Cooperative Institute for Research to Operations in Hydrology (CIROH)

CIROH DevCon 2025

CIROH Hydroinformatics
& Research
Cyberinfrastructure
Tools & Technologies

Accelerating Hydrologic Research
Across 28 institutions

Dan Ames
BYU
Professor

Arpita Patel
AWI – UA - DevOps Manager &
Enterprise Architect

2025 CIROH Developers Conference sponsors:

CIROH 2024 Productivity Measures

82
Published Journal Articles

132
User-Inspired Projects

454
Faculty and Research Staff

58
New Data Sets

35
States Directly Benefitting from Research Products

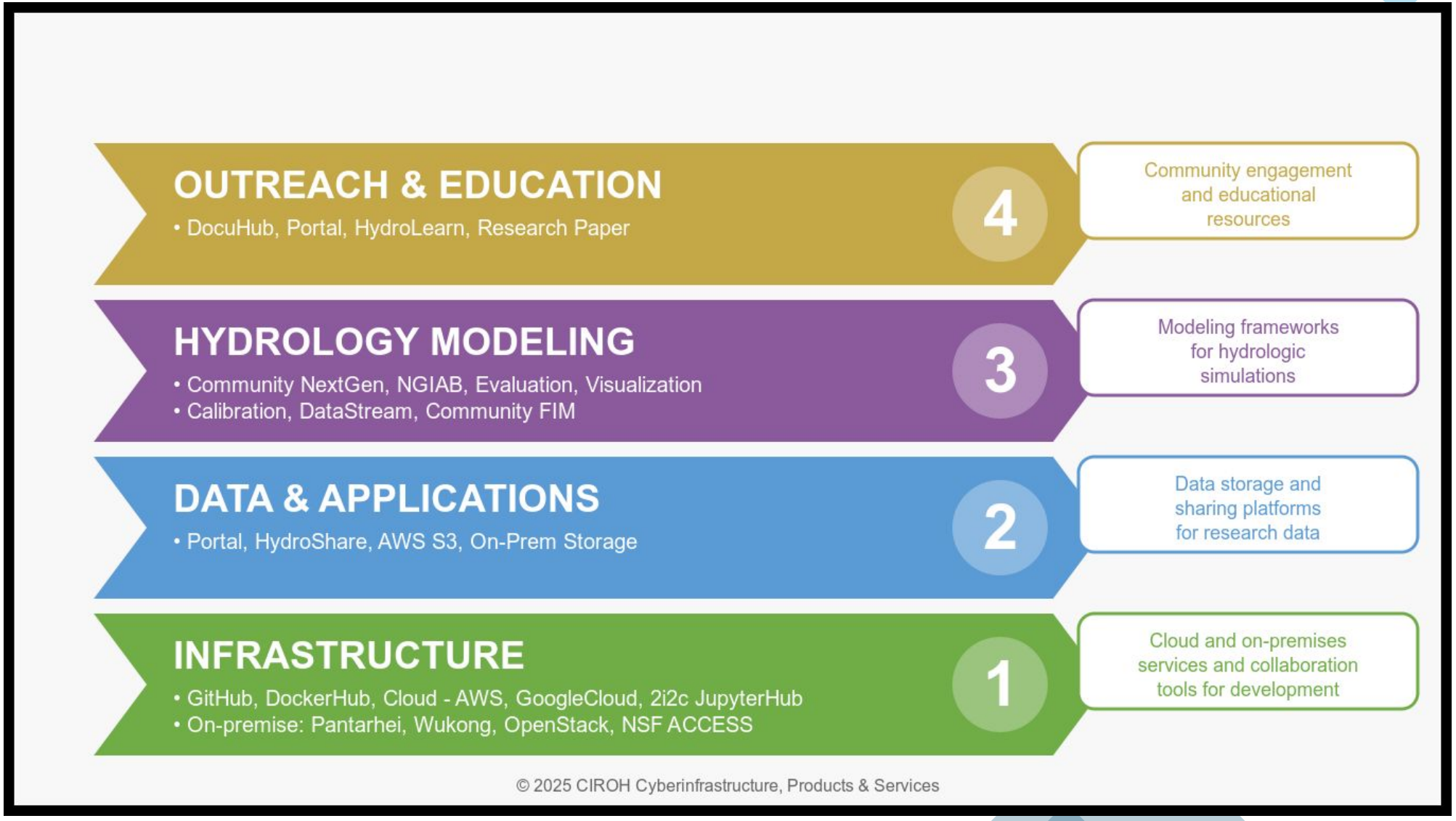
185
Post Docs and Graduate Students

605
Presentations

$113M
Research Funding

93
New Software Tools/Systems

What CIROH Offers You!



DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

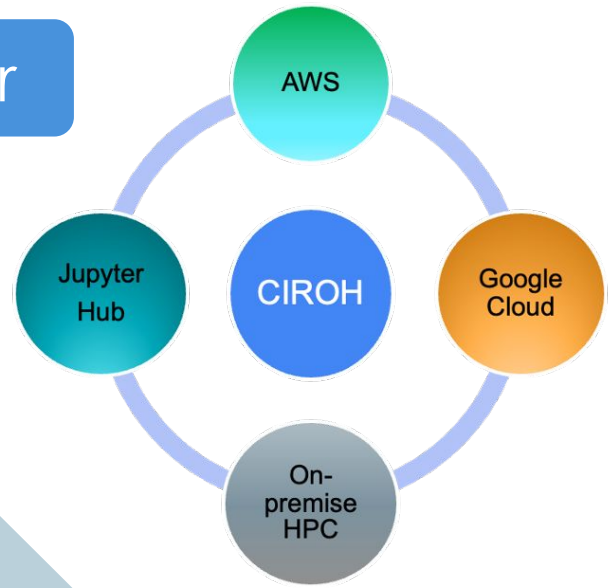
Part 1: CIROH Cyberinfrastructure DevOps

CIROH Cyberinfrastructure DevOps Team

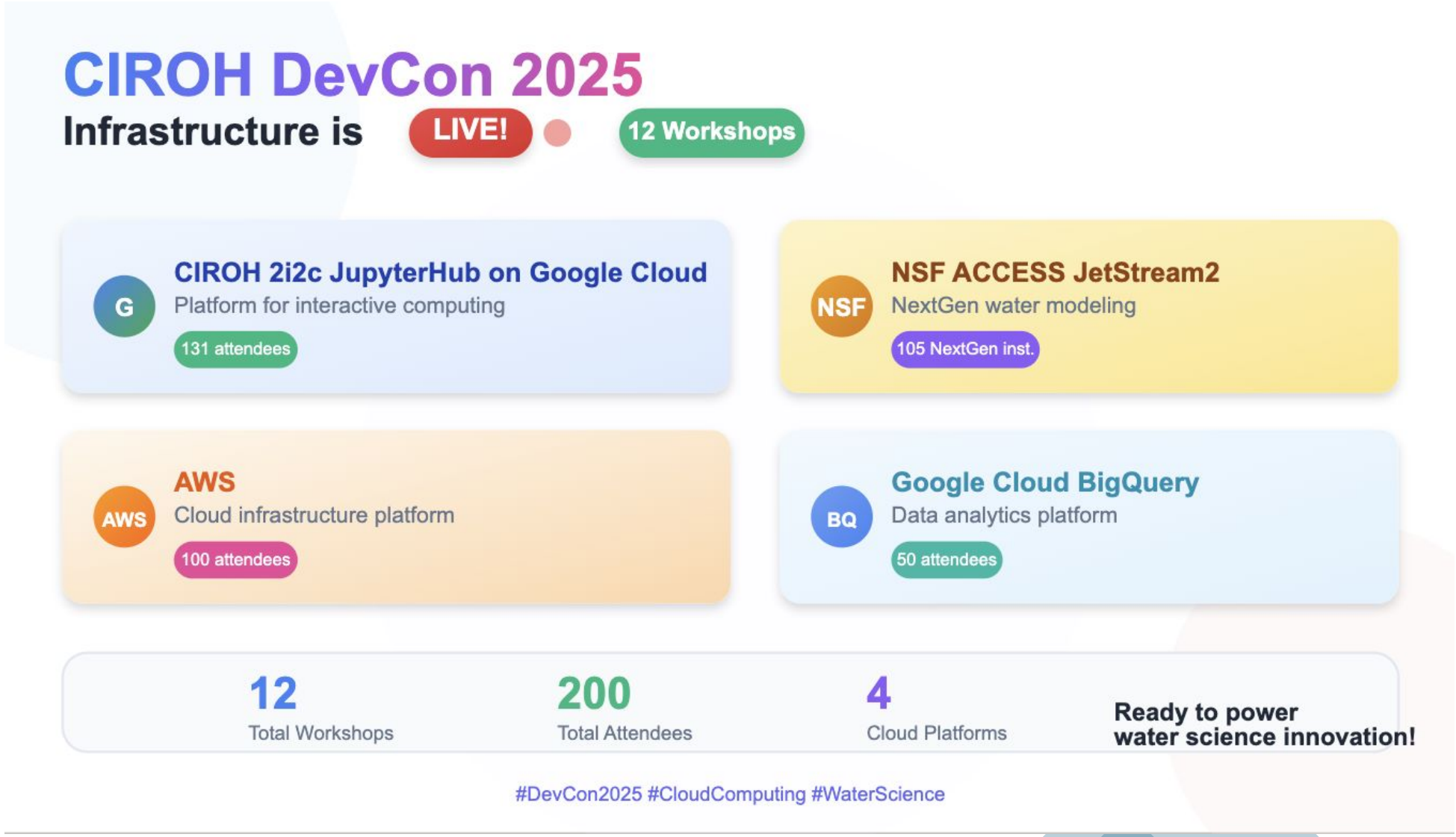
Cooperative Institute for Research to Operations in Hydrology

Partners

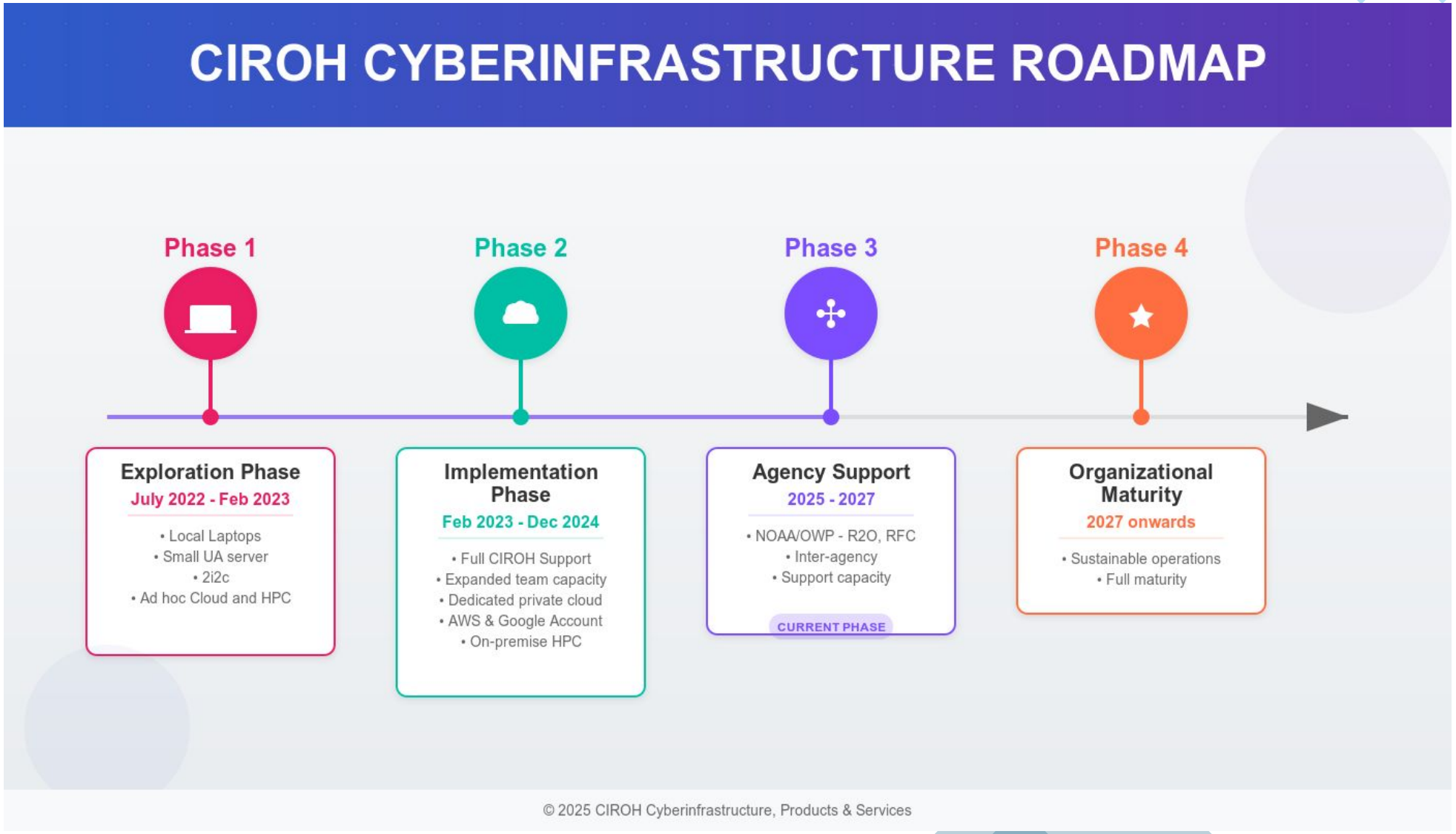
UA OIT	
2i2c	
Google Cloud	Sponsor
AWS	Sponsor
Microsoft Azure	
NSF	



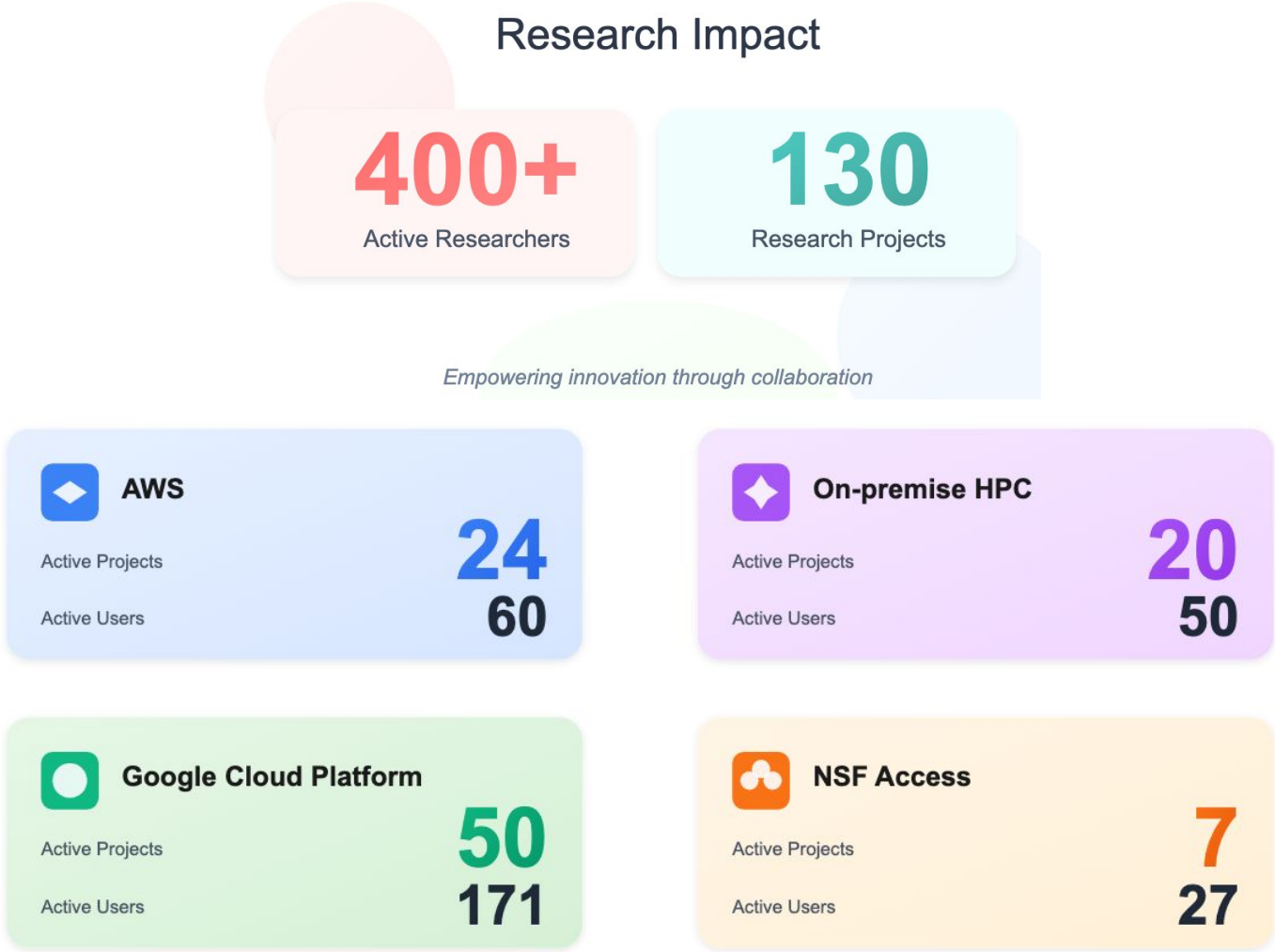
DevCon IT Support



How did we get here?



CIROH Cyberinfrastructure (CI)



Key Projects using CIROH CI

Other Projects deployed on CIROH AWS via Tethys Portal

Cooperative Institute for Research to Operations in Hydrology

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

Cooperative Institute for Research to Operations in Hydrology

Key Initiatives

DevCon
2023, 2024, 2025

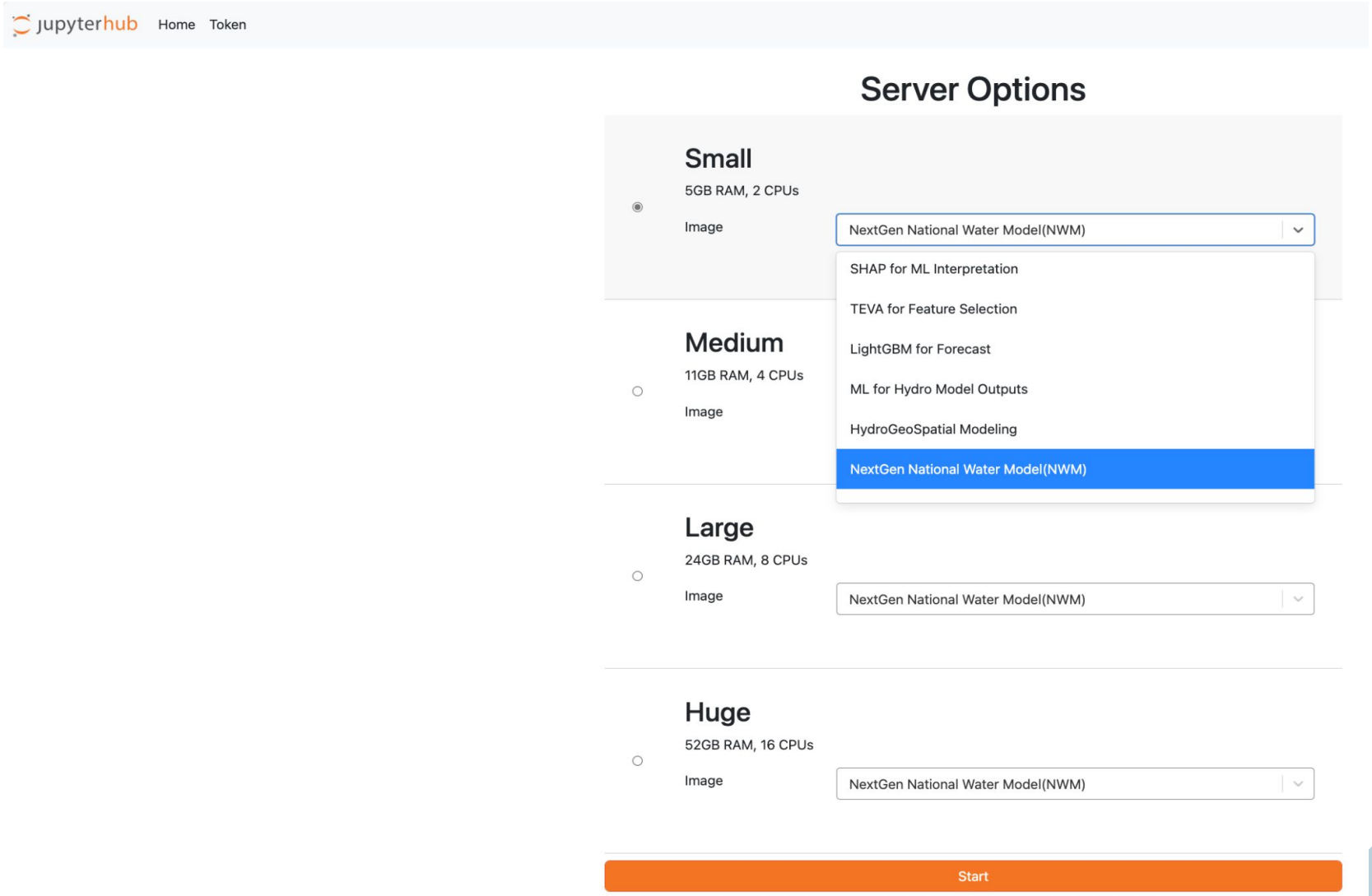
Education Programs
Summer Institute 2024, 2025
REU 2024, 2025

Various CIROH Projects
Research & Development Initiatives

User Support

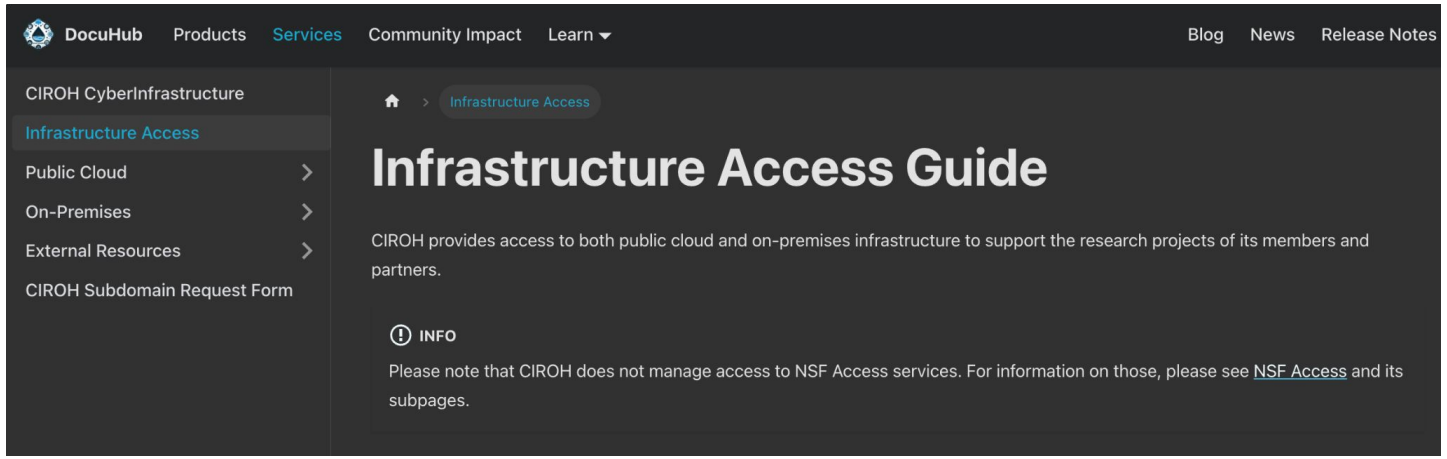
- AWS Office Hours
- Slack and Email Support
- DocuHub Monthly Blog and News Updates

CIROH JupyterHub Images



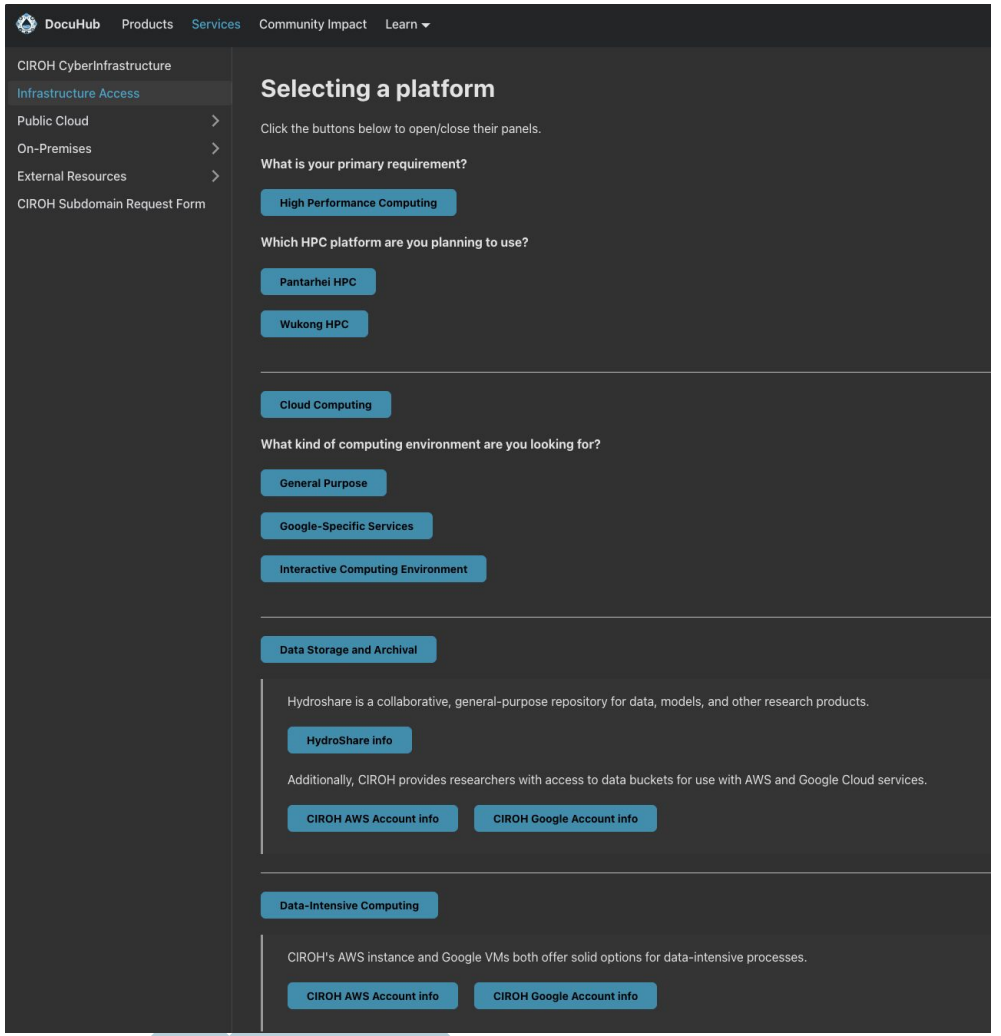
Available to any CIROH researcher (free)

How to get access?



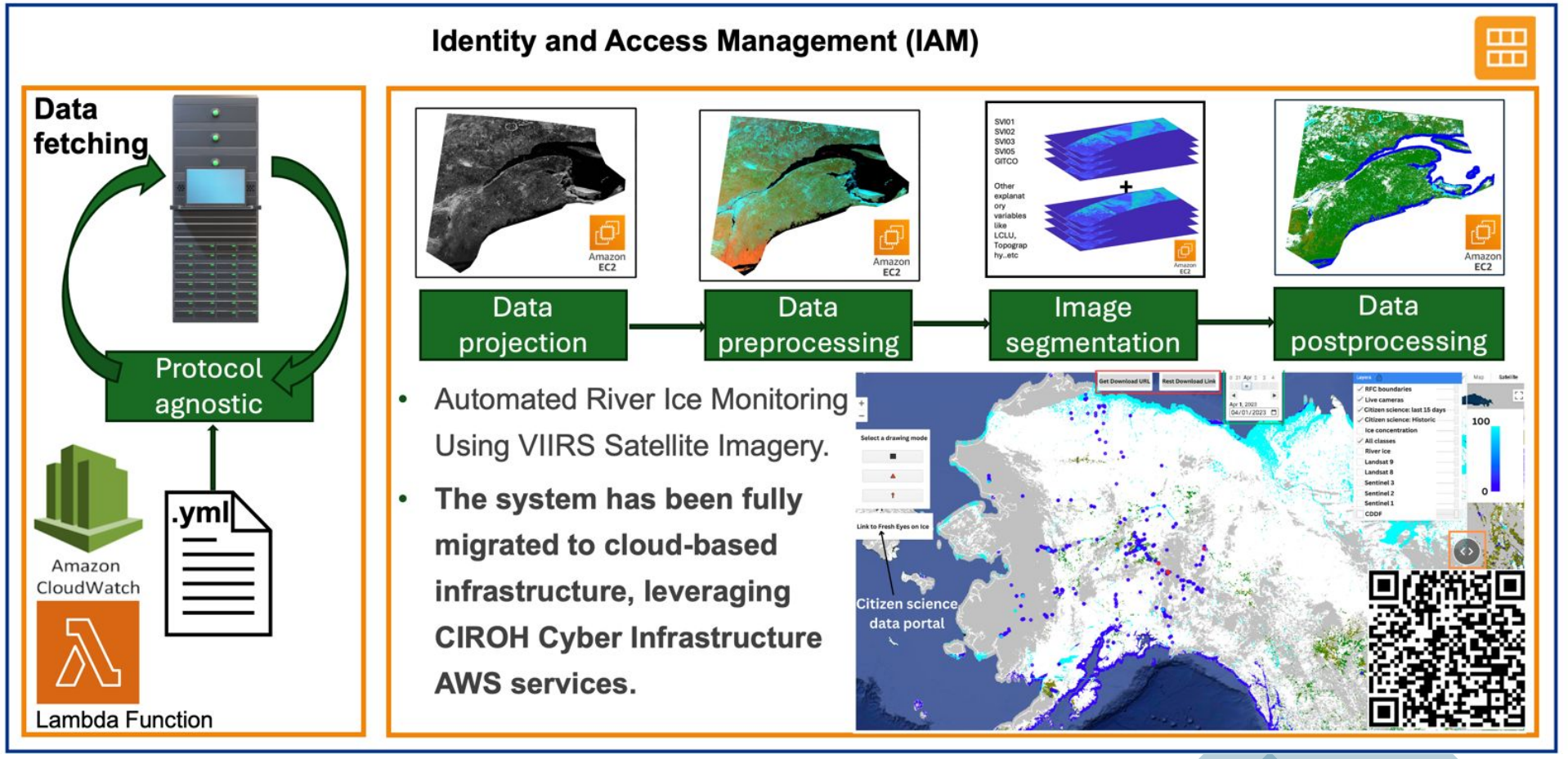
1. docs.ciroh.org

2. Go to “Services”



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

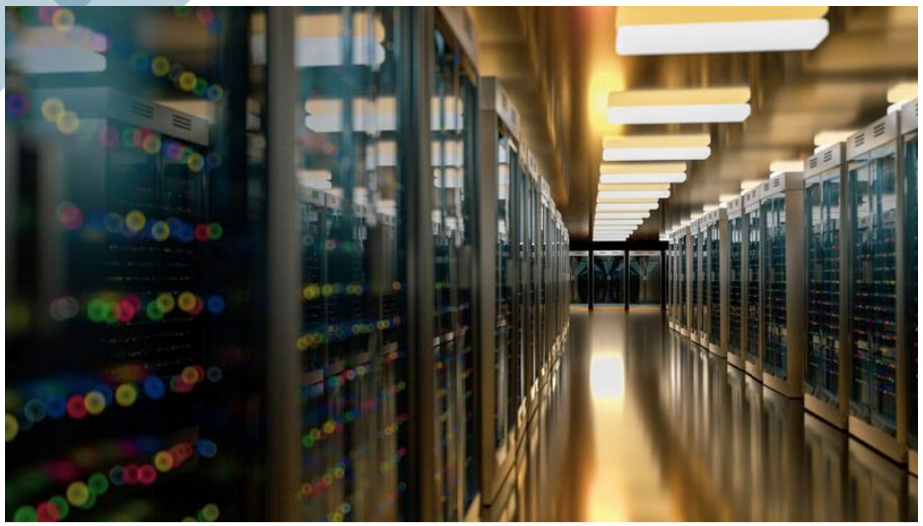


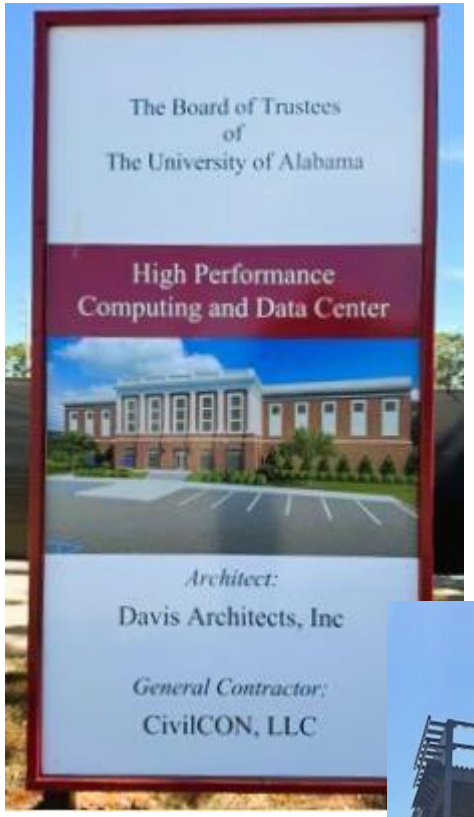
DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

Part 2: UA HPC Update

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





Opens
January
2027

High Performance Computing and Data Center Construction Ready to Begin

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

Twitter Facebook LinkedIn Email

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.

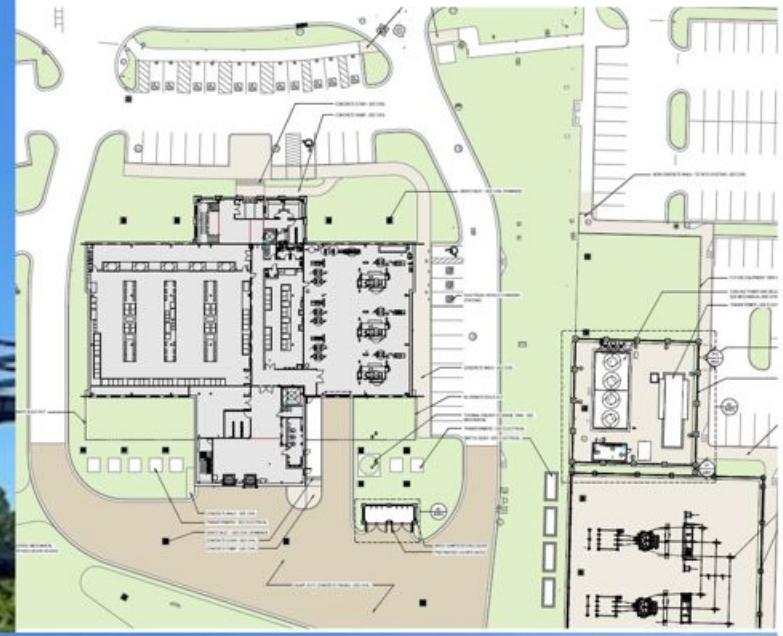
hpc.ua.edu

NSF

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

ALABAMA GREAT SEAL

UA HPC Facility



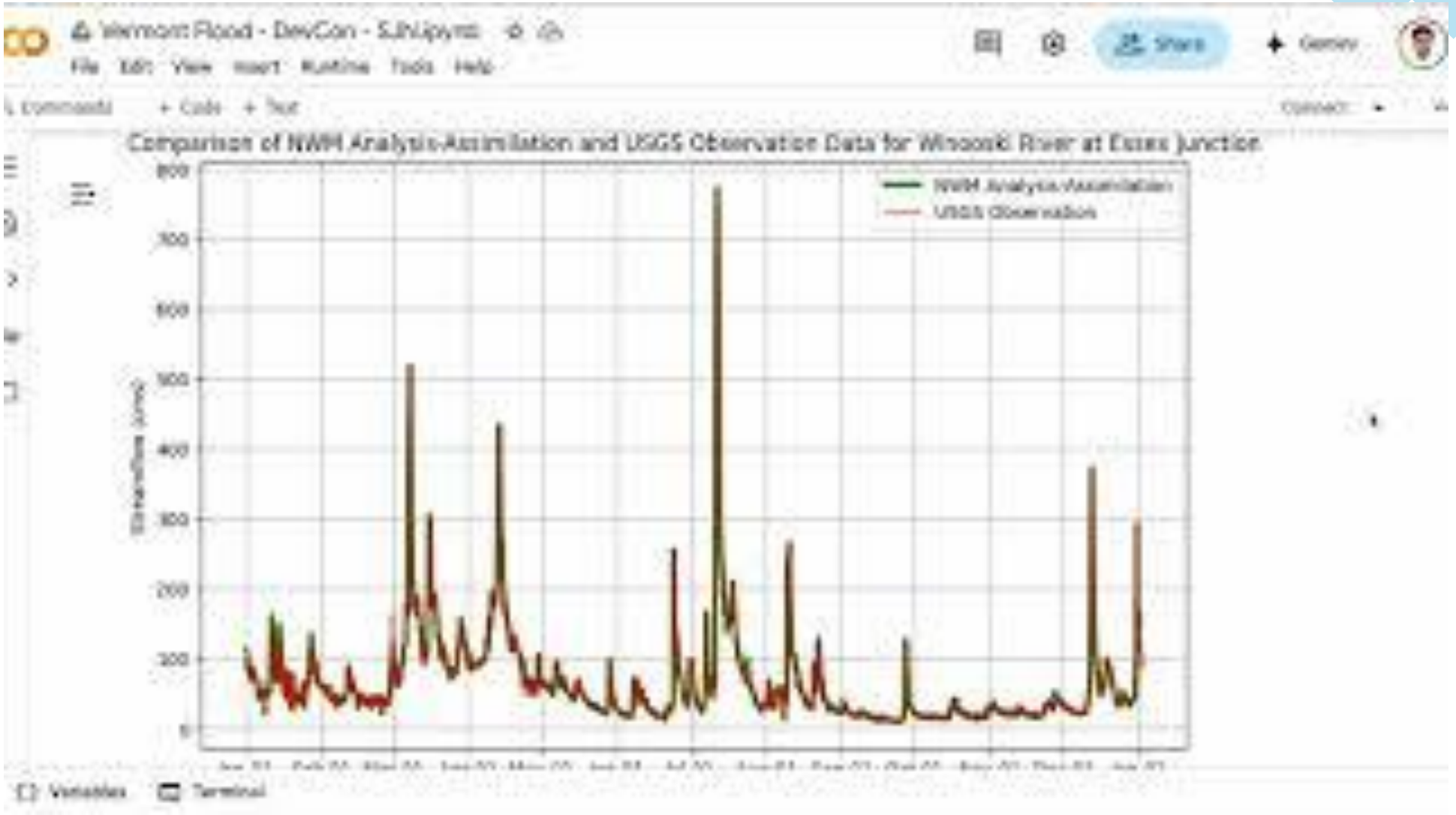
DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

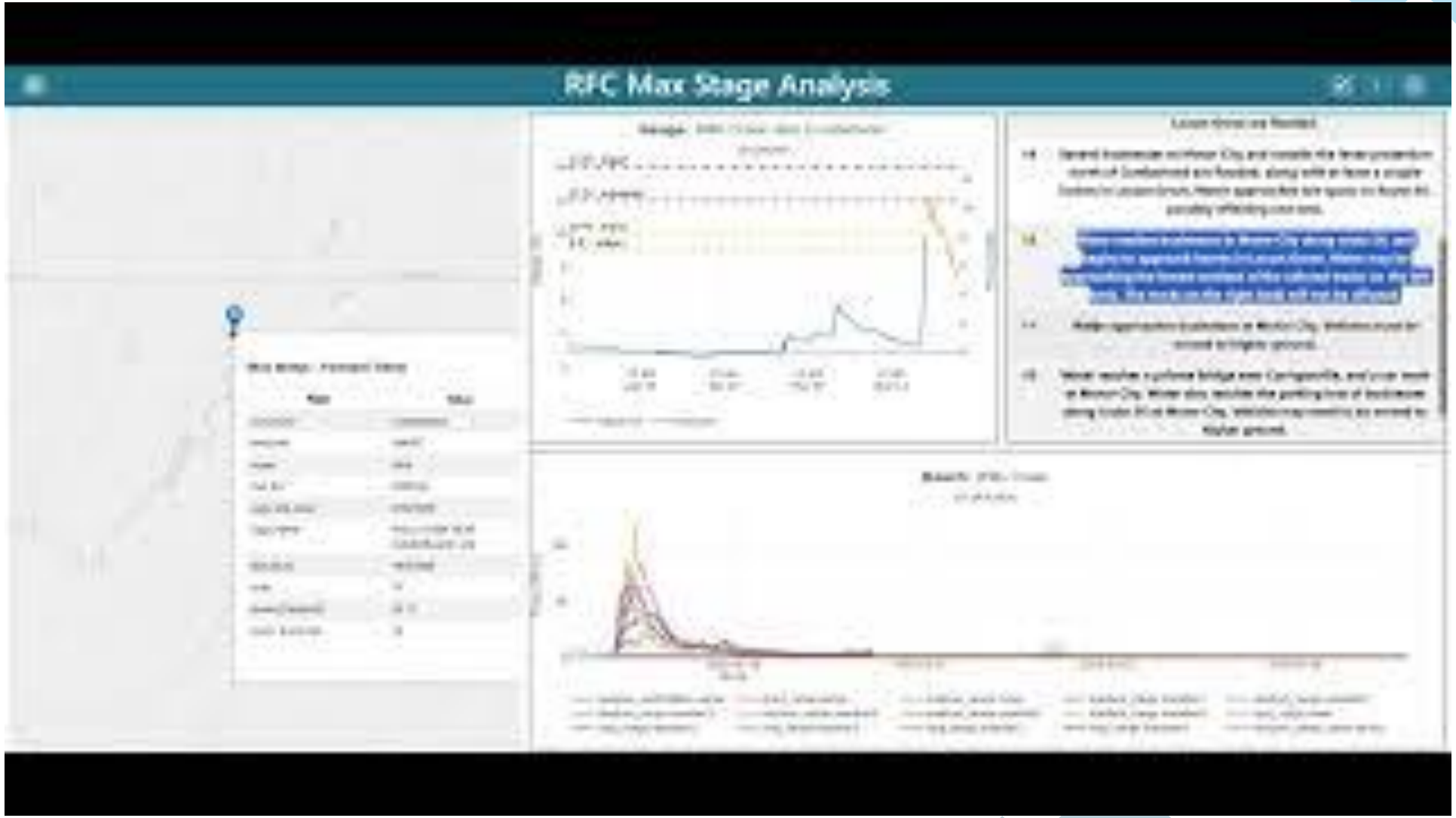
Part 3: DATA & APPLICATIONS

DEVCON 2025 - NWM BIGQUERY API

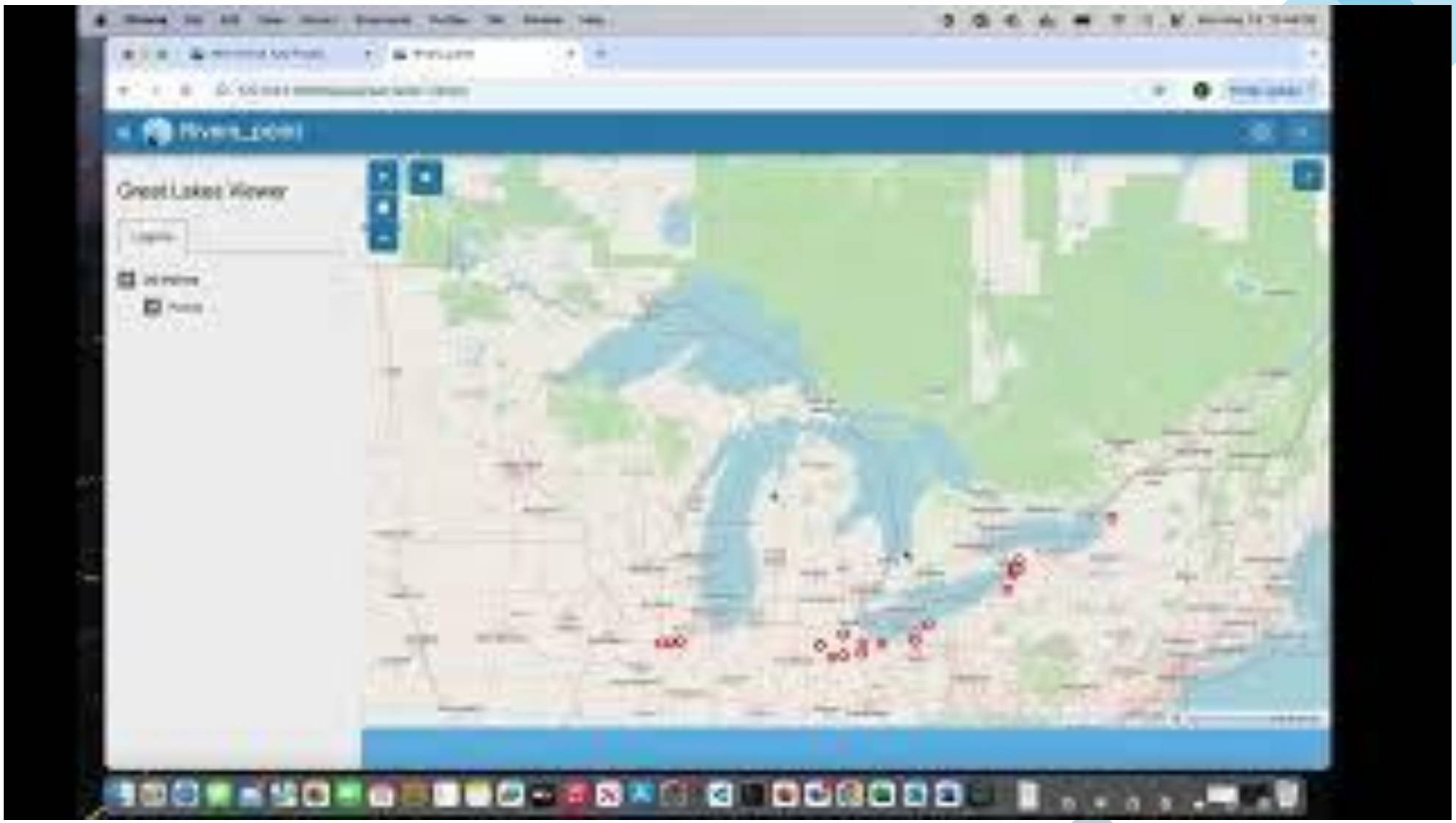
DEVCON 2025


Vermont Flood - DevCon - Jupyter
File Edit View Insert Runtime Tools Help
Share
Gemini
+ Code + Text
Comparison of NWM Analysis-Assimilation and USGS Observation Data for Winooski River at Essex Junction
NWM Analysis-Assimilation
USGS Observation
800
700
600
500
400
300
200
100
0
Variables
Terminal

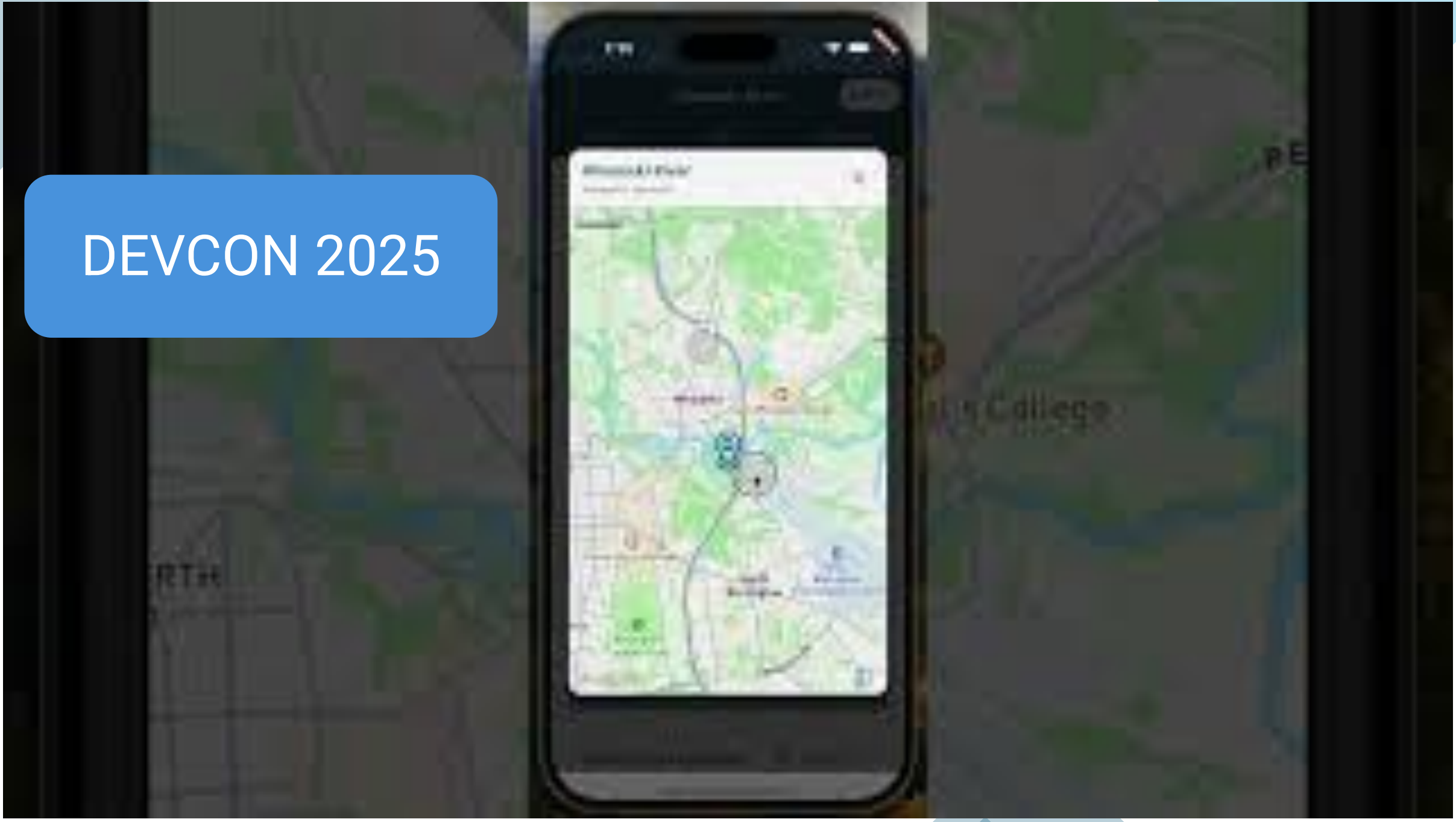
DEVCON 2025 - TETHYS APP



DEVCON 2025 - RIVERS_POINTS

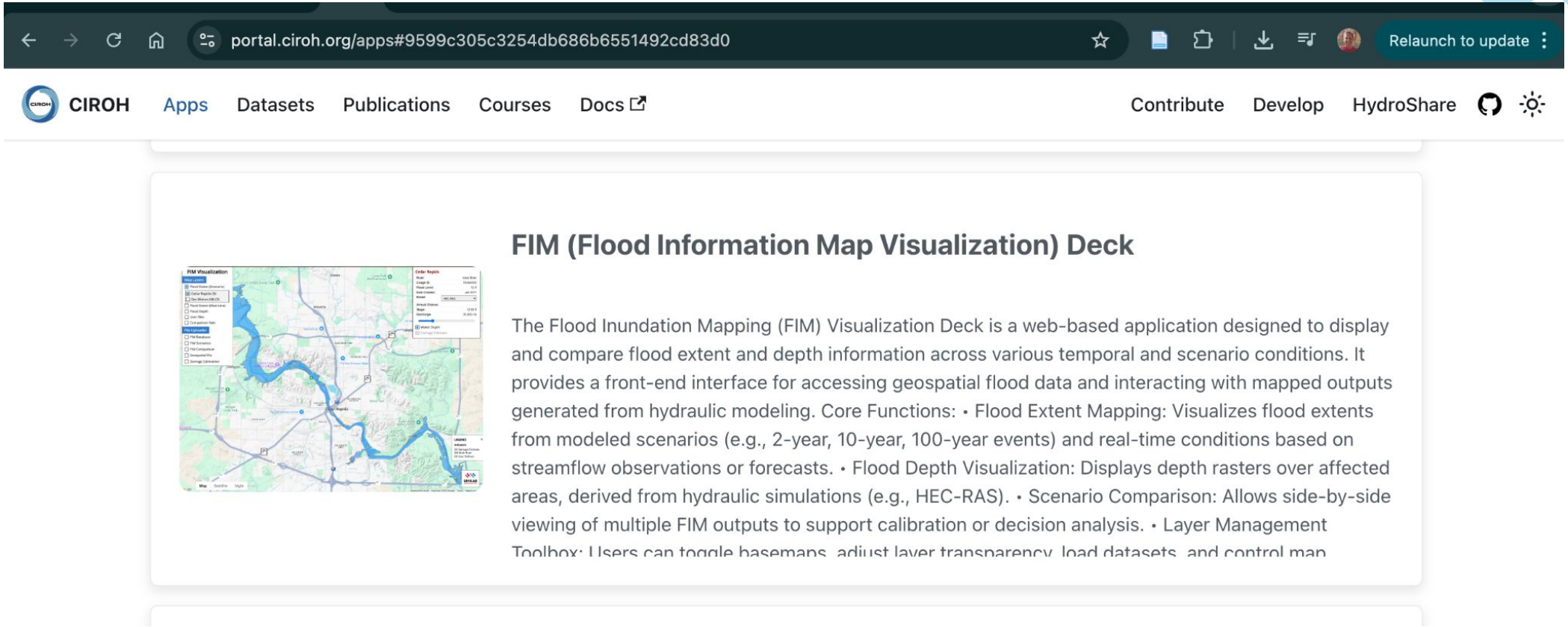


DEVCON 2025 - RIVERS_POINTS


DEVCON 2025

DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

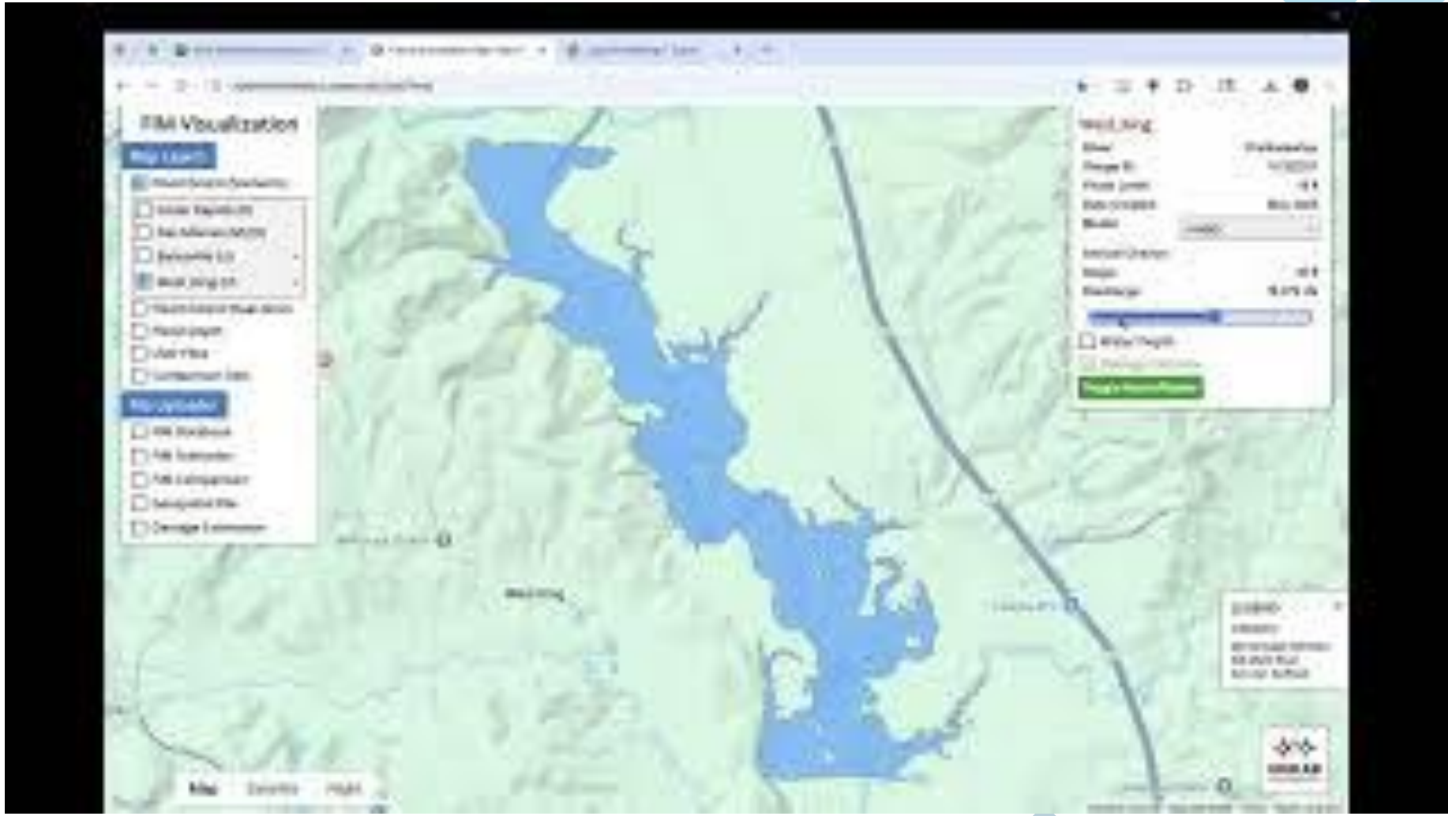


FLOOD IMPACT MAP COMMON DATABASE

DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

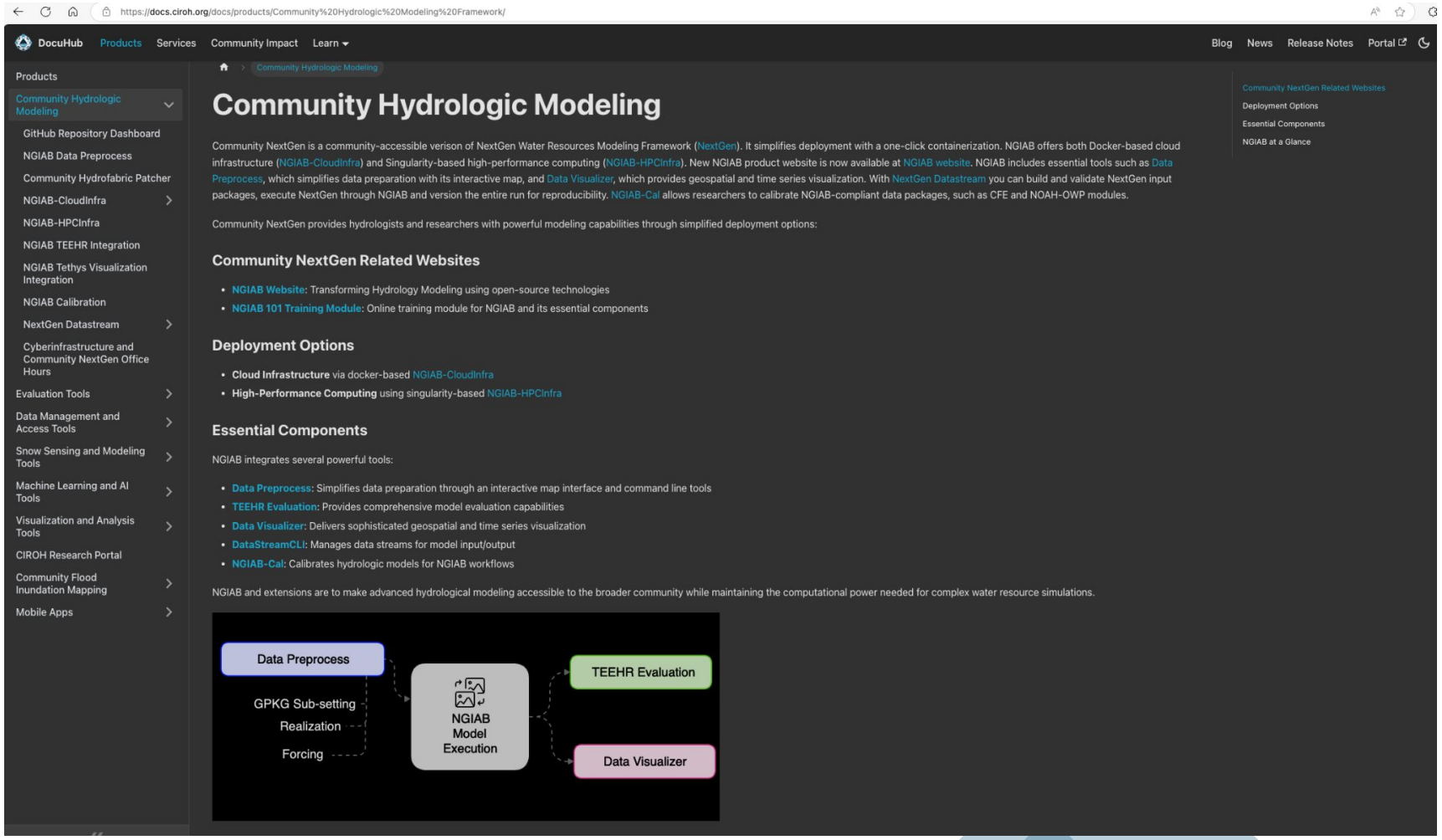
FIM Visualizer



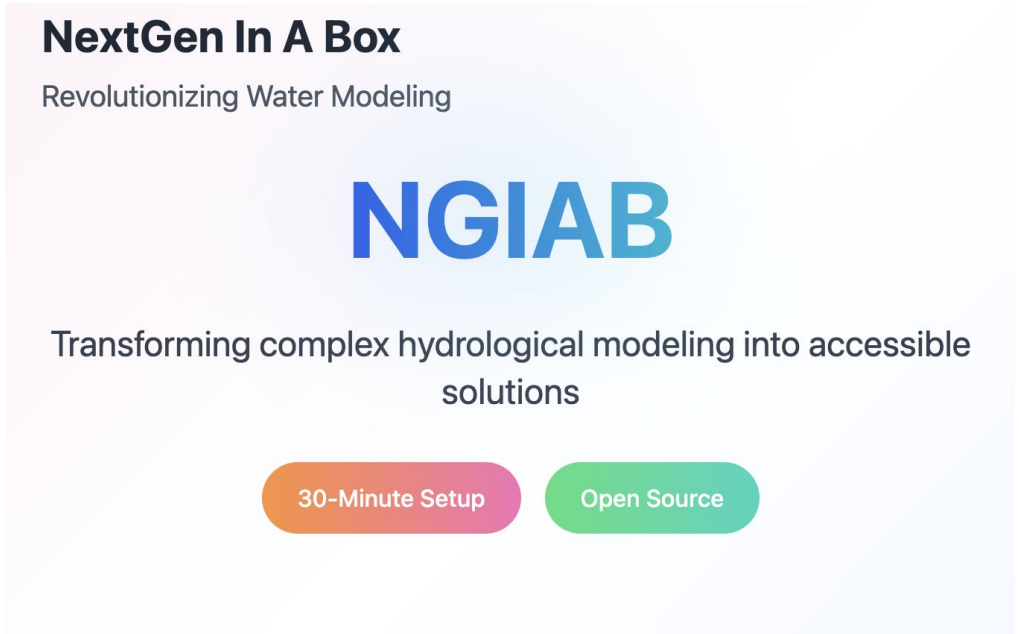
DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

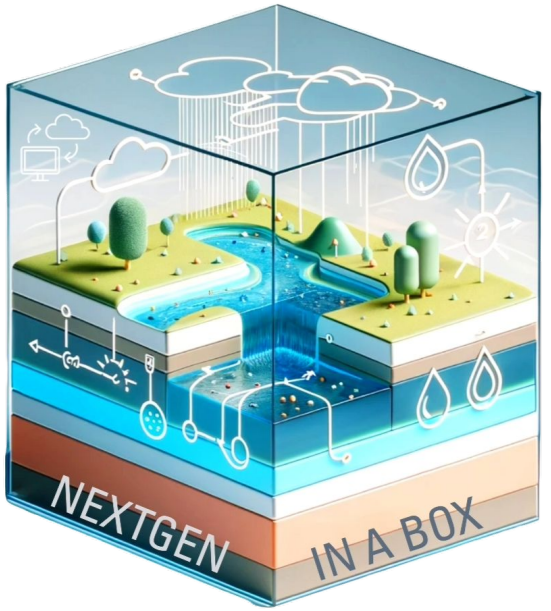
Part 4: Hydrology Modeling

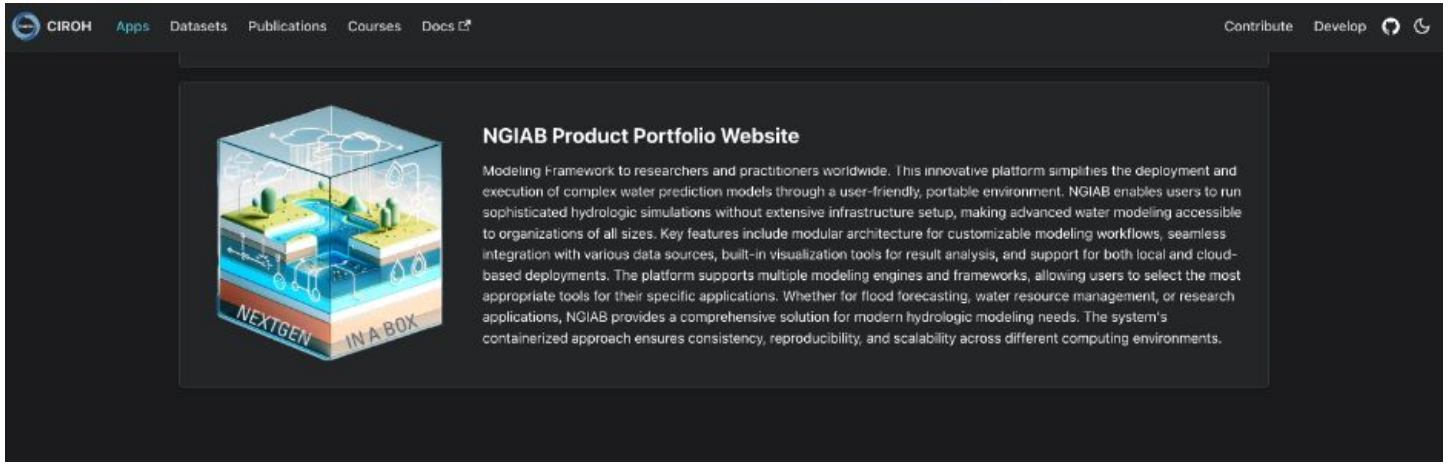


NEW!! NGIAB portfolio website



ngiab.ciroh.org

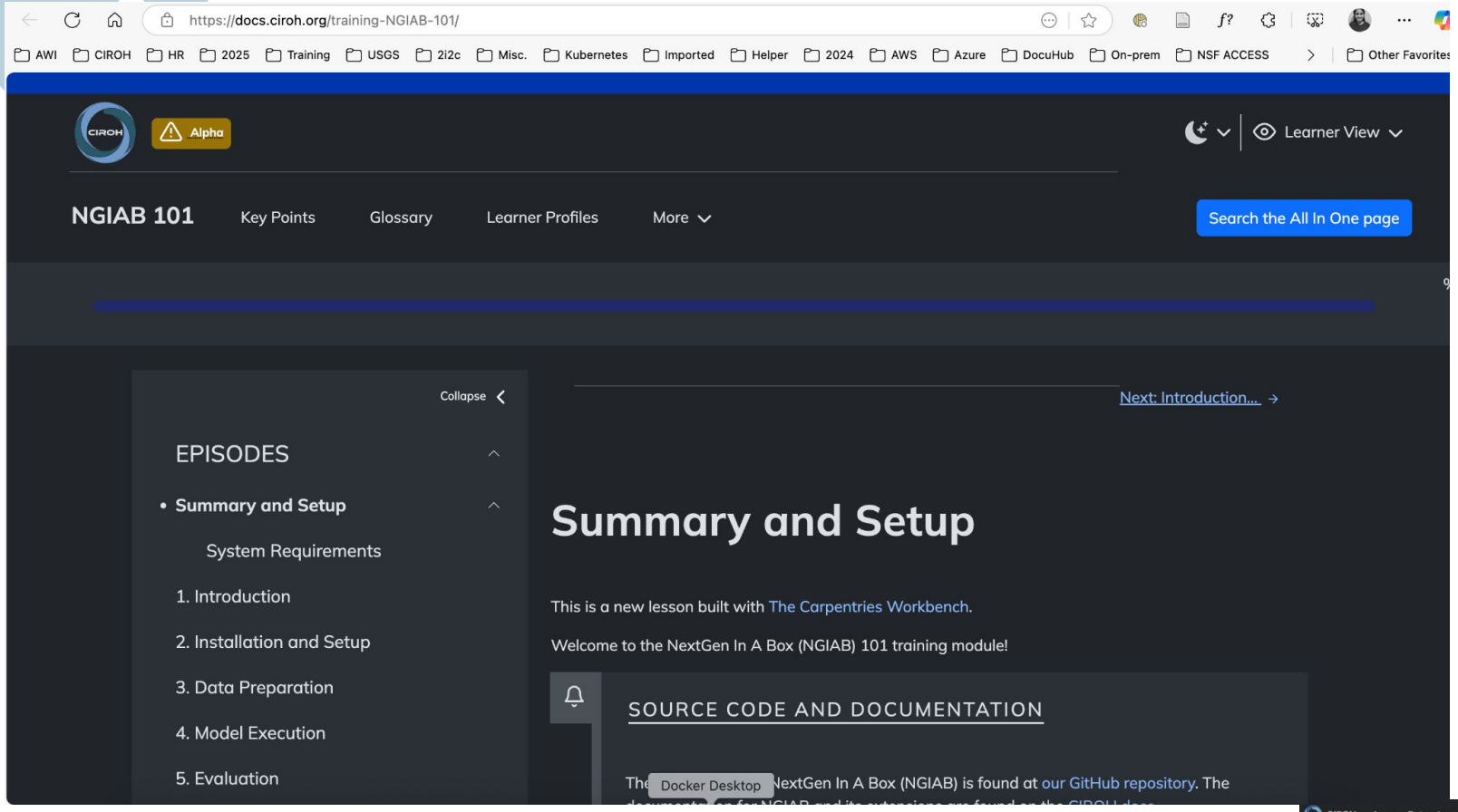


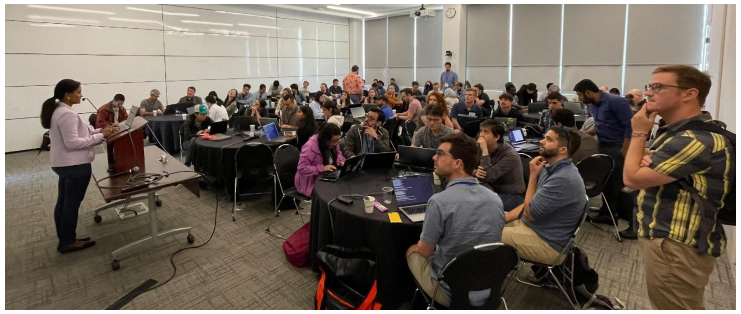


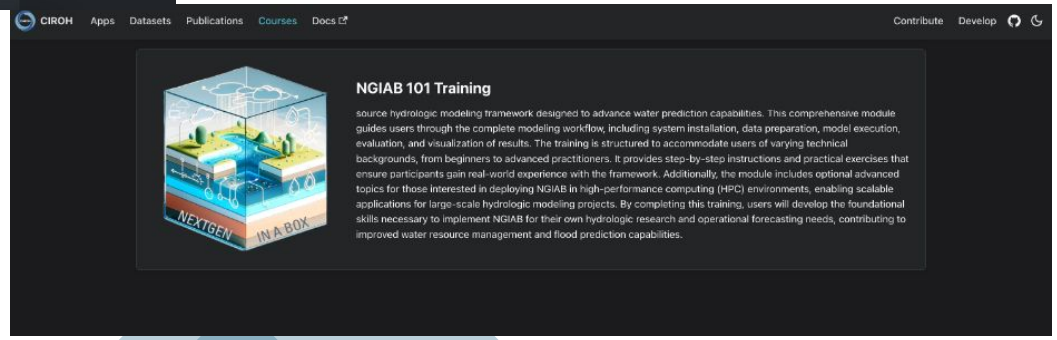
DEMO

NEW!! NGIAB 101 Training Module

Cooperative Institute for Research to Operations in Hydrology

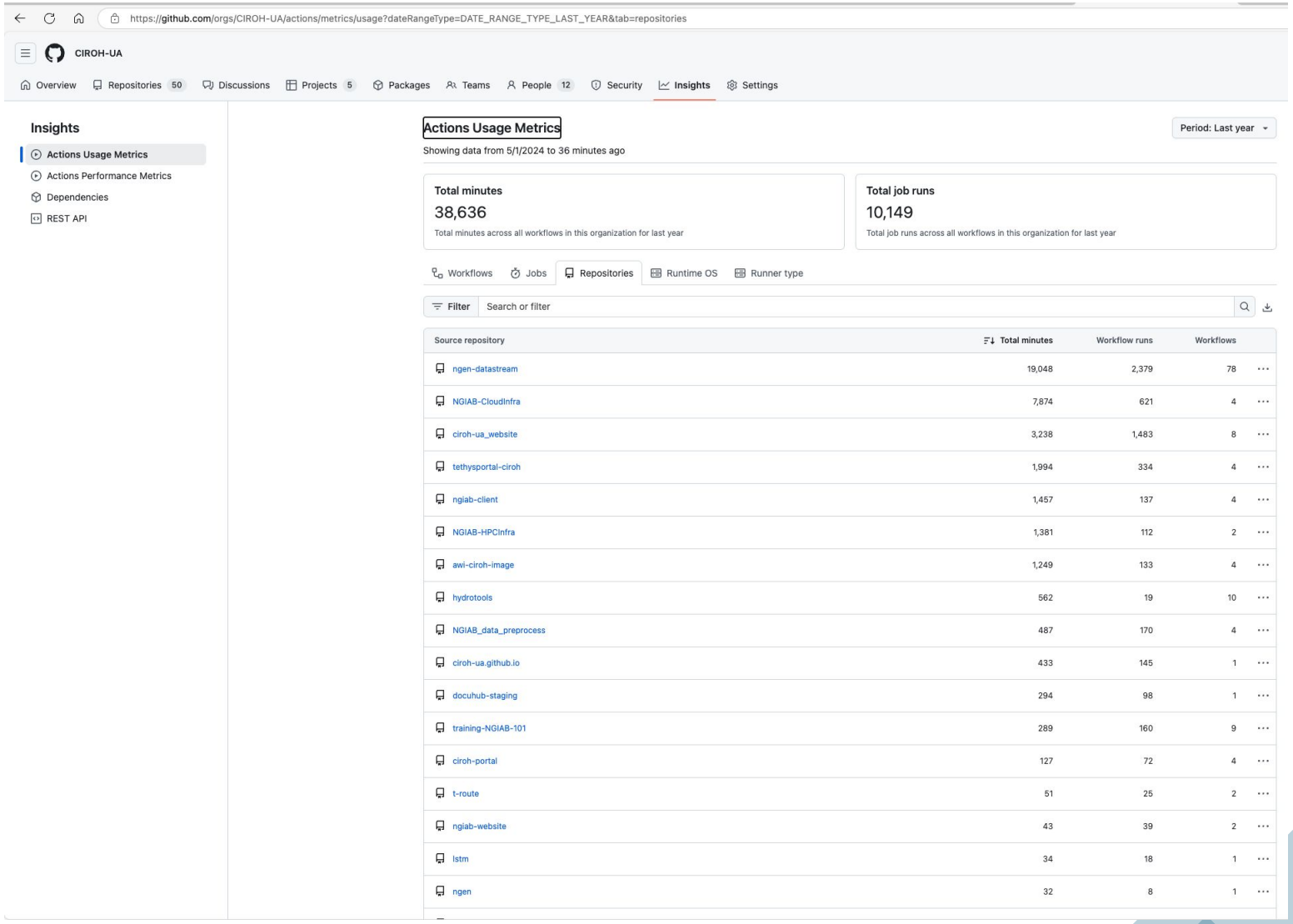






CIROH-UA GitHub Actions Usage Metrics

Cooperative Institute for Research to Operations in Hydrology



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

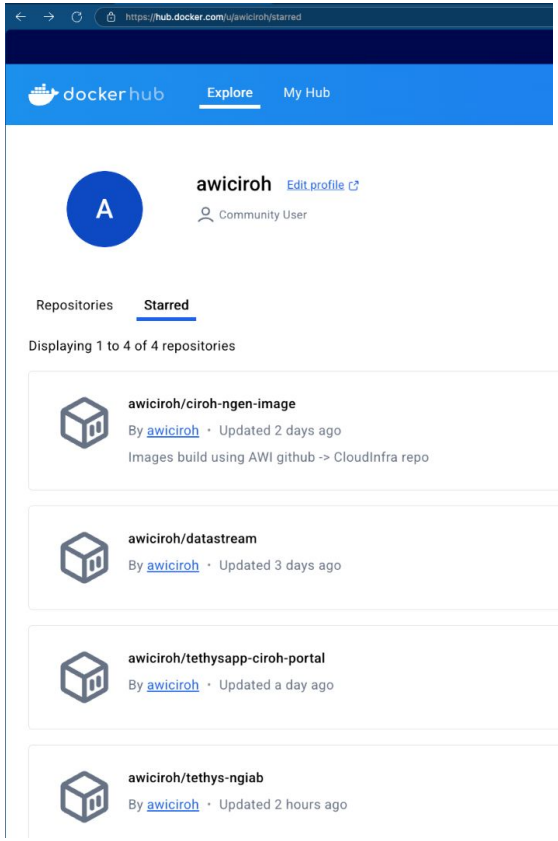
Shows significant CI/CD activity with over 10,000 automated runs and 38,636 minutes so far in last year alone!

AWICIROH DockerHub Stats

Cooperative Institute for Research to Operations in Hydrology

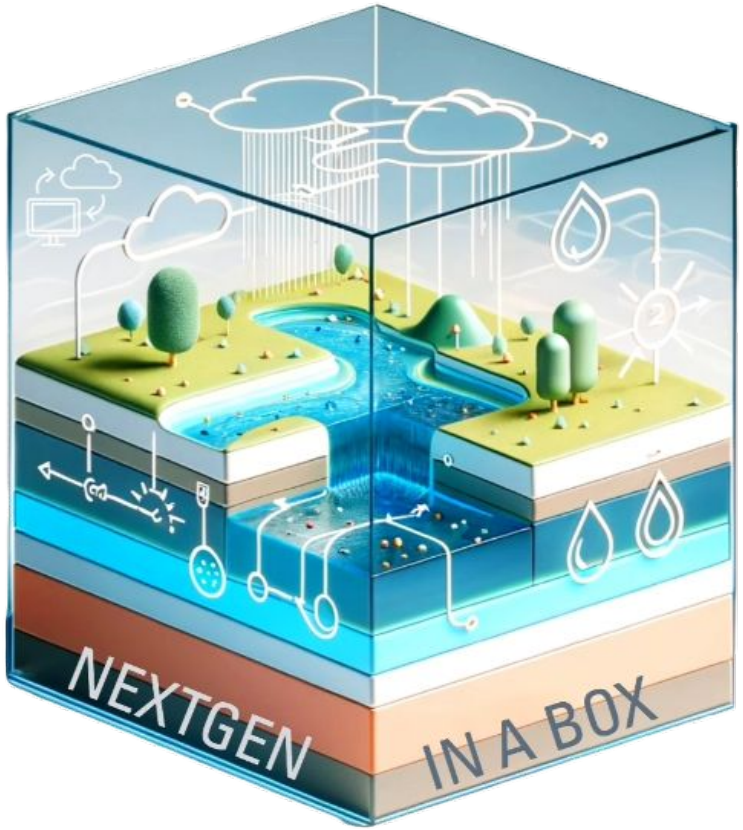
CIROH DockerHub Stats

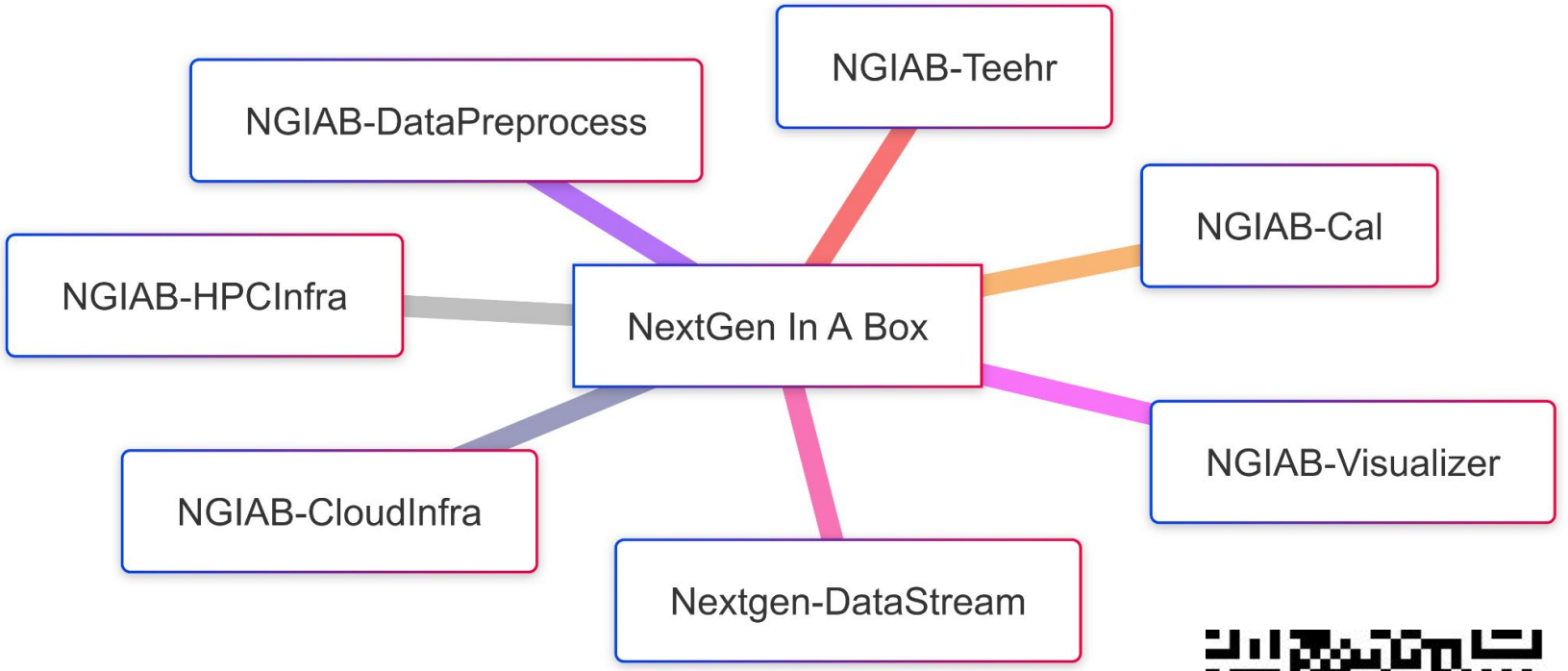
(awiciroh) Docker Image Pull Count



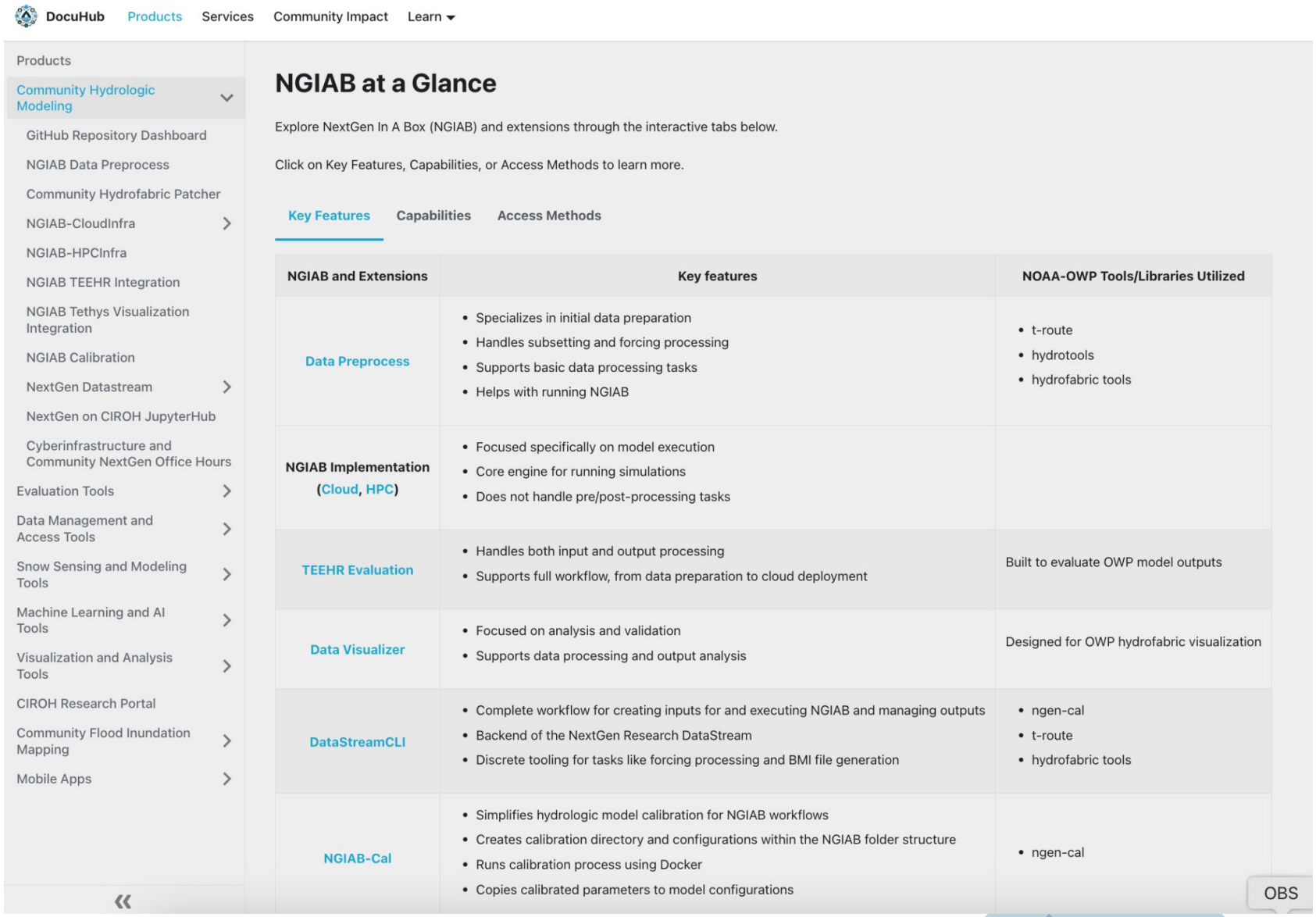
1. NGIAB — 8,800 pulls
2. tethys-portal — 1,800 pulls
3. datastream — 1,200 pulls

NGIAB ECOSYSTEM



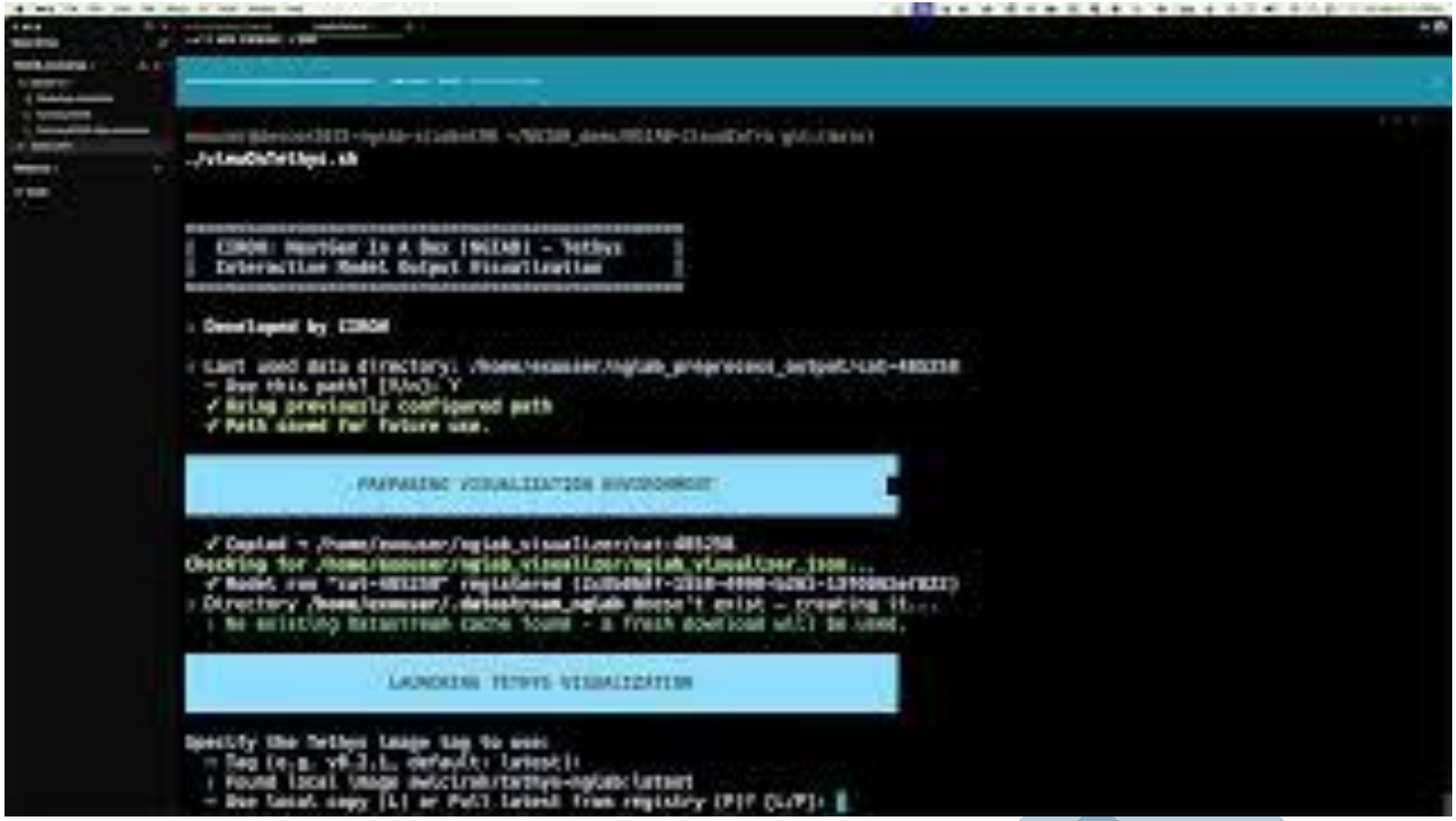


NGIAB ECOSYSTEM



NGIAB - DATA PREPROCESS MAP + RUN

NGIAB - TEEHR + TETHYS + VISUALIZER



Community NextGen Updates

DocuHub Products Services Community Impact Learn Blog News Release Notes Portal

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

feature 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

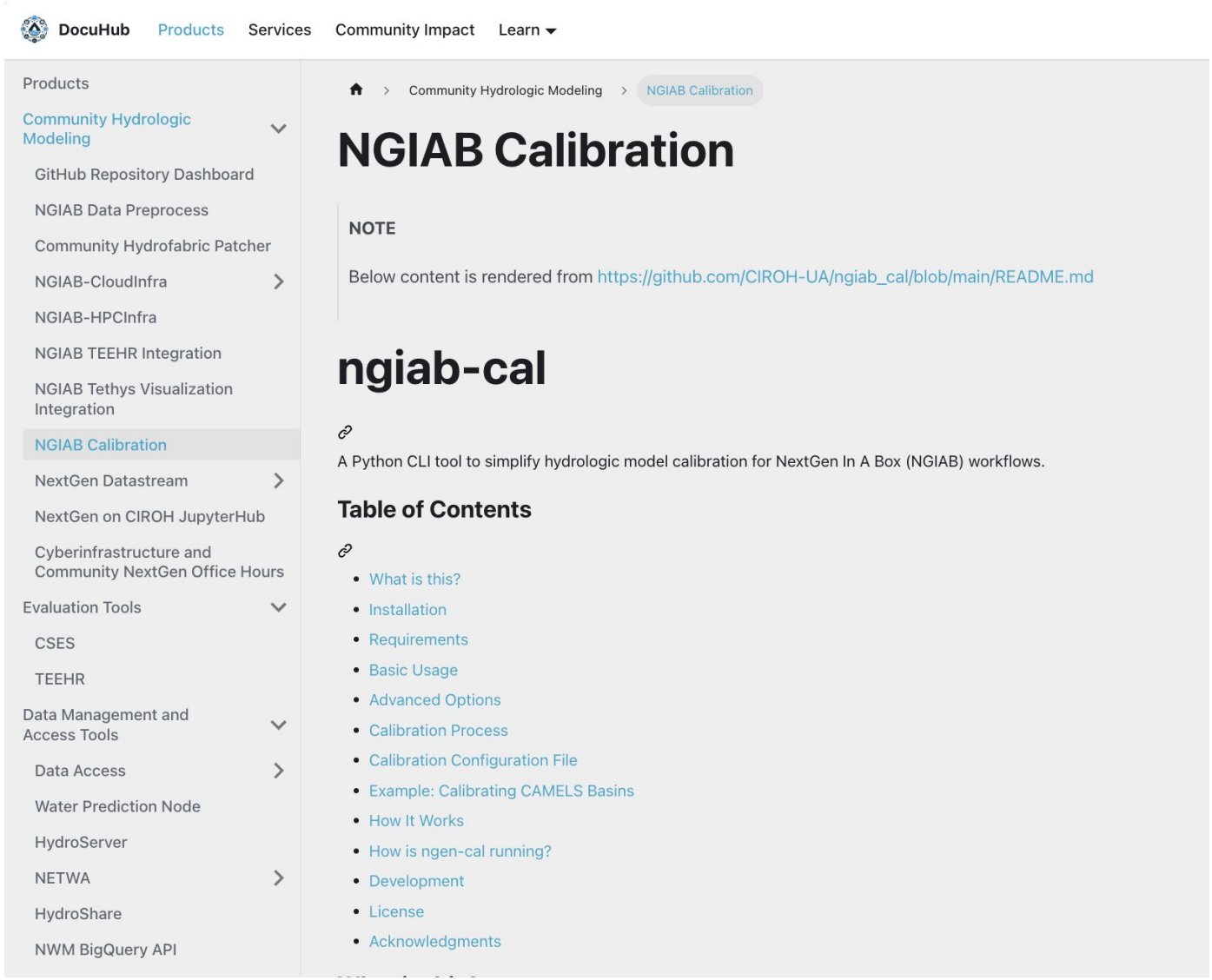
📖 For detailed instructions on how to use the new calibration capabilities, please check out: https://github.com/CIROH-UA/ngen-cal/tree/ngiab_cal#how-to-use-this

Read more...

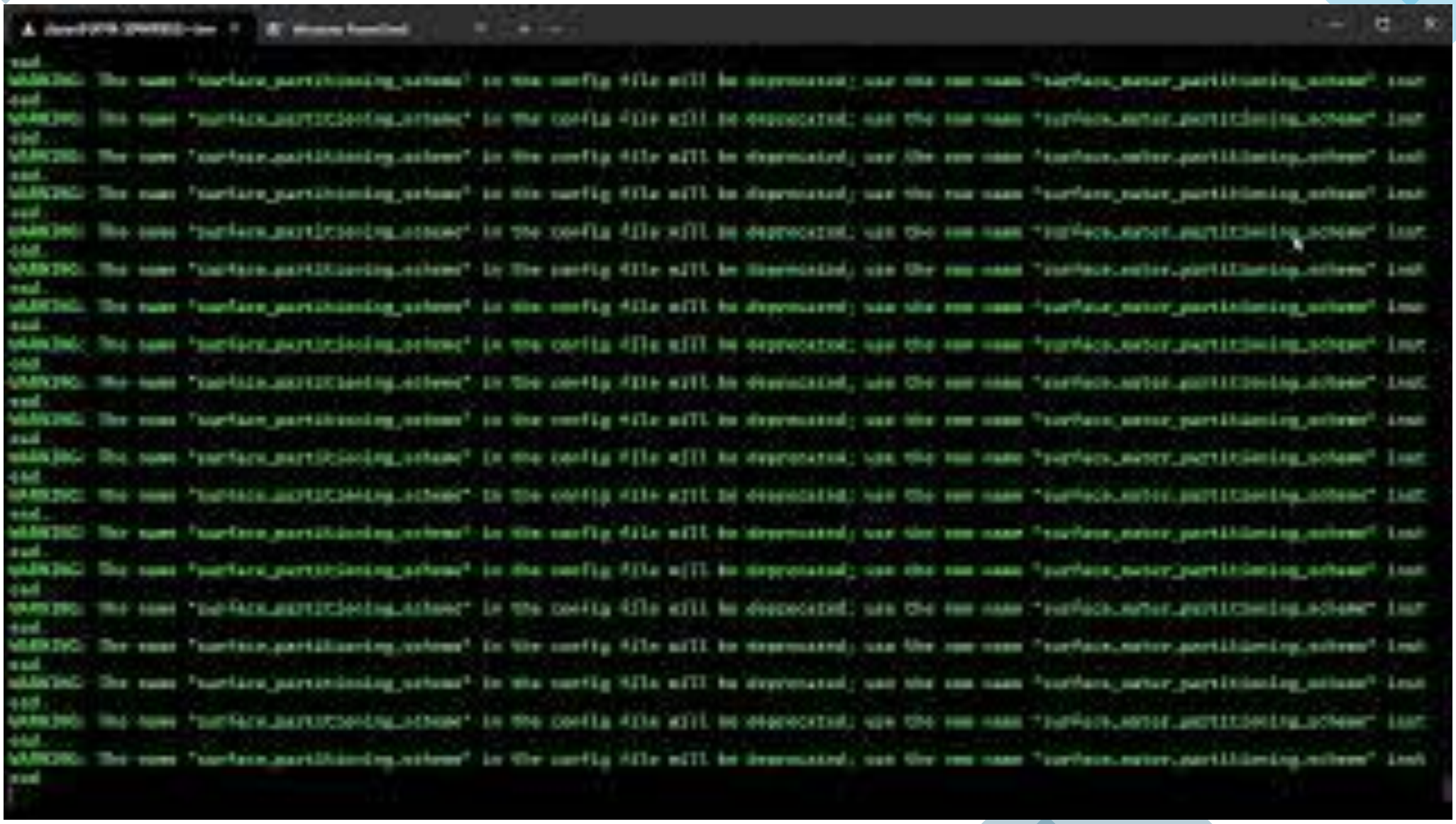
news New NextGen In A Box Product Website

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

NGIAB Calibration

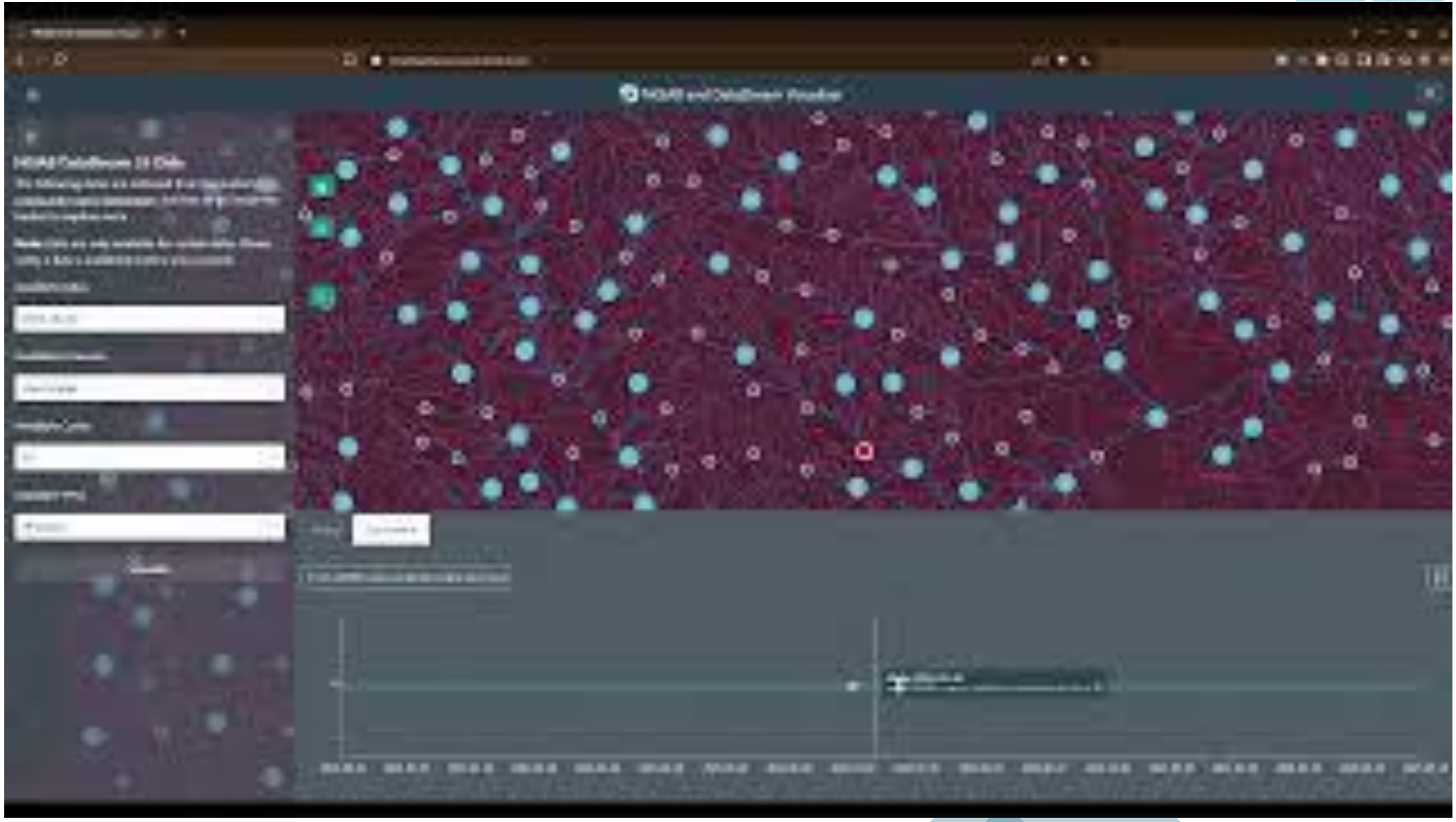


DEVCON 2025 - DATASTREAM CLI



Cooperative Institute for Research to Operations in Hydrology

DEVCON 2025 - DATASTREAM VISUALIZER



NGIAB (Singularity Image) for HPC

NGIAB-HPCInfra

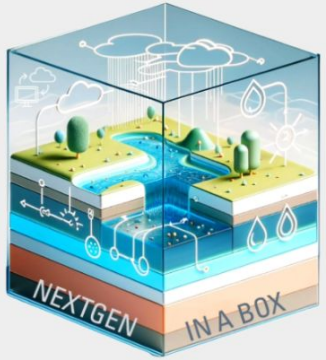
NOTE

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.



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).

Why NextGen In A Box?

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

Cooperative Institute for Research to Operations in Hydrology

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

Open with...
- MATLAB Online
- CUAHSI JupyterHub
- CIROH JupyterHub

Authors: David Tarboton | Homa Salehabadi | Ayman Nassar | Furqan Baig | Anthony M. Castronova | 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

Sharing Status: Public
Views: 15
Downloads: 0
+1 Votes: Be the first one to +1 this.
Comments: No comments (yet)

jupyterhub Home Token

Server Options

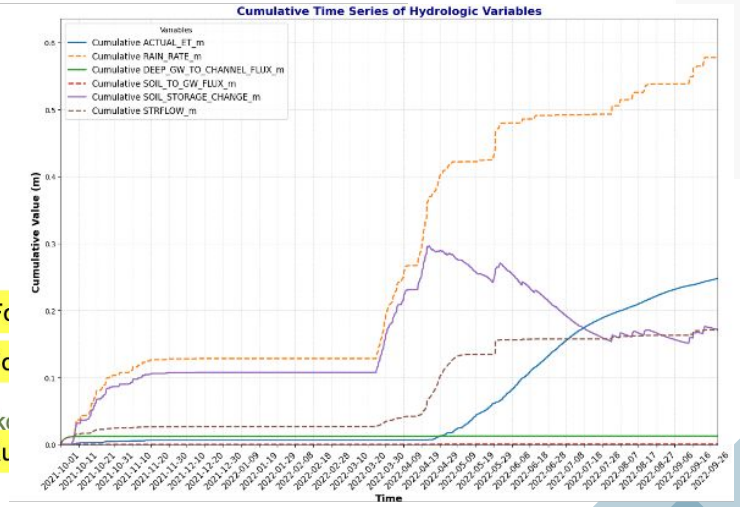
Small
5GB RAM, 2 CPUs

Image: NextGen National Water Model(NWM)

```
source /ngen/.venv/bin/activate
```
Virtual environment

```
python -m ngiab_data_cli -i "gage-10109001" -s
python -m ngiab_data_cli -i "cat-2861446" –s
```
Hydrofabric

```
python -m ngiab_data_cli -i "cat-2861446" -f --start "2021-10-01" --end "2022-09-30“
python -m ngiab_data_cli -i "cat-2861446" -r --start "2021-10-01" --end "2022-09-30"
/dmod/bin/ngen-serial config/cat-2861446_subset.gpkg all config/cat-2861446_subset.gpkg
    config/realization.json
```



FIM as a Service on CIROH JupyterHub

Cooperative Institute for Research to Operations in Hydrology

DocuHub Products Services Community Impact Learn Blog News Relea

Products
- 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

Community Flood Inundation Mapping › FIM as a Service

FIM as a Service

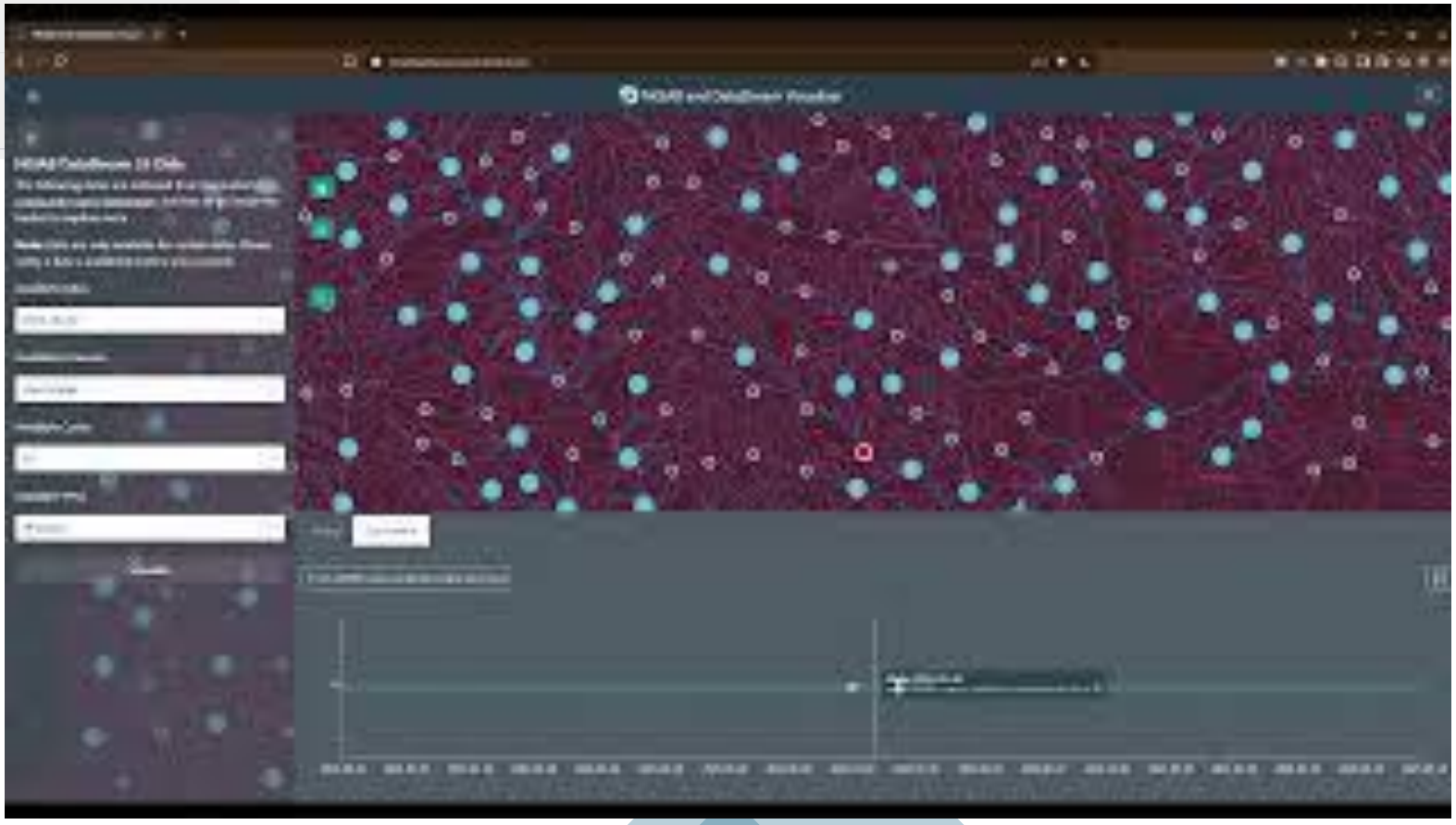
NOTE

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 v0.1.6 | issues 0 open | License GPLv3 | pypi package 0.1.81 | downloads 1K | Package Build and Test passing

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



FIM Visualizer

Cooperative Institute for Research to Operations in Hydrology

DEVCON 2025

Cooperative Institute for Research to Operations in Hydrology

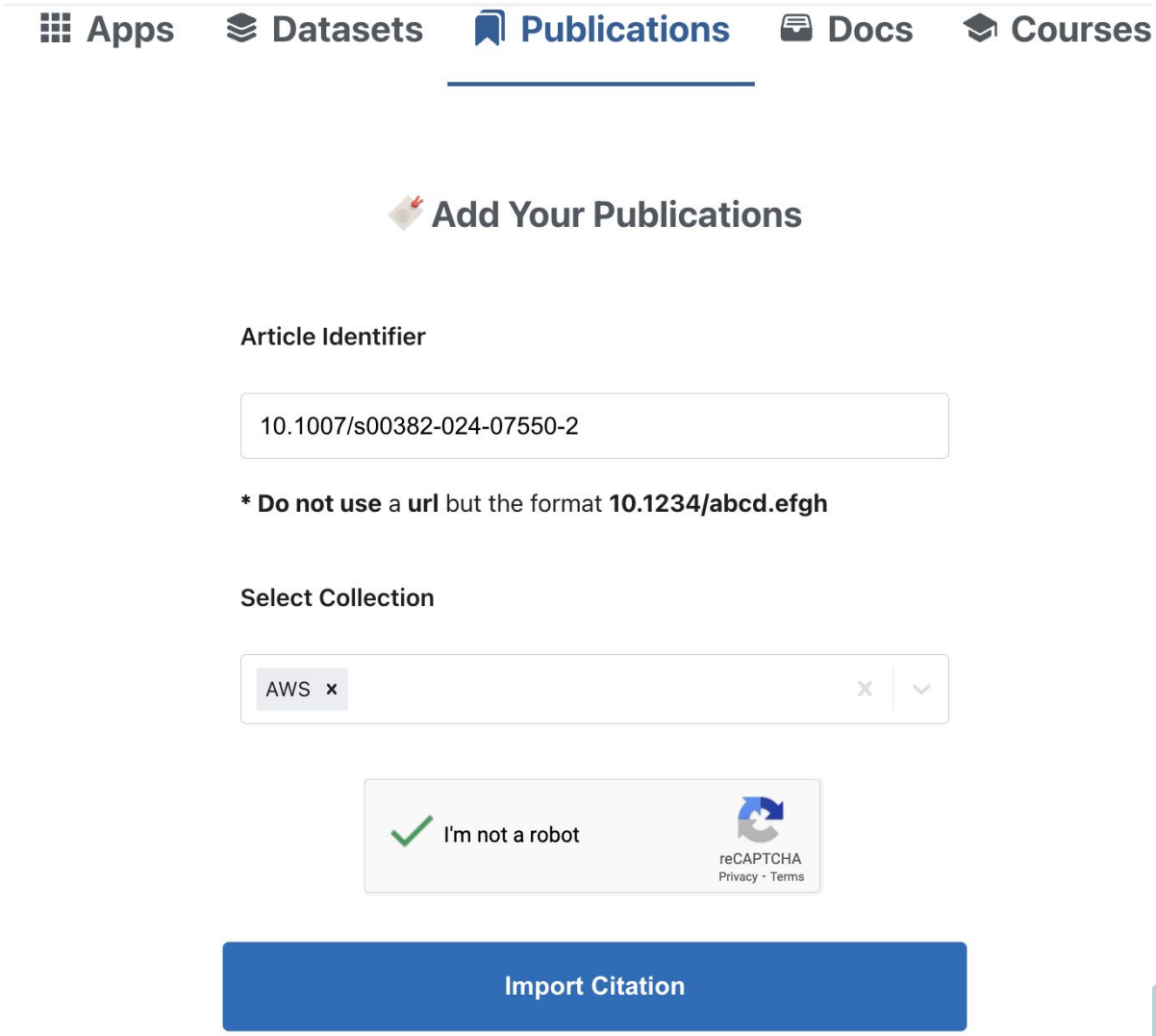
Part 5: Outreach and Education

PORTAL

portal.ciroh.org

Add Publications !!

Cooperative Institute for Research to Operations in Hydrology



Publications!!

Cooperative Institute for Research to Operations in Hydrology

CIROH Apps Datasets Publications Courses Docs Contribute Develop

Publications

Explore a rich selection of publications and papers featuring CIROH and NOAA's collaborative research in hydrology. Discover insights on water management, forecasting, and climate impacts through this comprehensive resource for scholars and professionals.

Search by Title, Author, Year

GCP and CIROH JupyterHub

A result is returned only if the exact text

JOURNAL ARTICLE
Published on 2024-08-01

Design and implementation of a BigQuery dataset and application programmer interface (API) for the U.S. National Water Model

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

Environmental Modelling & Software

doi
10.1016/j.envsoft.2024.106123

Search by Title, Author, Year

Wukong

A result is returned only if the exact text

JOURNAL ARTICLE
Published on 2025

High-resolution national-scale water modeling is enhanced by multiscale differentiable physics-informed machine learning

Song · Bindas · Shen · Ji · Knoben · Lonzarich · Clark · Liu · van Werkhoven · Lamont · Denno · Pan · Yang · Rapp · Kumar · Rahmani · Thébault · Adkins · Halgren · Patel · Patel · Sawadekar · Lawson

Water Resources Research

doi
10.1029/2024WR038928

Search by Title, Author, Year

AWS

A result is returned only if the exact text

JOURNAL ARTICLE
Published on 2024-12-24

Investigating river ice phenology and climatology in the northeast United States and the link with climate oscillations

Abdelkader · Temimi · Mendez · Miano · Macneil

Climate Dynamics

doi
10.1007/s00382-024-07550-2

Visit Ou

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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

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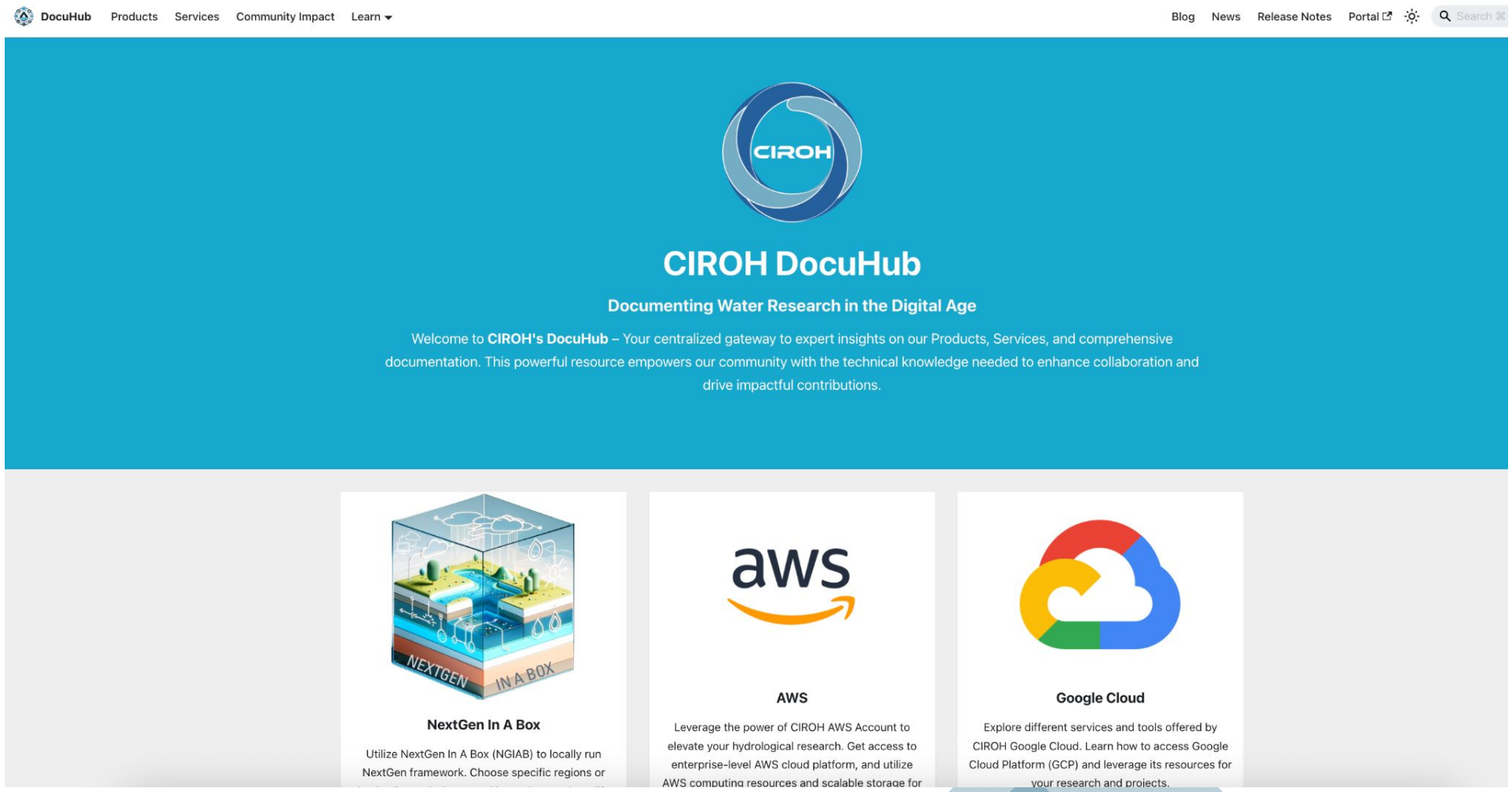

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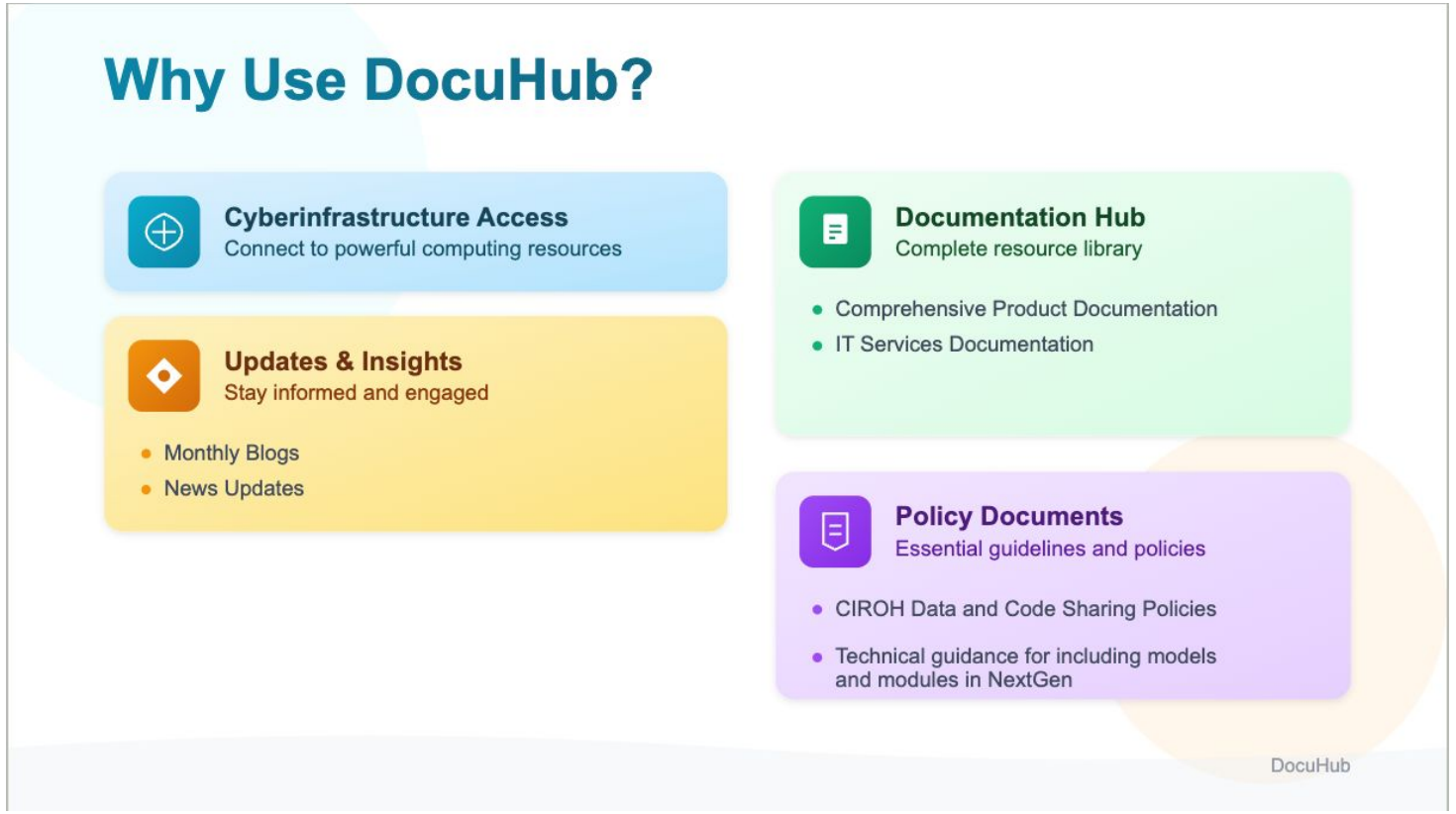

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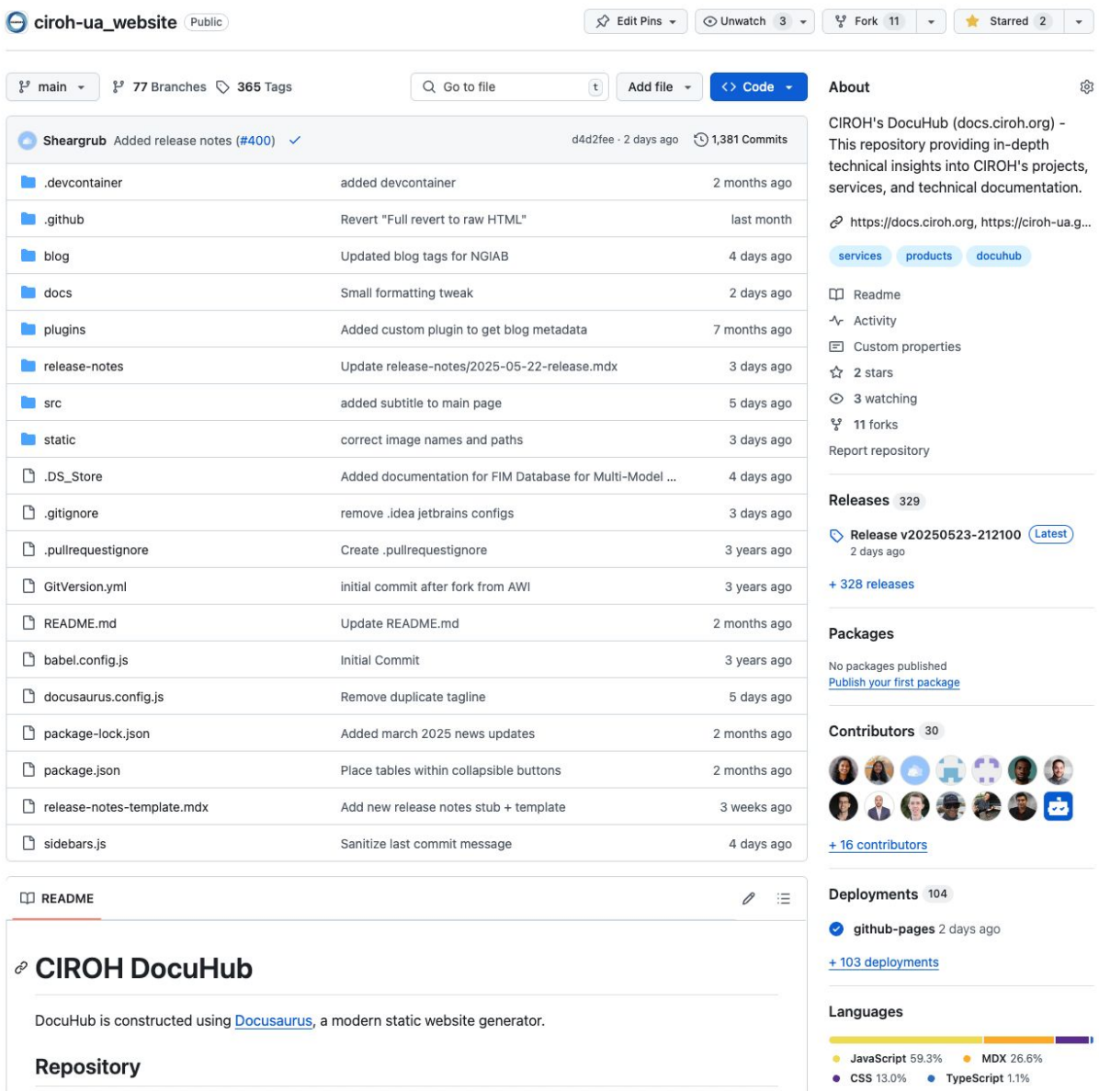

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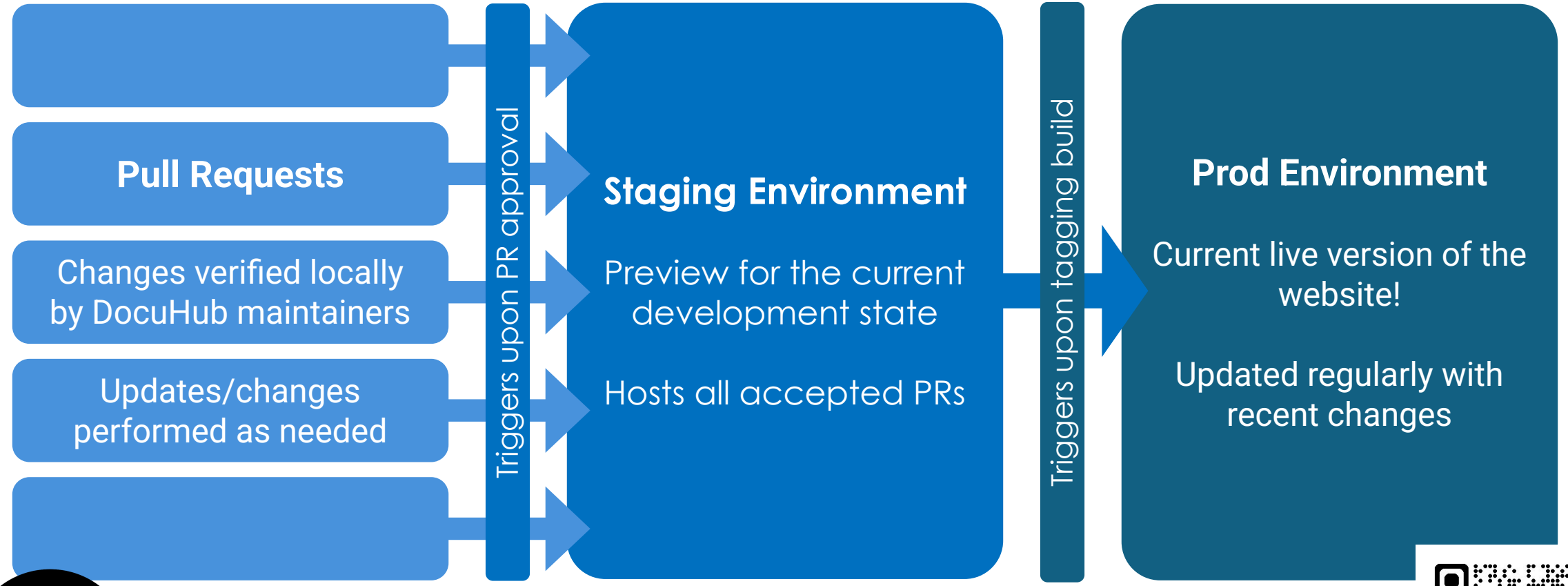

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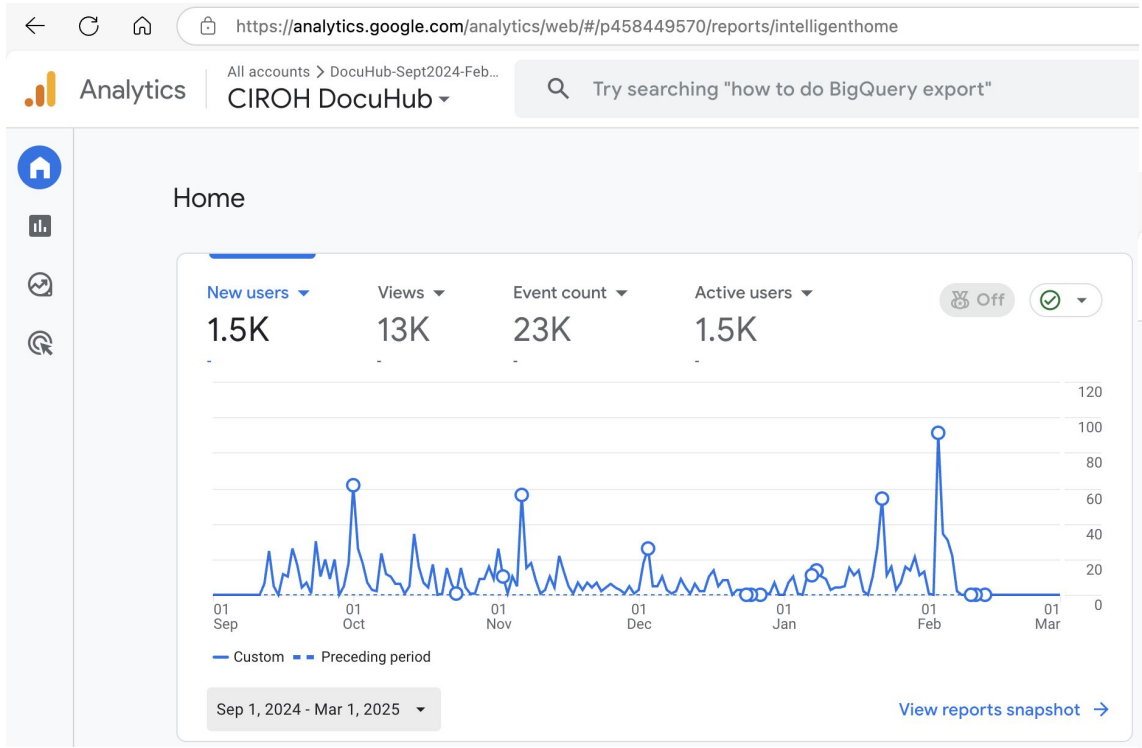

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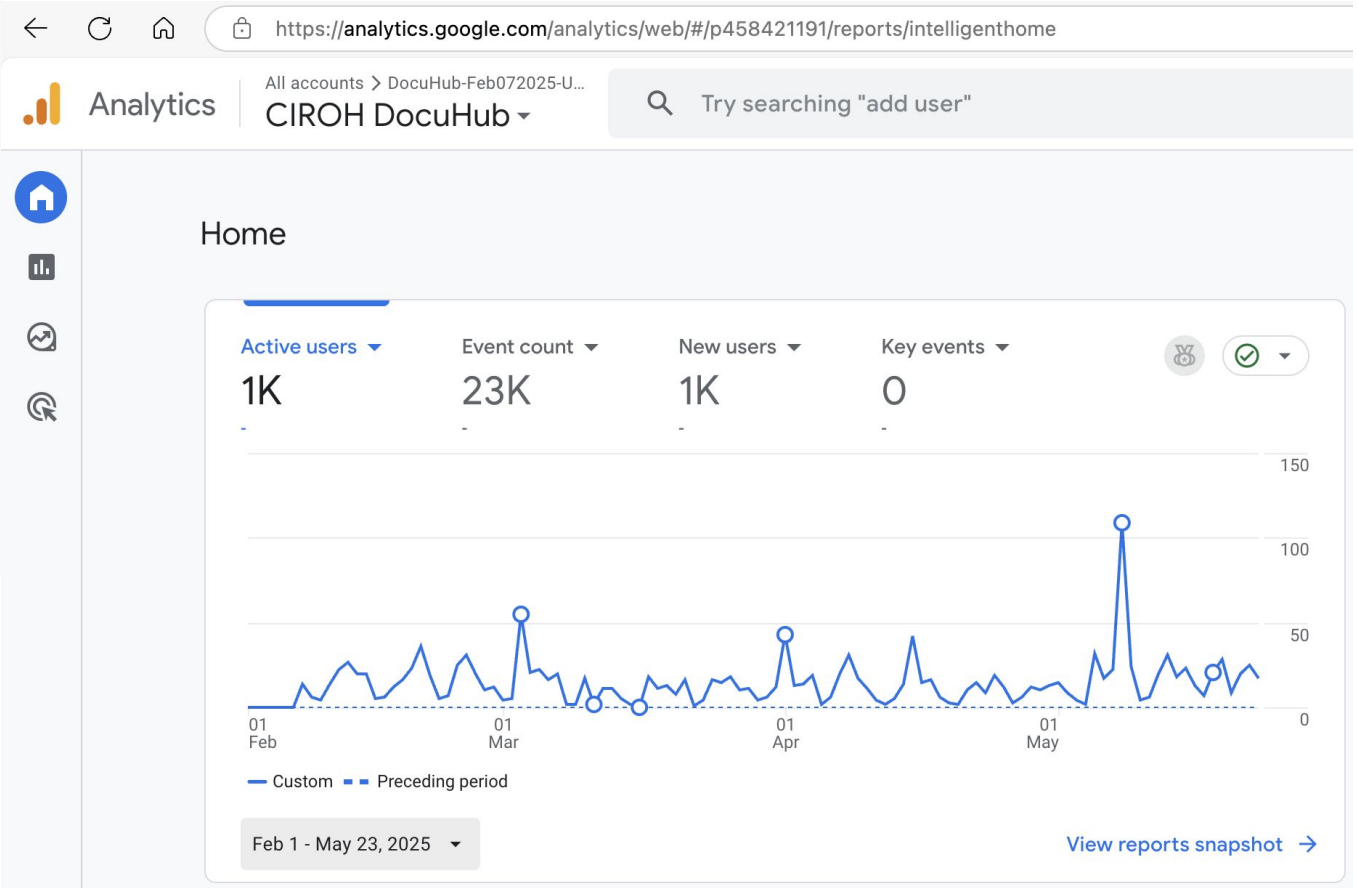

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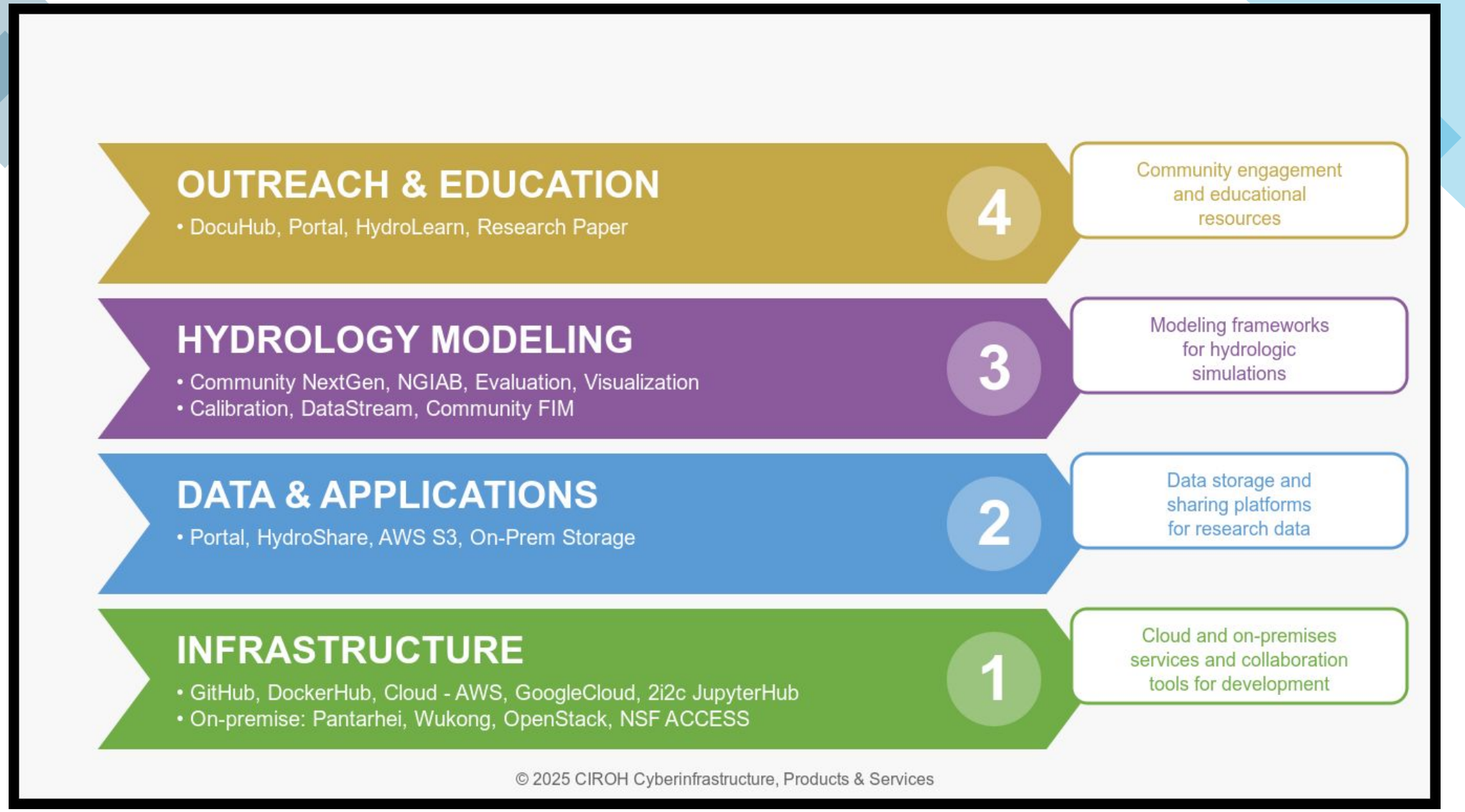

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