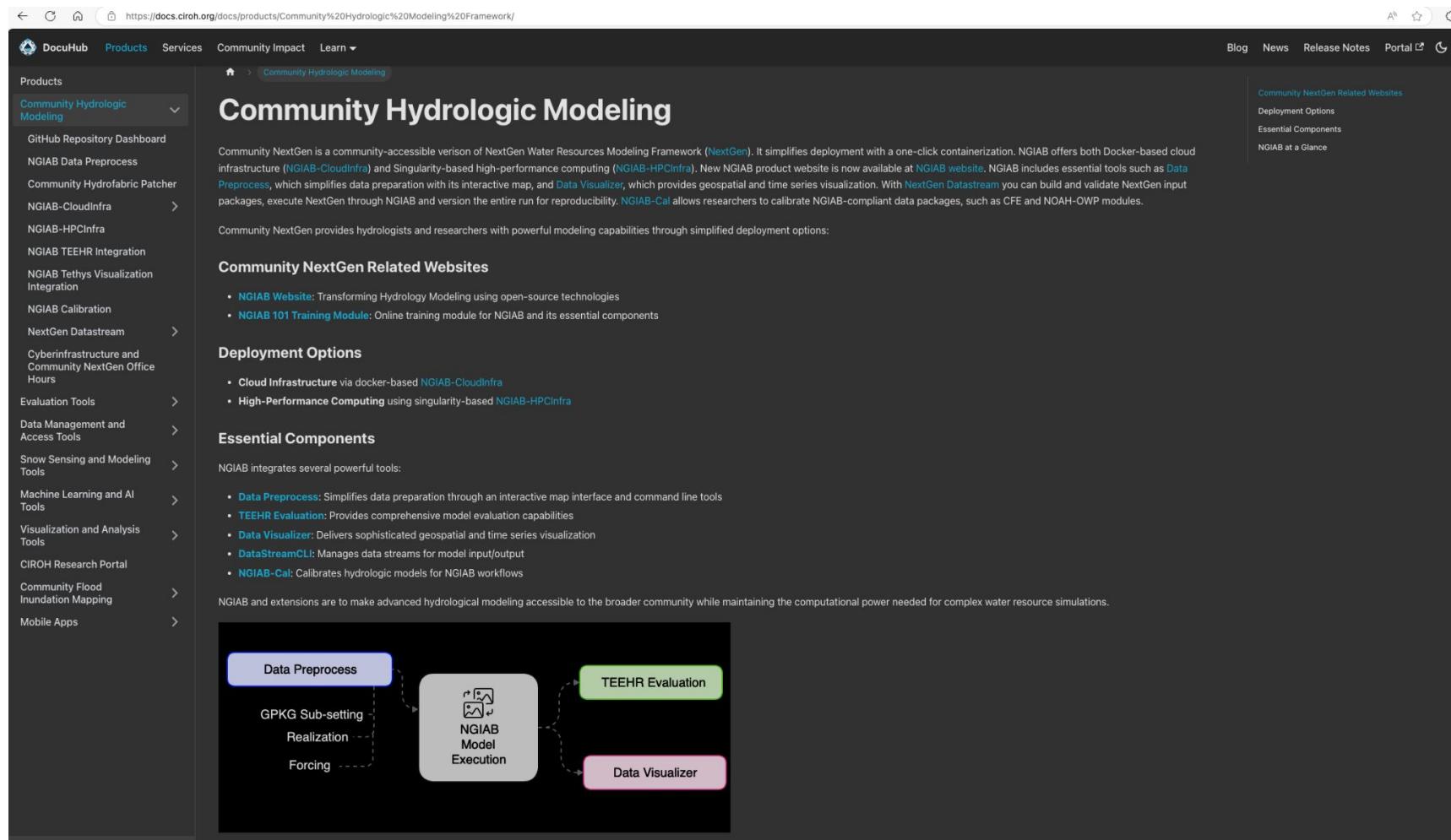
FIM Visualizer



DEVCON 2025

Part 4: Hydrology Modeling

https://docs.ciroh.org/docs/products/Community%20Hydrologic%20Modeling%20Framework/



Community Hydrologic Modeling

Community NextGen is a community-accessible version of NextGen Water Resources Modeling Framework ([NextGen](#)). It simplifies deployment with a one-click containerization. NGIAB offers both Docker-based cloud infrastructure ([NGIAB-CloudInfra](#)) and Singularity-based high-performance computing ([NGIAB-HPCInfra](#)). New NGIAB product website is now available at [NGIAB website](#). NGIAB includes essential tools such as [Data Preprocess](#), which simplifies data preparation with its interactive map, and [Data Visualizer](#), which provides geospatial and time series visualization. With [NextGen Datastream](#) you can build and validate NextGen input packages, execute NextGen through NGIAB and version the entire run for reproducibility. [NGIAB-Cal](#) allows researchers to calibrate NGIAB-compliant data packages, such as CFE and NOAH-OWP modules.

Community NextGen provides hydrologists and researchers with powerful modeling capabilities through simplified deployment options:

Community NextGen Related Websites

- [NGIAB Website](#): Transforming Hydrology Modeling using open-source technologies
- [NGIAB 101 Training Module](#): Online training module for NGIAB and its essential components

Deployment Options

- Cloud Infrastructure via docker-based [NGIAB-CloudInfra](#)
- High-Performance Computing using singularity-based [NGIAB-HPCInfra](#)

Essential Components

NGIAB integrates several powerful tools:

- [Data Preprocess](#): Simplifies data preparation through an interactive map interface and command line tools
- [TEEHR Evaluation](#): Provides comprehensive model evaluation capabilities
- [Data Visualizer](#): Delivers sophisticated geospatial and time series visualization
- [DataStreamCLI](#): Manages data streams for model input/output
- [NGIAB-Cal](#): Calibrates hydrologic models for NGIAB workflows

NGIAB and extensions are to make advanced hydrological modeling accessible to the broader community while maintaining the computational power needed for complex water resource simulations.

```

graph LR
    subgraph Workflow [ ]
        direction TB
        A[Data Preprocess] --> B[GPKG Sub-setting  
Realization  
Forcing]
        B --> C[NGIAB Model Execution]
        C --> D[TEEHR Evaluation]
        C --> E[Data Visualizer]
    end

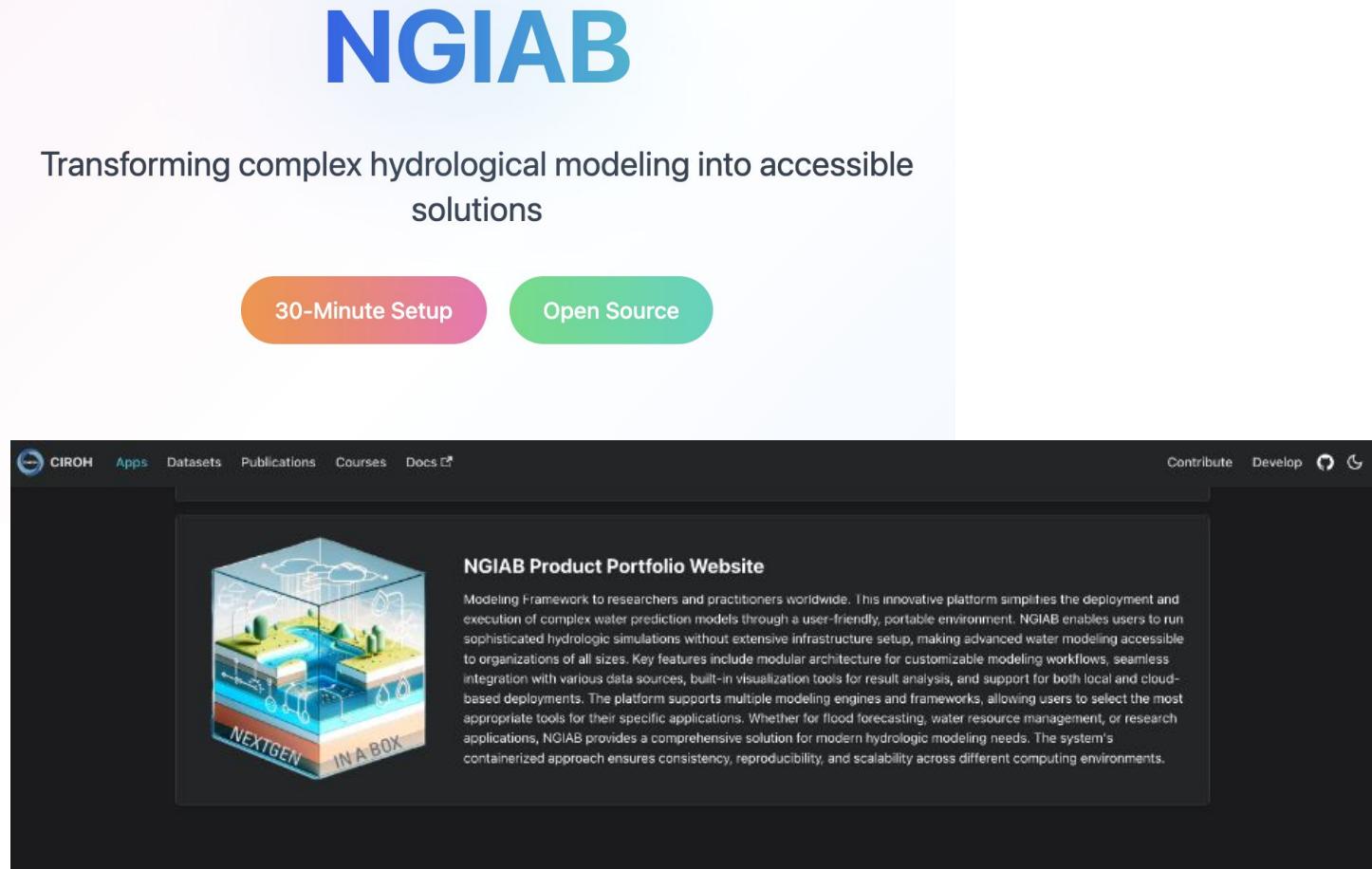
```

NEW!! NGIAB portfolio website

NextGen In A Box

Revolutionizing Water Modeling

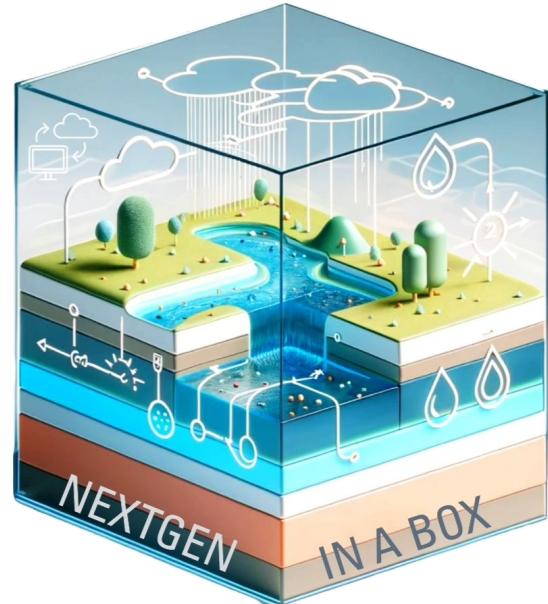
ngiab.ciroh.org



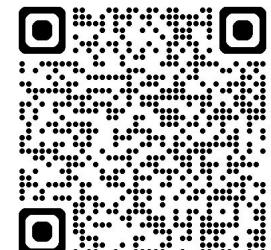
The screenshot shows the NGIAB portfolio website homepage. At the top, there's a large blue header with the text "Transforming complex hydrological modeling into accessible solutions". Below the header, there are two buttons: "30-Minute Setup" (orange) and "Open Source" (green). The main content area features a large image of a 3D hydrological model labeled "NEXTGEN IN A BOX". To the right of the image is a detailed description of the platform:

NGIAB Product Portfolio Website

Modeling Framework for researchers and practitioners worldwide. This innovative platform simplifies the deployment and execution of complex water prediction models through a user-friendly, portable environment. NGIAB enables users to run sophisticated hydrologic simulations without extensive infrastructure setup, making advanced water modeling accessible to organizations of all sizes. Key features include modular architecture for customizable modeling workflows, seamless integration with various data sources, built-in visualization tools for result analysis, and support for both local and cloud-based deployments. The platform supports multiple modeling engines and frameworks, allowing users to select the most appropriate tools for their specific applications. Whether for flood forecasting, water resource management, or research applications, NGIAB provides a comprehensive solution for modern hydrologic modeling needs. The system's containerized approach ensures consistency, reproducibility, and scalability across different computing environments.



DEMO



NEW!! NGIAB 101 Training Module

https://docs.ciroh.org/training-NGIAB-101/

AWI CIROH HR 2025 Training USGS 2i2c Misc. Kubernetes Imported Helper 2024 AWS Azure DocuHub On-prem NSF ACCESS Other Favorites

CIROH Alpha Learner View Search the All In One page

NGIAB 101 Key Points Glossary Learner Profiles More ▾

EPISODES

- Summary and Setup
 - System Requirements
- 1. Introduction
- 2. Installation and Setup
- 3. Data Preparation
- 4. Model Execution
- 5. Evaluation

Next: Introduction... →

Summary and Setup

This is a new lesson built with The Carpentries Workbench.

Welcome to the NextGen In A Box (NGIAB) 101 training module!

SOURCE CODE AND DOCUMENTATION

The Docker Desktop NextGen In A Box (NGIAB) is found at our GitHub repository. The documentation for NGIAB and its extensions can be found on the CIROH Docs.

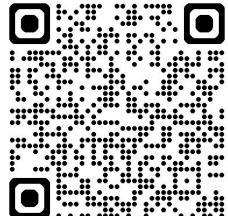


CIROH Apps Datasets Publications Courses Docs

Contribute Develop

NGIAB 101 Training

source hydrologic modeling framework designed to advance water prediction capabilities. This comprehensive module guides users through the complete modeling workflow, including system installation, data preparation, model execution, evaluation, and visualization of results. The training is structured to accommodate users of varying technical backgrounds, from beginners to advanced practitioners. It provides step-by-step instructions and practical exercises that ensure participants gain real-world experience with the framework. Additionally, the module includes optional advanced topics for those interested in deploying NGIAB in high-performance computing (HPC) environments, enabling scalable applications for large-scale hydrologic modeling projects. By completing this training, users will develop the foundational skills necessary to implement NGIAB for their own hydrologic research and operational forecasting needs, contributing to improved water resource management and flood prediction capabilities.



CIROH-UA GitHub Actions Usage Metrics

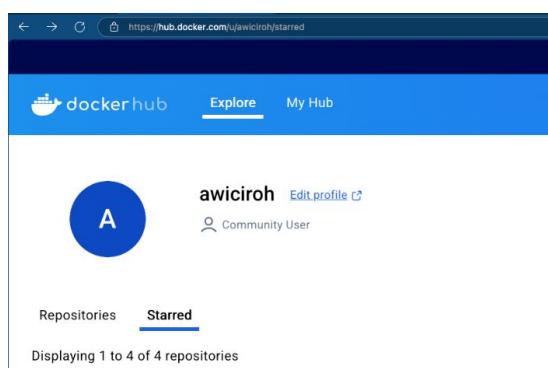
A screenshot of the GitHub organization's Actions Usage Metrics page. The URL is https://github.com/orgs/CIROH-UA/actions/metrics/usage?dateRangeType=DATE_RANGE_TYPE_LAST_YEAR&tab=repositories. The page shows a summary of usage metrics: Total minutes (38,636) and Total job runs (10,149) over the last year. Below this, a table lists the top repositories by total minutes, showing data for 20 repositories. The table includes columns for Source repository, Total minutes, Workflow runs, and Workflows. Notable entries include 'ngen-datastream' with 19,048 minutes and 'ciroh-ua_website' with 3,238 minutes.

Source repository	Total minutes	Workflow runs	Workflows
ngen-datastream	19,048	2,379	78
NGIAB-CloudInfra	7,874	621	4
ciroh-ua_website	3,238	1,483	8
tethysportal-ciroh	1,994	334	4
ngiab-client	1,457	137	4
NGIAB-HPCinfra	1,381	112	2
awi-ciroh-image	1,249	133	4
hydrotools	562	19	10
NGIAB_data_preprocess	487	170	4
ciroh-ua.github.io	433	145	1
docuhub-staging	294	98	1
training-NGIAB-101	289	160	9
ciroh-portal	127	72	4
t-route	51	25	2
ngiab-website	43	39	2
lstm	34	18	1
ngen	32	8	1

Shows computational resources used by CIROH-UA CI/CD pipelines.

Shows significant CI/CD activity with over 10,000 automated runs and 38,636 minutes so far in last year alone!

AWICIROH DockerHub Stats



A screenshot of the DockerHub interface showing the 'Starred' repositories for user 'awiciroh'. The top navigation bar includes 'docker hub', 'Explore', and 'My Hub'. Below, the user profile 'awiciroh' is shown as a community user. The 'Starred' tab is selected, displaying four repositories:

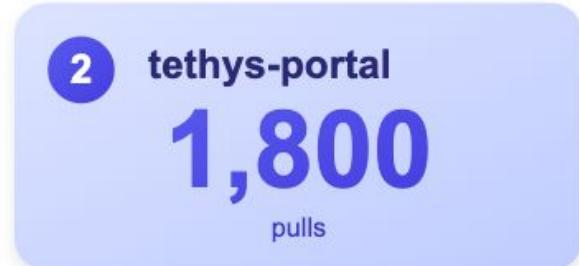
- awiciroh/ci Roh-ngen-image
- awiciroh/datastream
- awiciroh/tethysapp-ci Roh-portal
- awiciroh/tethys-ngiab

Each repository entry shows the image name, author, update time, description, pull count (e.g., 8.8K), and star count (e.g., 3).

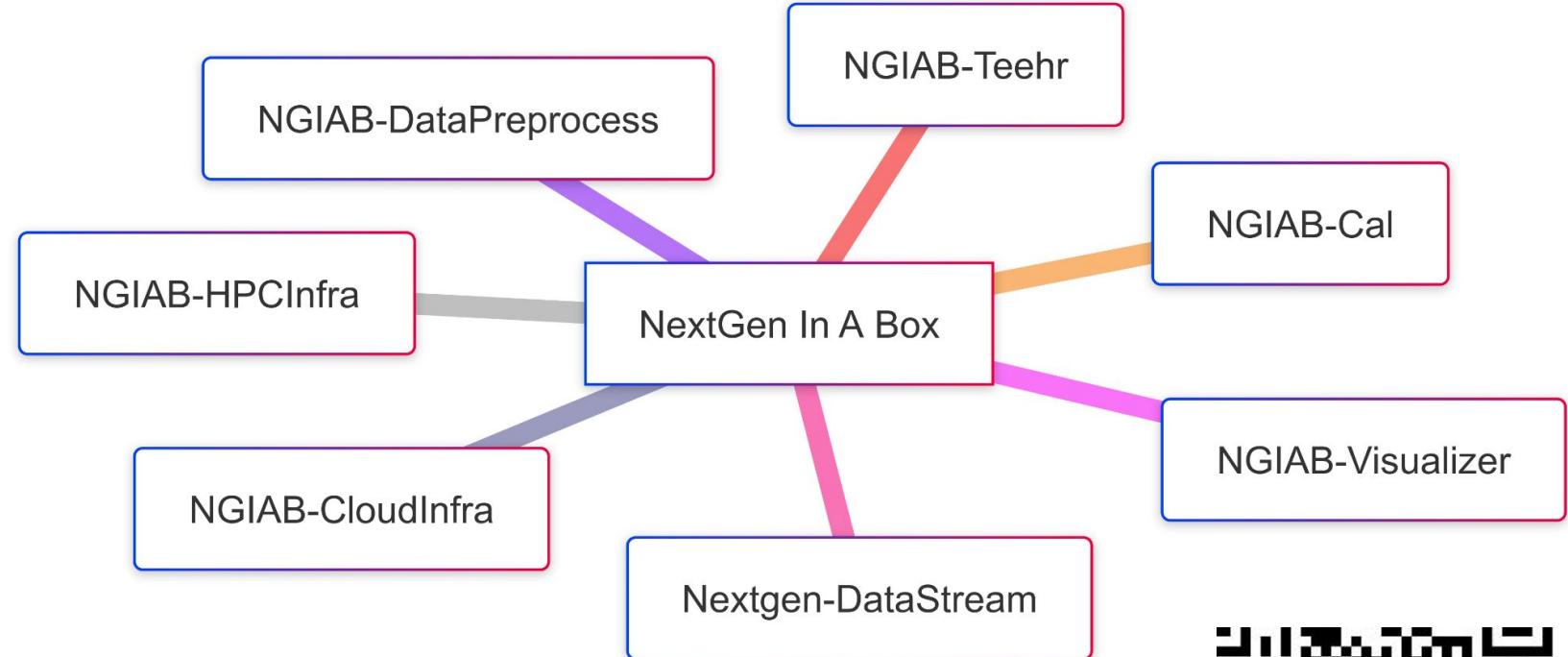
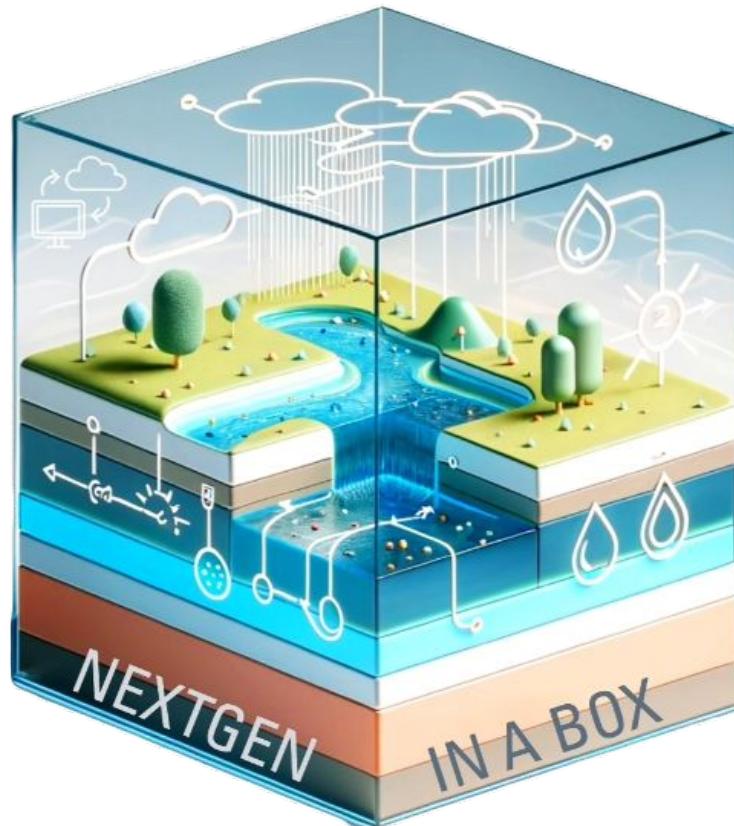


CIROH DockerHub Stats

(awiciroh) Docker Image Pull Count



NGIAB ECOSYSTEM



NGIAB ECOSYSTEM

DocuHub Products Services Community Impact Learn ▾

Products

Community Hydrologic Modeling

- GitHub Repository Dashboard
- NGIAB Data Preprocess
- Community Hydrofabric Patcher
- NGIAB-CloudInfra >
- NGIAB-HPCInfra
- NGIAB TEEHR Integration
- NGIAB Tethys Visualization Integration
- NGIAB Calibration
- NextGen Datastream >
- NextGen on CIROH JupyterHub
- Cyberinfrastructure and Community NextGen Office Hours
- Evaluation Tools >
- Data Management and Access Tools >
- Snow Sensing and Modeling Tools >
- Machine Learning and AI Tools >
- Visualization and Analysis Tools >
- CIROH Research Portal
- Community Flood Inundation Mapping >
- Mobile Apps >

NGIAB at a Glance

Explore NextGen In A Box (NGIAB) and extensions through the interactive tabs below.

Click on Key Features, Capabilities, or Access Methods to learn more.

	Key Features	Capabilities	Access Methods
NGIAB and Extensions	<p>Data Preprocess</p> <ul style="list-style-type: none"> • Specializes in initial data preparation • Handles subsetting and forcing processing • Supports basic data processing tasks • Helps with running NGIAB 		NOAA-OWP Tools/Libraries Utilized
NGIAB Implementation (Cloud, HPC)	<p>TEEHR Evaluation</p> <ul style="list-style-type: none"> • Focused specifically on model execution • Core engine for running simulations • Does not handle pre/post-processing tasks 		
Data Visualizer	<p>DataStreamCLI</p> <ul style="list-style-type: none"> • Handles both input and output processing • Supports full workflow, from data preparation to cloud deployment 		Built to evaluate OWP model outputs
	<p>NGIAB-Cal</p> <ul style="list-style-type: none"> • Focused on analysis and validation • Supports data processing and output analysis 		Designed for OWP hydrofabric visualization
	<p>ngen-cal</p> <ul style="list-style-type: none"> • Complete workflow for creating inputs for and executing NGIAB and managing outputs • Backend of the NextGen Research DataStream • Discrete tooling for tasks like forcing processing and BMI file generation 		• ngen-cal
	<p>OBS</p> <ul style="list-style-type: none"> • Simplifies hydrologic model calibration for NGIAB workflows • Creates calibration directory and configurations within the NGIAB folder structure • Runs calibration process using Docker • Copies calibrated parameters to model configurations 		• hydrotools

«

NGIAB - DATA PREPROCESS MAP + RUN

```

System information as of Sun May 26 16:31:00 UTC 2018
System load: 0.235  Processes: 423
Usage of /: 46.2% of 57.84GB Swap Totalled 0
Memory usage: 8%  CPU+ address for export: 26.8.209.242
Swap usage: 0%

```

→ There is 1 active process.

```

https://jetctrace.state.vt.edu/

```

Overall Deployment Status: Operational

Bottom Status Items:

- Source availability of global resources

```

2018-05-26 16:30:43,423 - INFO - Running all missing steps required to run ngiab.
2018-05-26 16:30:42,515 - INFO - Submit folder does not exist, enabling submit, forcing, and reutilization.
2018-05-26 16:30:42,515 - INFO - Processing cat=463298 to /home/ncar/njog/20170829/outputs/cat=463298
2018-05-26 16:30:42,515 - INFO - Specified catchment is 4629
2018-05-26 16:30:42,515 - INFO - Subsetting hydrologic
2018-05-26 16:30:34,943 - INFO - Subsetting folder: ["vulnerability", "vulnerability_attributes", "vulnerability_catchments", "vulnerability_cat", "hydrologistics", "seas", "sites", "factors", "network"]
2018-05-26 16:30:33,943 - INFO - subset complete for 46000 features (CATCHMENTS + 4600040)
2018-05-26 16:30:32,943 - INFO - Subsetting complete.
2018-05-26 16:30:32,943 - INFO - Generating rasters from 2008-01-01 00:00:00 to 2008-01-01 00:00:00...
2018-05-26 16:30:30,943 - INFO - No raster found
2018-05-26 16:30:29,943 - INFO - Selected time range and rasters no bounds
2018-05-26 16:30:29,943 - INFO - Downscaling and caching forcing data, this may take a while
}

```

NGIAB - TEEHR + TETHYS + VISUALIZER

```
git clone https://github.com/CIROH/teehr.git
cd teehr
./install.sh

CIROH: Partition Is A Box (NGIAB) - Tethys
Determination Model Output: Runout Loss

Downloaded by CIROH
CIROH used data directory: /home/runner/.ngiab/.teehr/.tethys/.runoutloss
- See this path! [MnO]
✓ Using previously configured path
✓ PATH stored for future use.

PAVING VISUALIZATION SUPPORT

✓ Created: ~ /home/runner/.ngiab/.visualizer/tethys_viz
Checking for /home/runner/.ngiab/.visualizer/tethys_viz...
✓ Success: see "curl -H$CIROH" registered (curl https://ciroh.r-2020-0200-L21000347023)
Directory /home/runner/.ngiab/.visualizer doesn't exist - creating it...
- No existing repository clone found - a fresh download will be done.

LAUNCHING TETHYS VISUALIZER

Specify the tethys usage tag to use
- Reg (e.g. v0.2.1, default: latest)
  ✓ Found local usage index in tethys-viz-registry.tgz
- Use local usage [L] or pull latest from registry (P)P (L/P): L
```

Community NextGen Updates

Community NextGen Updates

Stay connected with the latest developments in NextGen water modeling! This news hub brings you updates, breakthroughs, and opportunities from across our community of practice.

Discover how researchers and practitioners are applying NextGen frameworks to solve pressing water challenges, learn about upcoming training events, and explore new resources to enhance your modeling workflow. Our community-driven approach ensures you'll always be informed about the innovations that matter most.

[Click to collapse](#)



News

April 2025 Updates

New NGIAB-Calibration Feature

Major update to NextGen In A Box! It now supports extended calibration for CFE and NOAA OWP modules. The new calibration framework provides more flexible parameter tuning and improved model performance.

Uses ngen-cal branch: https://github.com/CIROH-UA/ngen-cal/tree/ngiab_cal

For detailed instructions on how to use the new calibration capabilities, please check out: https://github.com/CIROH-UA/ngen-cal/tree/ngiab_cal#how-to-use-this

[Read more...](#)

New NextGen In A Box Product Website

We're excited to announce the launch of our new NGIAB dedicated website! Visit our NGIAB website at <https://ngiab.ciroh.org/> to explore all NGIAB tools, documentation, and resources all in one place.

NGIAB Calibration

DocuHub Products Services Community Impact Learn ▾

Products

Community Hydrologic Modeling

GitHub Repository Dashboard

NGIAB Data Preprocess

Community Hydrofabric Patcher

NGIAB-CloudInfra

NGIAB-HPCInfra

NGIAB TEEHR Integration

NGIAB Tethys Visualization Integration

NGIAB Calibration

NextGen Datastream

NextGen on CIROH JupyterHub

Cyberinfrastructure and Community NextGen Office Hours

Evaluation Tools

CSES

TEEHR

Data Management and Access Tools

Data Access

Water Prediction Node

HydroServer

NETWA

HydroShare

NWM BigQuery API

Community Hydrologic Modeling > NGIAB Calibration

NGIAB Calibration

NOTE

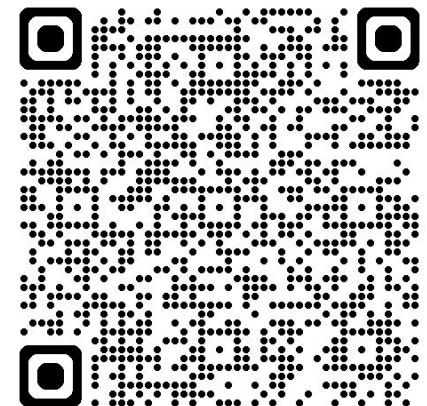
Below content is rendered from https://github.com/CIROH-UA/ngiab_cal/blob/main/README.md

ngiab-cal

A Python CLI tool to simplify hydrologic model calibration for NextGen In A Box (NGIAB) workflows.

Table of Contents

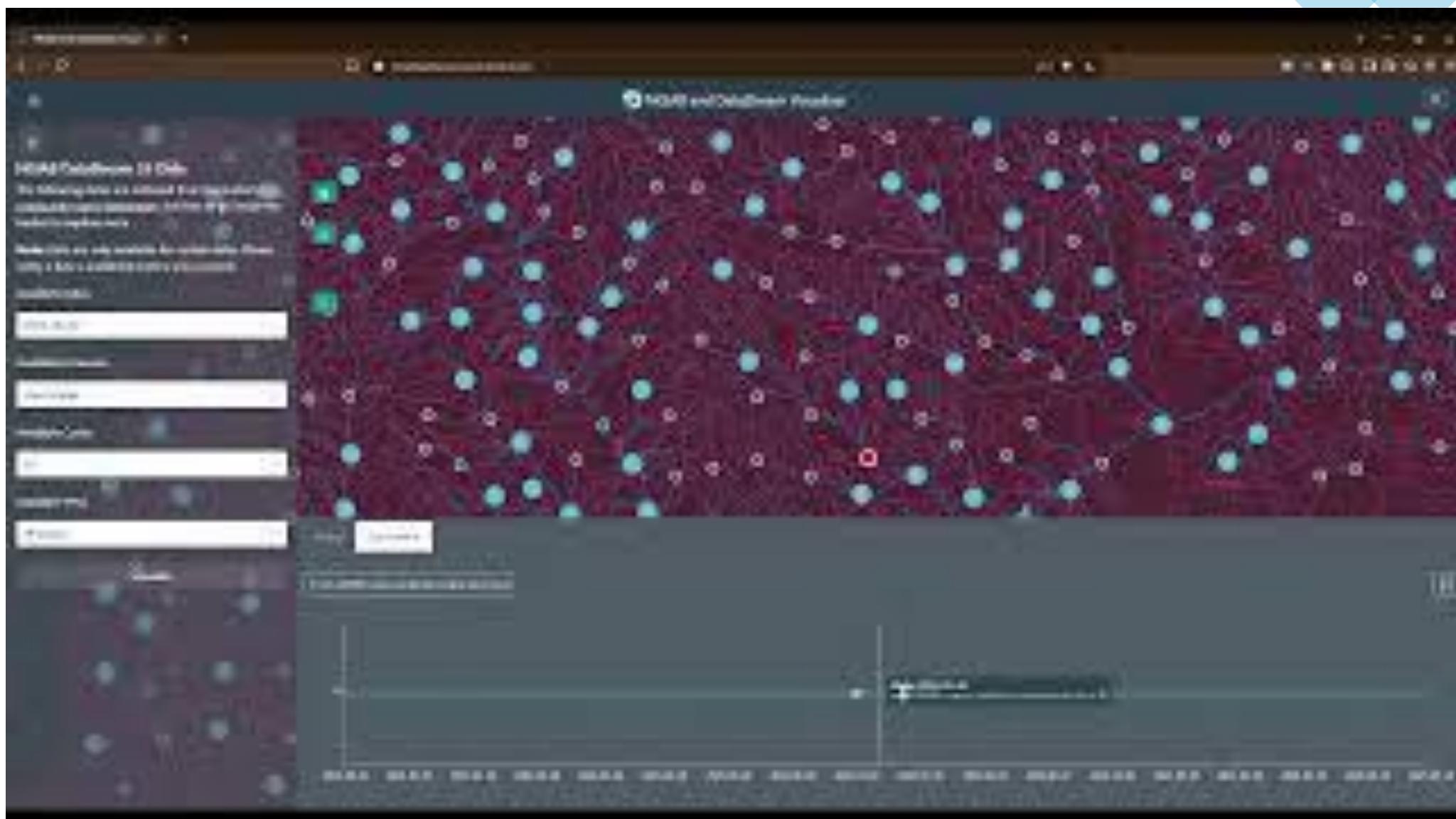
- What is this?
- Installation
- Requirements
- Basic Usage
- Advanced Options
- Calibration Process
- Calibration Configuration File
- Example: Calibrating CAMELS Basins
- How It Works
- How is ngen-cal running?
- Development
- License
- Acknowledgments





DEVCON 2025 - DATASTREAM CLI

DEVCON 2025 - DATASTREAM VISUALIZER



NGIAB (Singularity Image) for HPC

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Blog ▾

Products

Community Hydrologic Modeling

- GitHub Repository Dashboard
- NGIAB Data Preprocess
- Community Hydrofabric Patcher
- NGIAB-CloudInfra >
- NGIAB-HPCInfra**
- NGIAB TEEHR Integration
- NGIAB Tethys Visualization Integration
- NGIAB Calibration
- NextGen Datastream >
- NextGen on CIROH JupyterHub
- Cyberinfrastructure and Community NextGen Office Hours
- Evaluation Tools >
- Data Management and Access Tools
- Snow Sensing and Modeling Tools
- Machine Learning and AI Tools
- Visualization and Analysis Tools
- CIROH Research Portal
- Community Flood Inundation Mapping
- Mobile Apps >

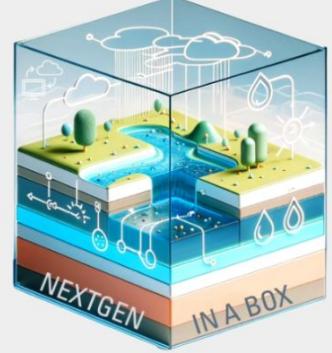
NOTE

Below content is rendered from <https://github.com/CIROH-UA/NGIAB-HPCInfra/blob/main/README.md>

NextGen In A Box (NGIAB)

Run the NextGen National Water Resources Modeling Framework locally with ease.

NGIAB provides a containerized and user-friendly solution for running the NextGen framework, allowing you to control inputs, configurations, and execution on your local machine.



Why NextGen In A Box?

Funding for this project was provided by the National Oceanic & Atmospheric Administration (NOAA), awarded to the Cooperative Institute for Research to Operations in Hydrology (CIROH) through the NOAA Cooperative Agreement with The University of Alabama (NA22NWS4320003).

NGIAB Data Preprocess and NextGen on CIROH JupyterHub i.e integrated with HydroShare

Working with HydroShare, AORC data, HydroFabric and NextGen on CIROH JupyterHub Tutorial

Authors: David Tarboton | Homa Salehabadi | Ayman Nassar | Furqan Baig | Anthony M. Castranova | Irene Garousi-Nejad | Arpita Patel
Owners: David Tarboton
Type: Resource
Storage: The size of this resource is 8.4 MB
Created: May 26, 2025 at 3:03 a.m.
Last updated: May 26, 2025 at 7:01 p.m.
Citation: See how to cite this resource

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Comments: No comments (yet)

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MATLAB Online

CUAHSI JupyterHub

CIROH JupyterHub

jupyterhub Home Token

Server Options

Small

5GB RAM, 2 CPUs

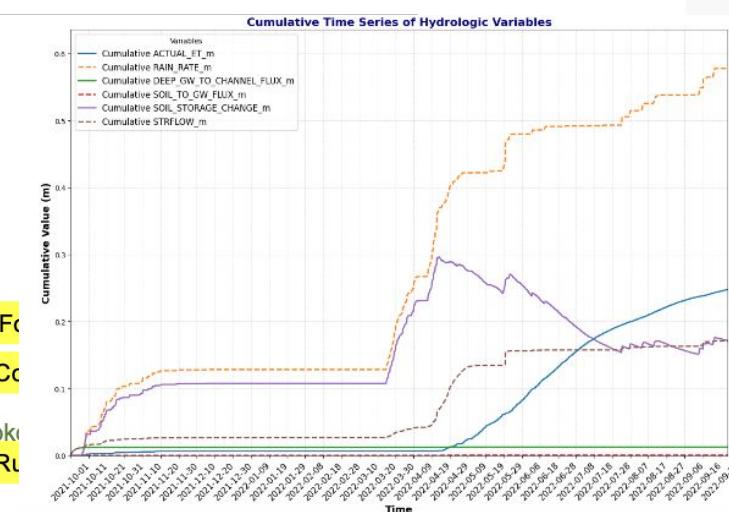
Image

NextGen National Water Model(NWM)

source /ngen/.venv/bin/activate Virtual environment
python -m nqiab data cli -i "gage-10109001" -s Hydrofabric
python -m nqiab data cli -i "cat-2861446" -s Hydrofabric

python -m nqiab data cli -i "cat-2861446" -f --start "2021-10-01" --end "2022-09-30" For
python -m nqiab data cli -i "cat-2861446" -r --start "2021-10-01" --end "2022-09-30" Co

/dmod/bin/ngen-serial config/cat-2861446_subset.gpkg all config/cat-2861446_subset.gpkg config/realization.json Run



FIM as a Service on CIROH JupyterHub

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- Community Hydrologic Modeling >
- Evaluation Tools >
- Data Management and Access Tools >
- Snow Sensing and Modeling Tools >
- Machine Learning and AI Tools >
- Visualization and Analysis Tools >
- CIROH Research Portal
- Community Flood Inundation Mapping
- FIM as a Service**
- FIM Evaluation Framework
- FIM Database for Multi-Model Visualization
- Mobile Apps >

FIM as a Service

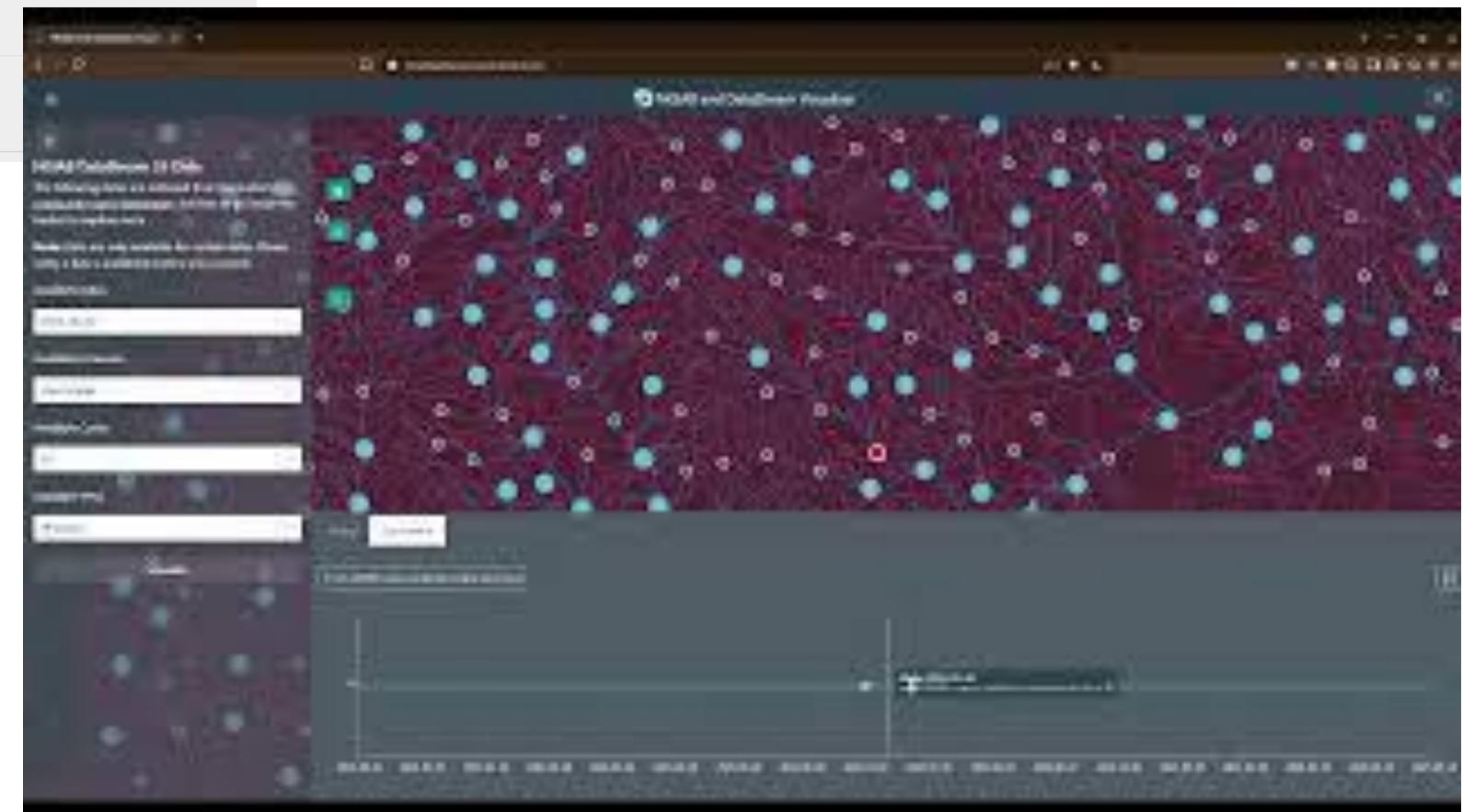
NOTE

Below content is rendered from <https://github.com/sdmlua/FIMserv/blob/main/README.md>

Flood Inundation Mapping Tool using the OWP HAND-FIM operational framework

release v0.1.0 issues 6 open License GPLv3 pypi package 0.1.81 downloads 26 Package Build and Test passing

OWP HAND-FIM 'as a service' (FIMserv)



FIM Visualizer

DEVCON 2025



Part 5: Outreach and Education

PORTAL

portal.ciroh.org



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CIROH Research Portal

The CIROH Research Portal, developed in collaboration with NOAA, provides tools aimed at advancing water forecasting, hydrologic modeling, and water quality analysis.

Publications

CIROH enhances U.S. hydrological forecasting in collaboration with NOAA, focusing on water events and quality through a consortium of diverse institutions. Explore this portal for research publications, applications, and datasets from the NOAA and CIROH

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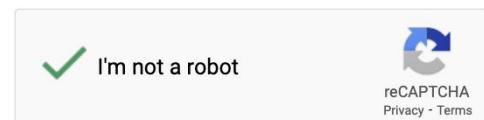
Article Identifier

10.1007/s00382-024-07550-2

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Publications!!

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Markert · da Silva · Ames · Maghami · Williams · Nelson · Halgren · Patel · Santos · Ames

Environmental Modelling & Software
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[10.1016/j.envsoft.2024.106123](https://doi.org/10.1016/j.envsoft.2024.106123)

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Climate Dynamics
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A Proof of Concept for Improving Estimates of Ungauged Basin Streamflow via an LSTM-Based Synthetic Network Simulation Approach

Ramírez Molina · Frame · Halgren · Gong

Journal of Geophysical Research: Machine Learning and Computation
doi
[10.1029/2024JH000405](https://doi.org/10.1029/2024JH000405)

JOURNAL ARTICLE
Published on 2025

Machine Learning for a Heterogeneous Water Modeling Framework

Frame · Araki · Bhuiyan · Bindas · Rapp · Bolotin · Deardorff · Liu · Haces-Garcia · Liao · Frazier · Ogden

JAWRA Journal of the American Water Resources Association
doi
[10.1111/1752-1688.70000](https://doi.org/10.1111/1752-1688.70000)

JOURNAL ARTICLE
Published on 2024-12-12

On the predictability of turbulent fluxes from land: PLUMBER2 MIP experimental description and preliminary results

Abramowitz · Ukkola · Hobechi · Cranko · Page · Lipson · De Kauwe · Green · Brenner · Frame · Nearing · Clark · Best · Anthoni · Arduini · Boussetta · Calderaru · Cho · Cuntz · Fairbairn · Ferguson · Kim · Kim · Knauer · Lawrence · Luo · Malyshov · Nitta · Ogee · Oleson · Ottié · Peiyin · de Rosnay · Rumbold · Su · Vuichard · Walker · Wang-Faivre · Wang · Zeng

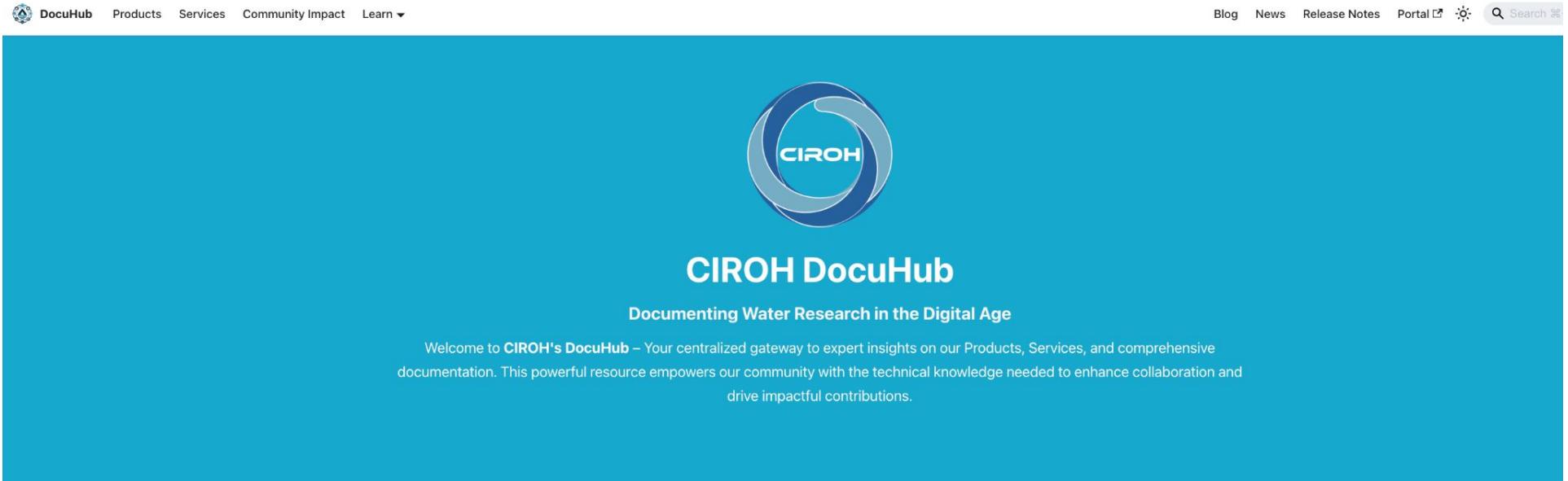
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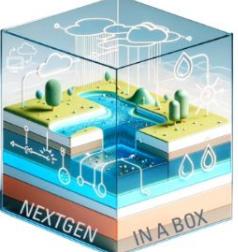
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DEVCON 2025

DOCUHUB est. 2022



The screenshot shows the CIROH DocuHub homepage with a teal header bar. The header includes navigation links for DocuHub, Products, Services, Community Impact, Learn, and a search bar. Below the header is a large teal section featuring the CIROH logo, the text "CIROH DocuHub", and "Documenting Water Research in the Digital Age". A welcome message is present, followed by three callout boxes at the bottom: "NextGen In A Box" (with an illustration of a 3D cube containing hydrological models), "AWS" (with the AWS logo), and "Google Cloud" (with the Google Cloud logo).



NextGen In A Box
Utilize NextGen In A Box (NGIAB) to locally run NextGen framework. Choose specific regions or



AWS
Leverage the power of CIROH AWS Account to elevate your hydrological research. Get access to enterprise-level AWS cloud platform, and utilize AWS computing resources and scalable storage for



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- IT Services Documentation



Policy Documents

Essential guidelines and policies

- CIROH Data and Code Sharing Policies
- Technical guidance for including models and modules in NextGen

DocuHub

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Policies and Best Practices
Data and Code Sharing
[NextGen Framework](#)

Home > [NextGen Framework](#)

Technical guidance for the inclusion of models/modules in the NextGen Water Resources Modeling Framework

Authors: Fred Ogden, Nels Frazier, Keith Jennings, Jonathan Frame, Wouter Knoben, Tadd Bindas, Yalan Song, Irene Garousi-Nejad, Jeffrey Carver, Andy Wood, Anthony Castranova, Arpita Patel, Shahabul Alam, Sifan A. Koriche, Junwei Guo, Cyril Thébault, Raymond J. Spiteri, Ahmad J. Khattak, James Halgren, Patrick J. Clemins, Mukesh Kumar, and Martyn Clark

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Sheargrub Added release notes (#400) d4d2fee · 2 days ago 1,381 Commits

- .devcontainer added devcontainer 2 months ago
- .github Revert "Full revert to raw HTML" last month
- blog Updated blog tags for NGIAB 4 days ago
- docs Small formatting tweak 2 days ago
- plugins Added custom plugin to get blog metadata 7 months ago
- release-notes Update release-notes/2025-05-22-release.mdx 3 days ago
- src added subtitle to main page 5 days ago
- static correct image names and paths 3 days ago
- .DS_Store Added documentation for FIM Database for Multi-Model ... 4 days ago
- .gitignore remove .idea jetbrains configs 3 days ago
- .pullrequestignore Create .pullrequestignore 3 years ago
- GitVersion.yml initial commit after fork from AWI 3 years ago
- README.md Update README.md 2 months ago
- babel.config.js Initial Commit 3 years ago
- docusaurus.config.js Remove duplicate tagline 5 days ago
- package-lock.json Added march 2025 news updates 2 months ago
- package.json Place tables within collapsible buttons 2 months ago
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CSS 13.0% TypeScript 1.1%

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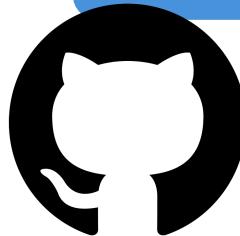
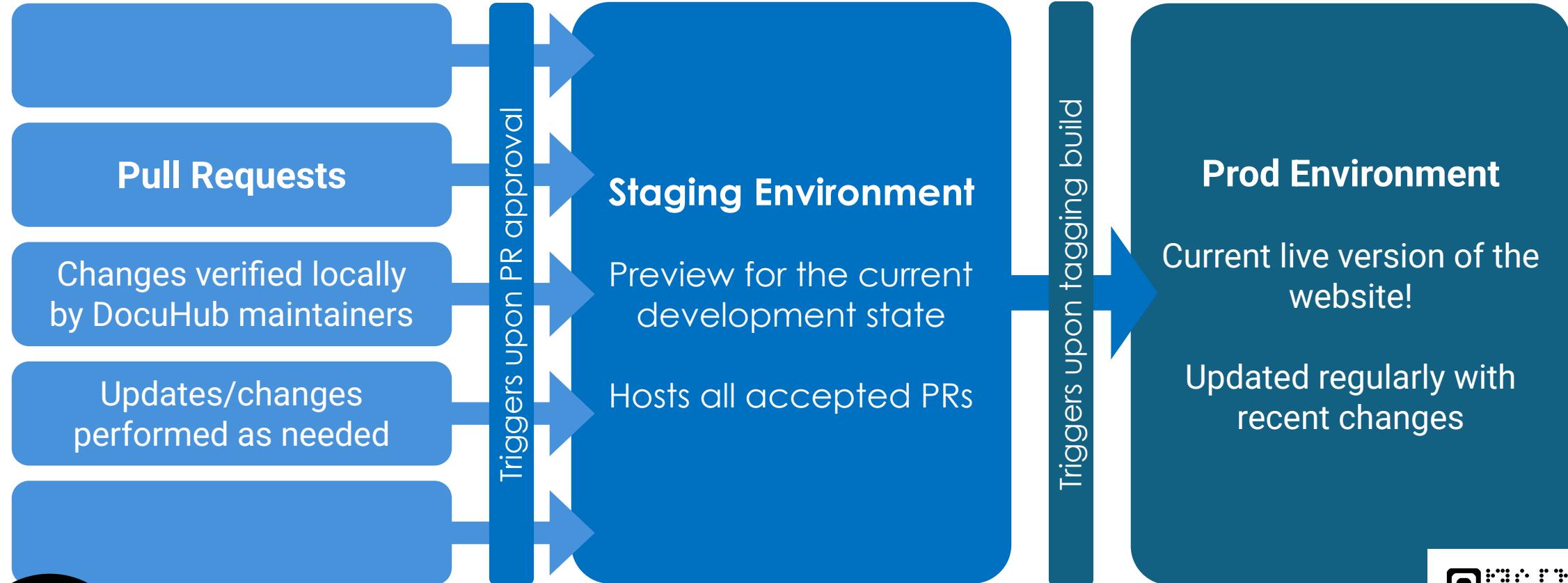
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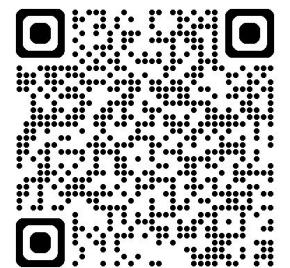
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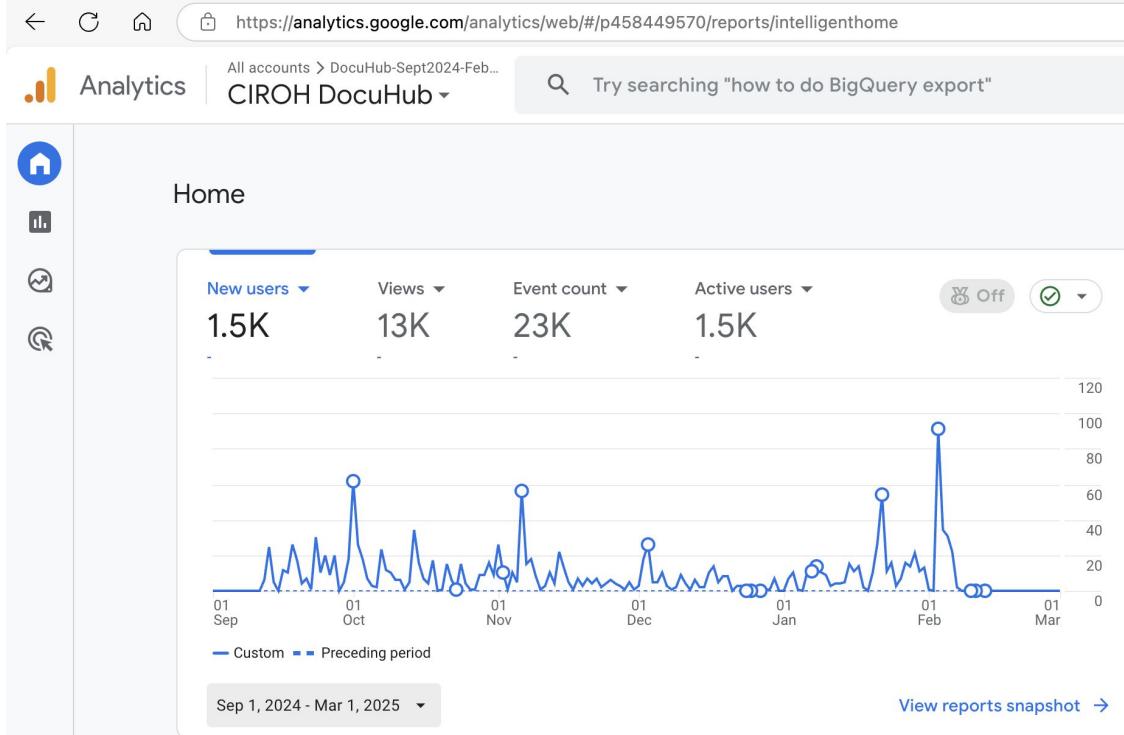
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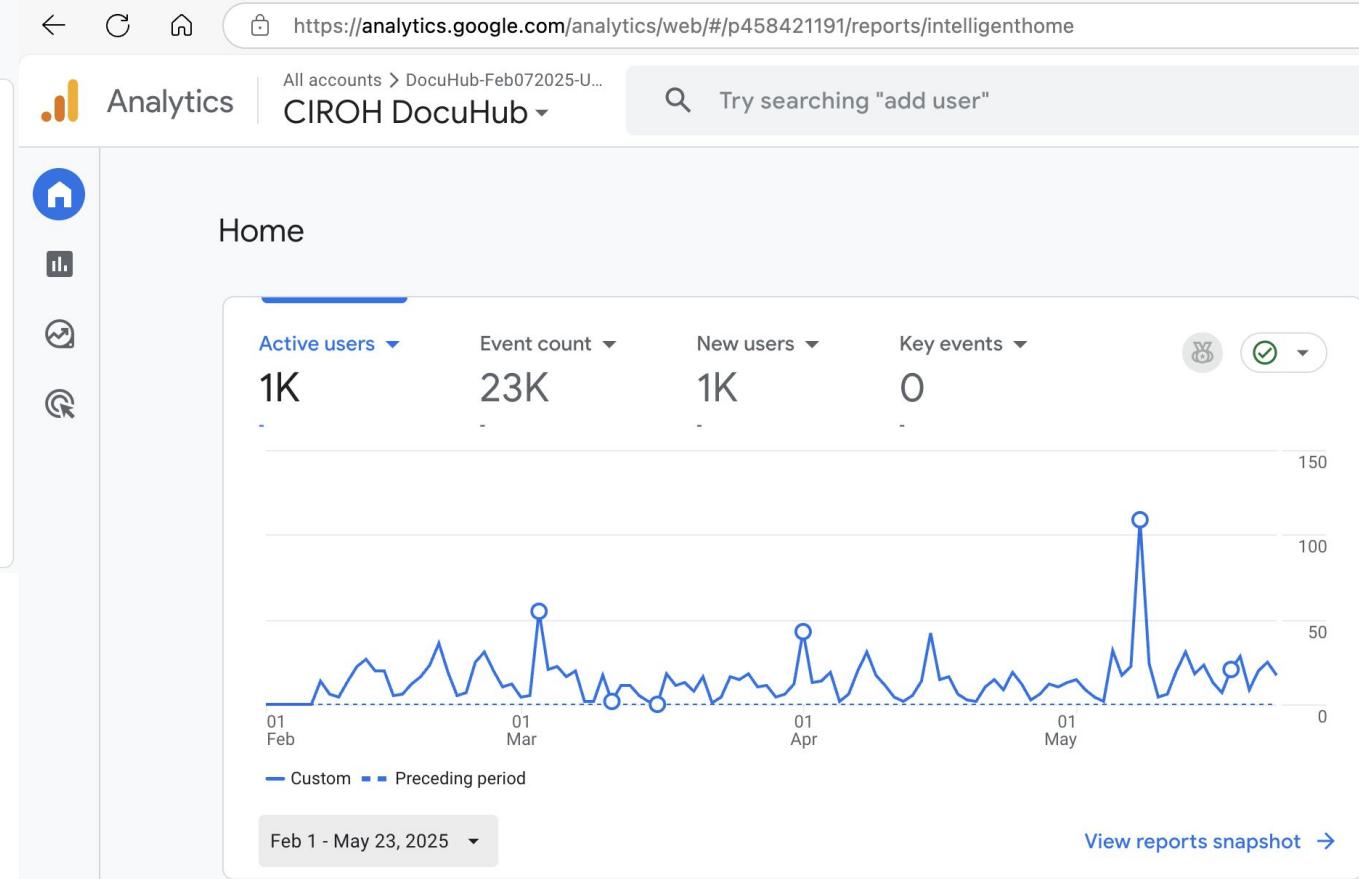
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4

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and educational
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HYDROLOGY MODELING

- Community NextGen, NGIAB, Evaluation, Visualization
- Calibration, DataStream, Community FIM

3

Modeling frameworks
for hydrologic
simulations

DATA & APPLICATIONS

- Portal, HydroShare, AWS S3, On-Prem Storage

2

Data storage and
sharing platforms
for research data

INFRASTRUCTURE

- GitHub, DockerHub, Cloud - AWS, GoogleCloud, 2i2c JupyterHub
- On-premise: Pantarhei, Wukong, OpenStack, NSF ACCESS

1

Cloud and on-premises
services and collaboration
tools for development

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apatel54@ua.edu