Enhancing Hydrologic Forecasting in the Rio Grande Basin

Develop a hydrological model with forecasting capabilities and prototype a decision support tool for water supply management in the Rio Grande Basin, leveraging NASA data, models, and technologies.

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Water Watch Analytic (WWA): Model solutions derived from direct NASA observations and modeling approaches

- We employ satellite Earth observation to measure surface water extent and stream flow discharge using SWOT, Sentinel-1 (SAR), Sentinel-2, Landsat, and ICESat-2. This includes retrospective analysis (2015-2024) and near real-time monitoring at 10m input model resolutions.

- We developed three efficient water balance models for the cloud using monthly data from NASA's GLDAS models (NOAH, VIC, and CLSM). These models—Model-N, Model-V, and Model-C—rely on precipitation and air temperature inputs to accurately replicate evaporation, runoff, and soil moisture.

Water Watch Analytics (WWA) and Inundation Model

Water Balance Model (WBM)

Model:
Contains 3 scalable models that mimic runoff & evaporation productions of the 3-LSMs (land surface models) the NASA GLDAS system – NOAH3.6, VIC2.0, and CLSM at the daily time scale.

Inputs:
Precipitation and T2M

Daily evaporation, runoff and soil moisture

River Routing Model (RRM)

Model:
Two linear reservoir models
that run on 291,284 watersheds comprise the River Routing Model (RRM).

Inputs:
Daily total runoff in the Watershed (either from WBM or an outside source)

Daily streamflows on river reaches in the watershed

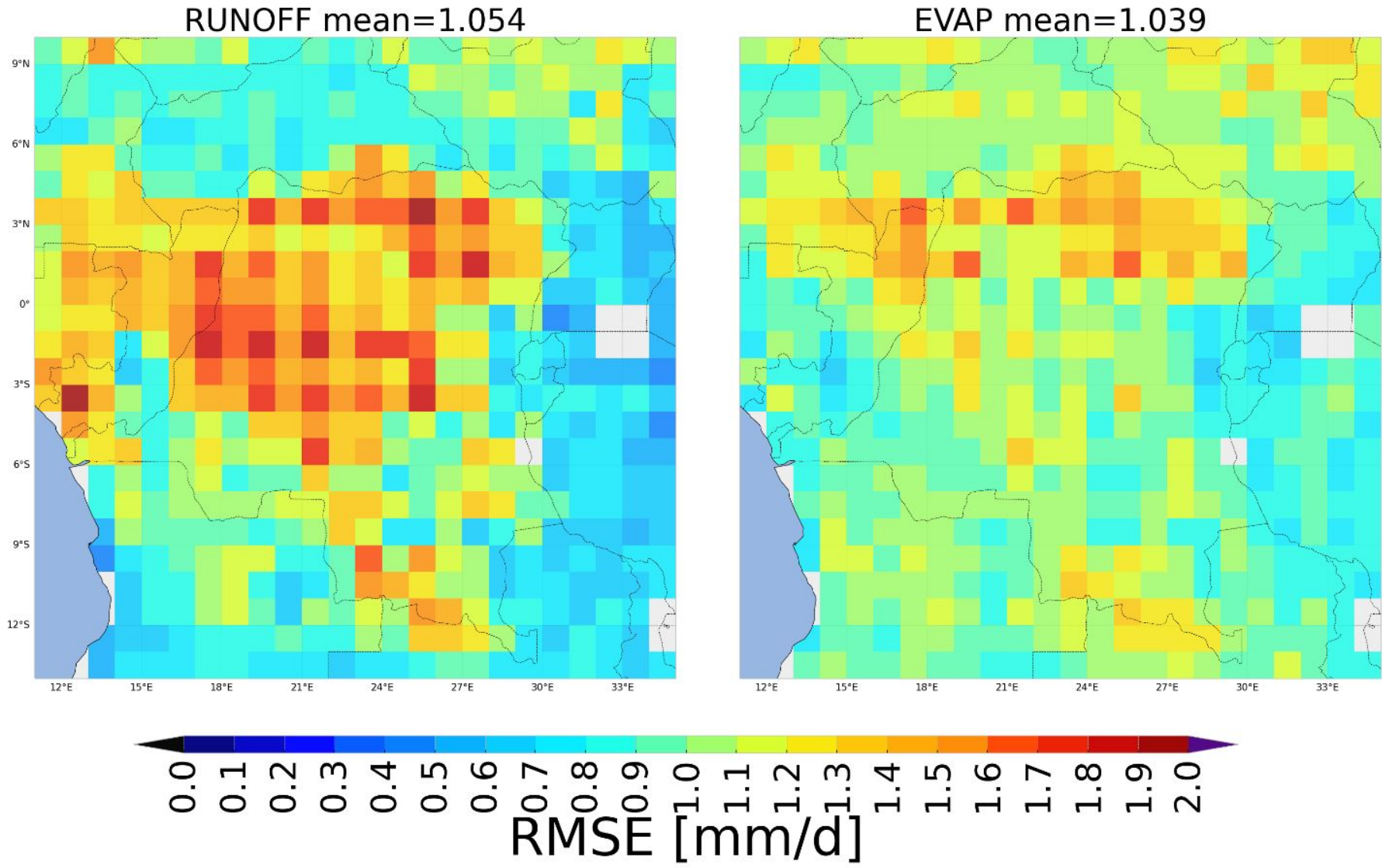
Flood Inundation Model (FIM)

Model:
Global River Data Assimilation System (GRDAS)

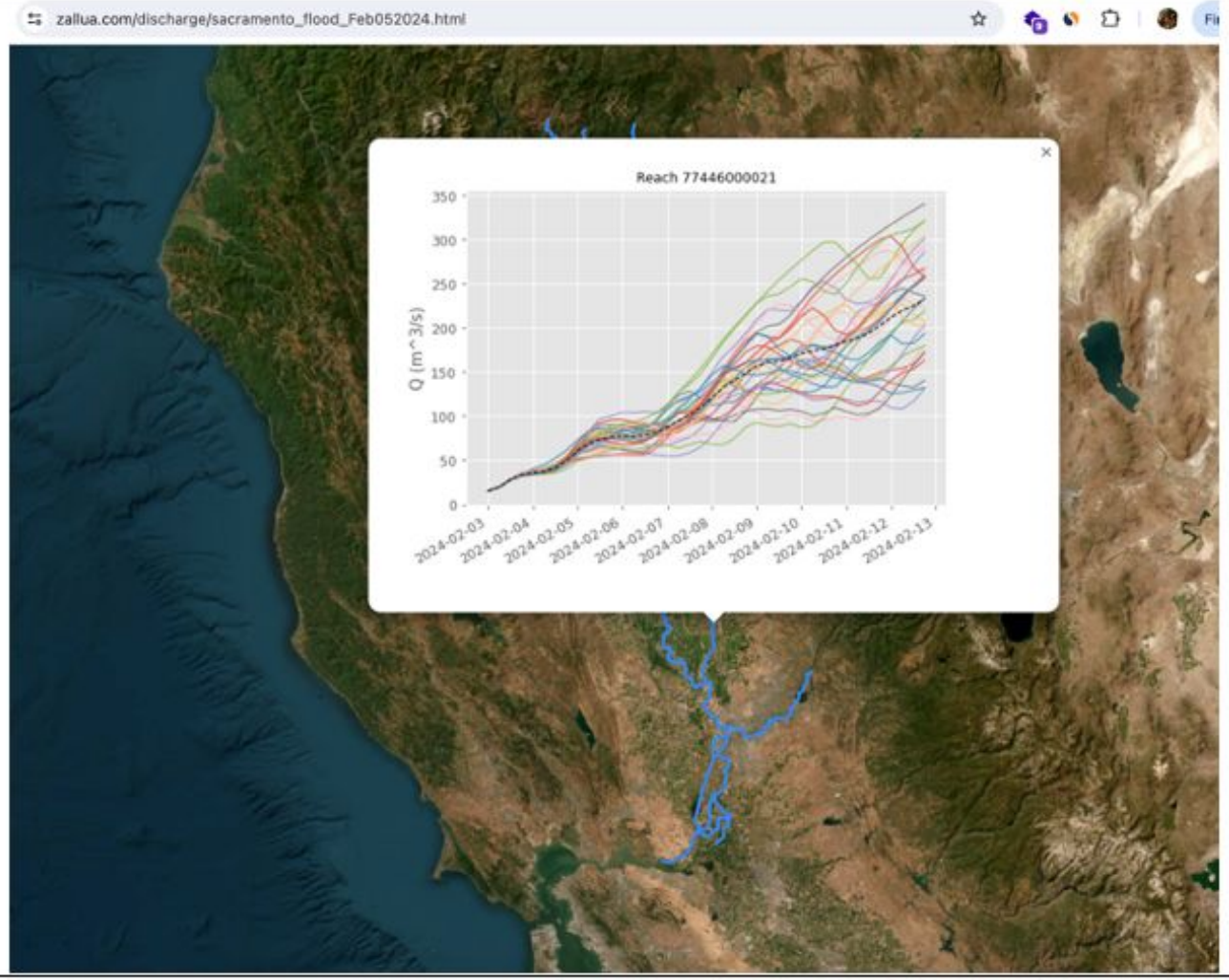
Inputs:
Daily total runoff in the Watershed (either from WBM or an outside source), Individual width, depth, surface water extent, slope observations

Harmonized River Geometry & likelihood in Inundations

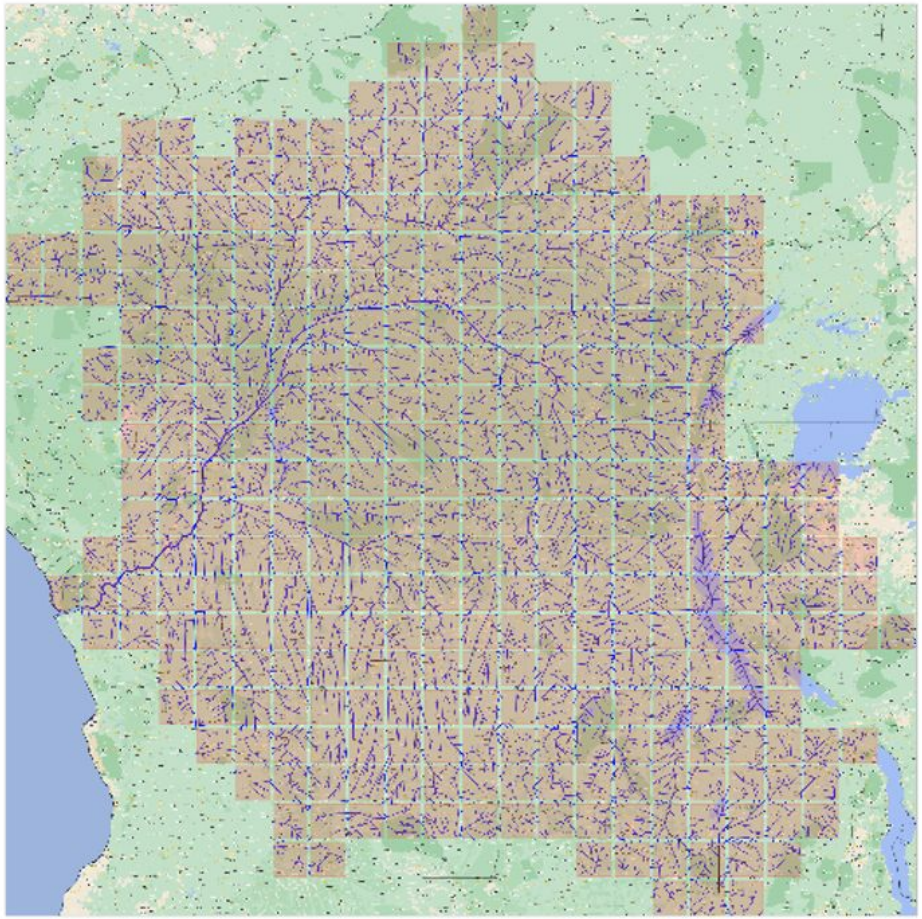
Spatial maps showing the computed Root Mean Square Error (RMSE) of daily runoff (left) and evaporation (right) between WWA's Model N and GLDAS NOAH model for the period 2017-2021

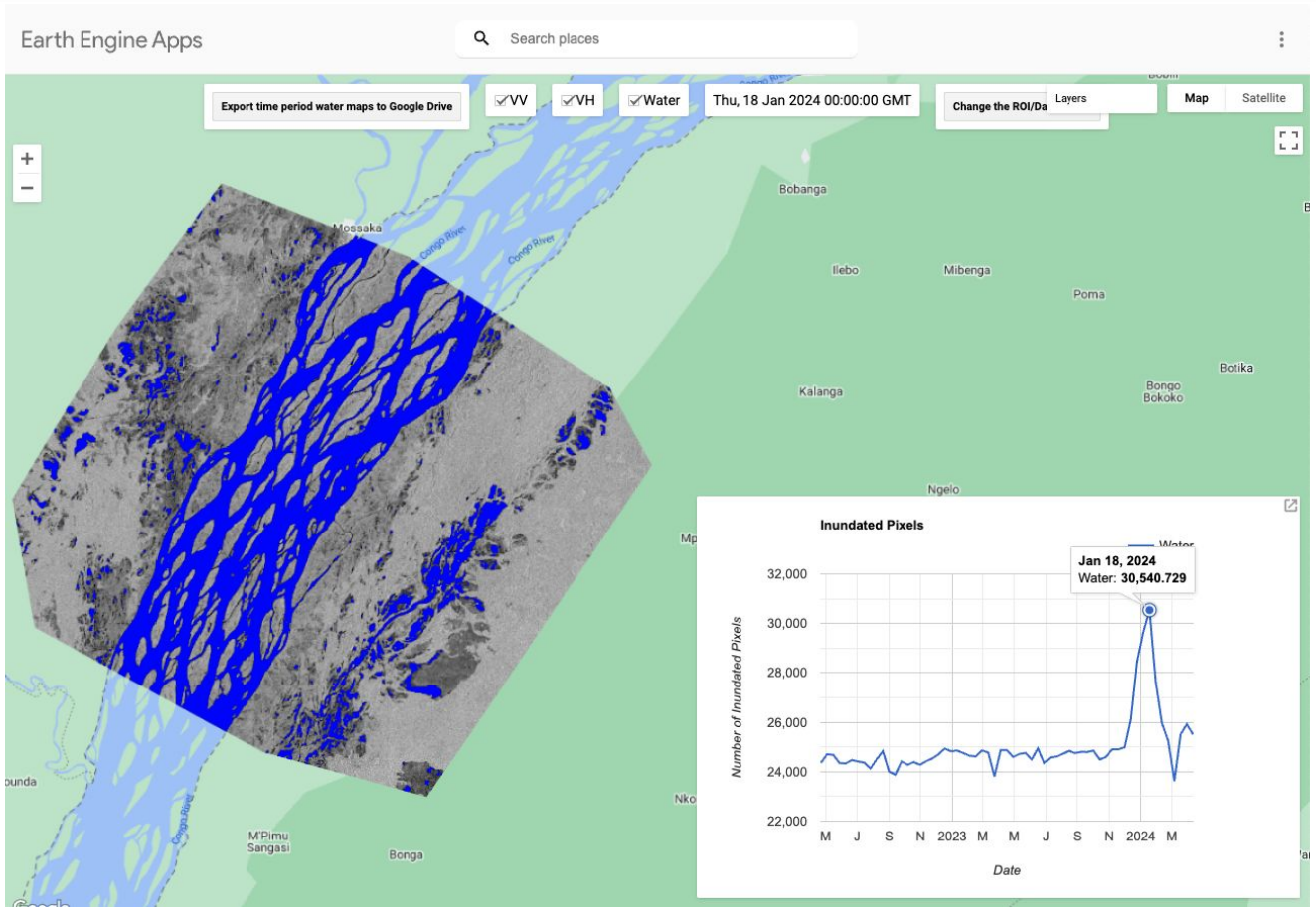


Snapshots of preliminary results: In early February 2024, sections of California experienced widespread flooding, strong winds, and power outages due to the impact of two atmospheric rivers.

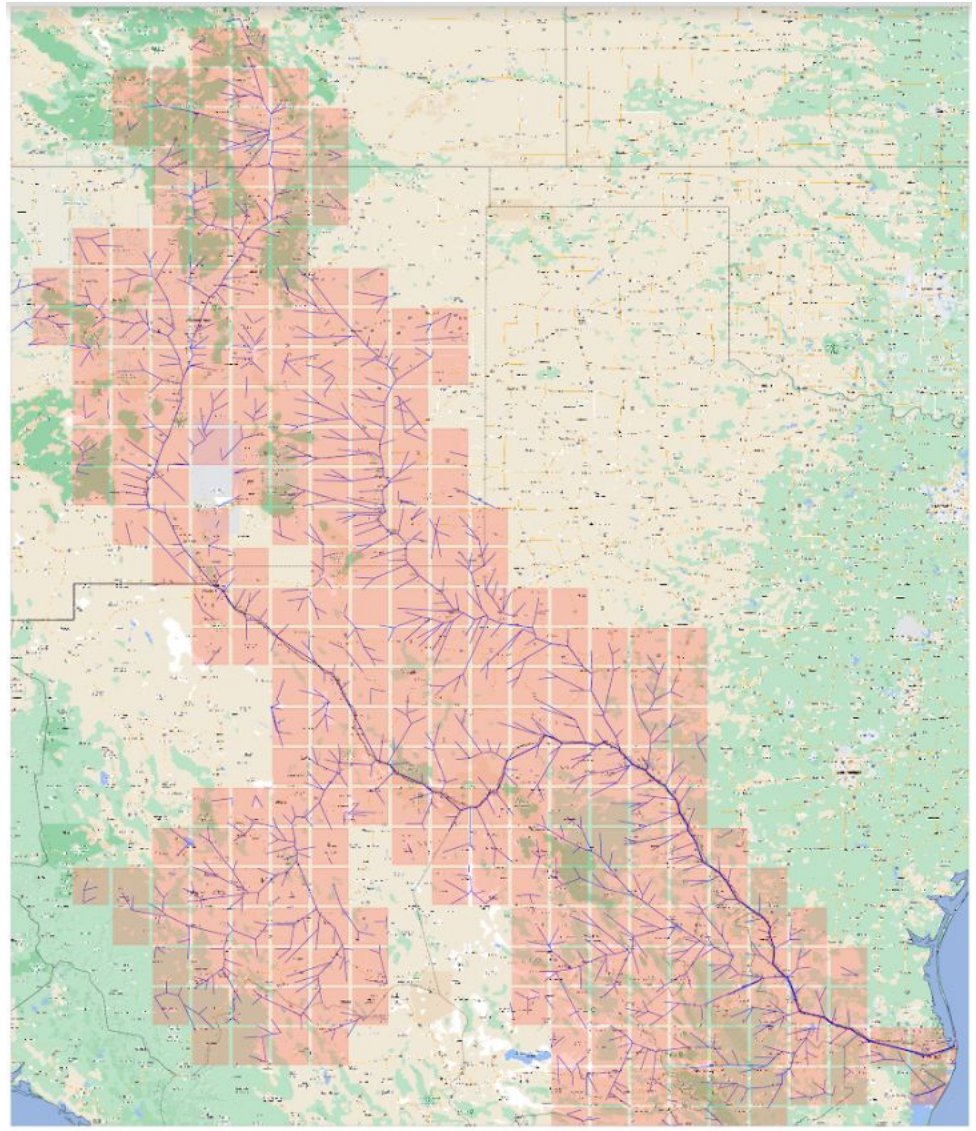


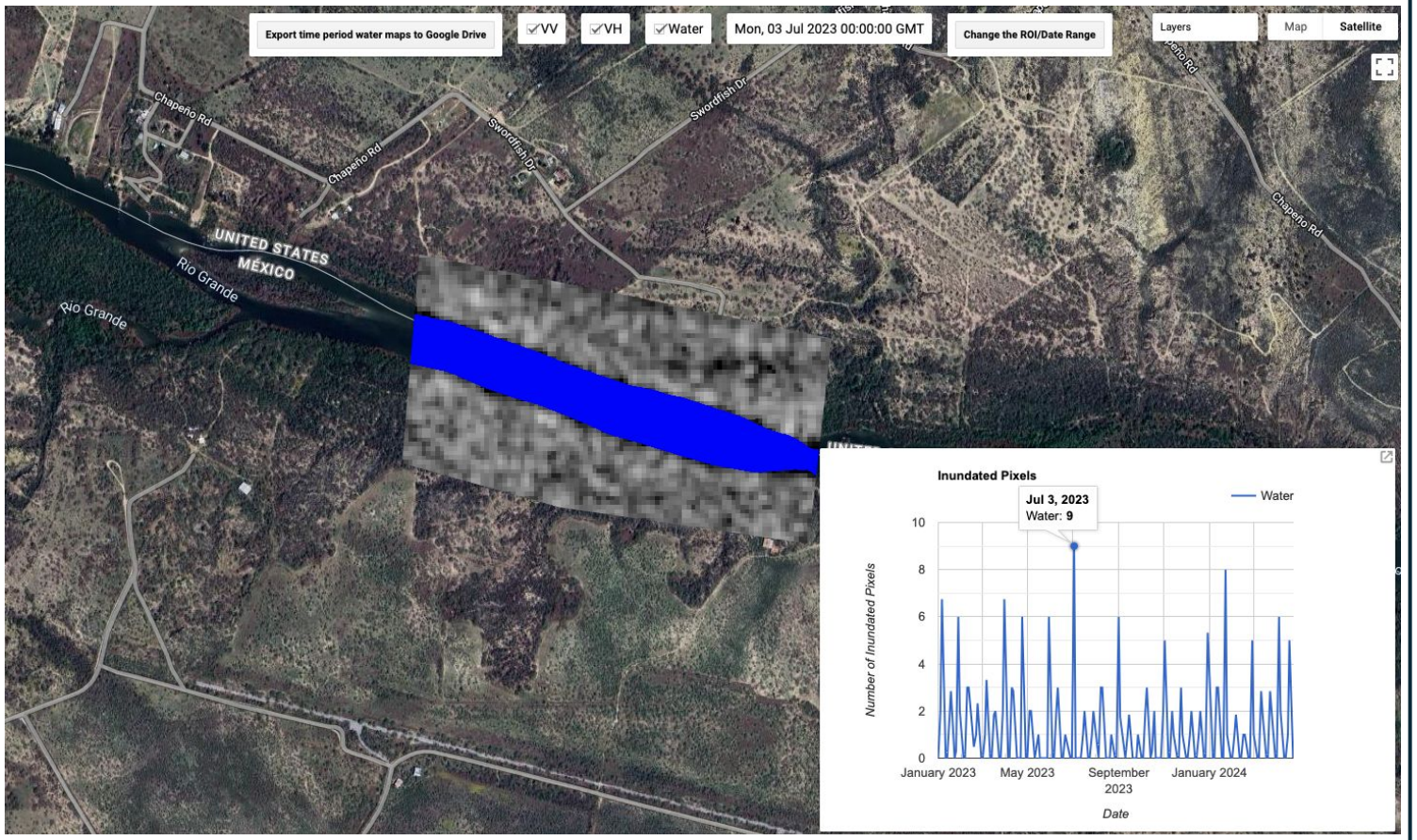
Snapshots of preliminary results: Congo Basin Jan 18, 2024 peak flood level since 1970



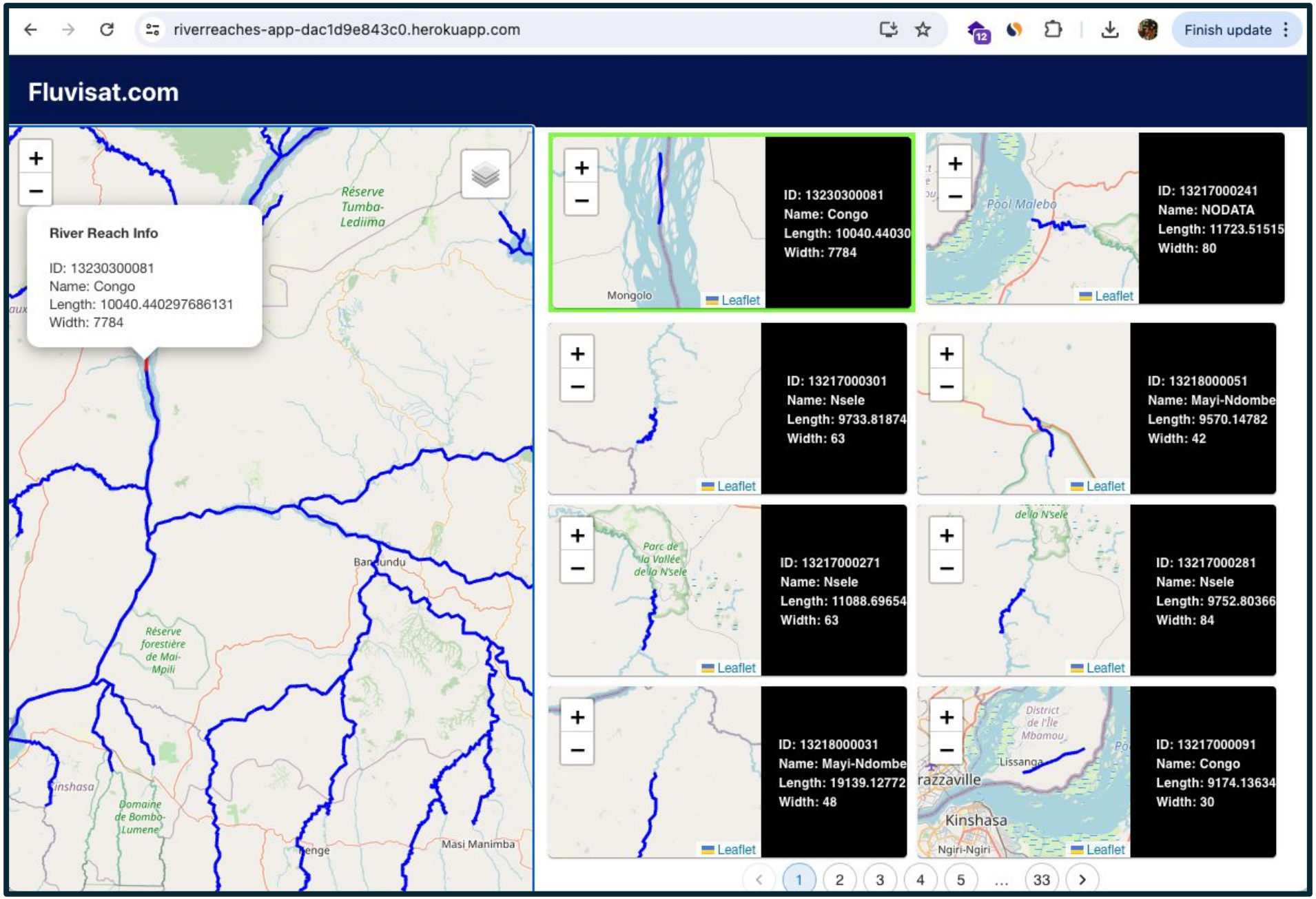


Snapshots of preliminary results: Rio Grande Basin





Accessing NASA Data for Non-Expert Users(http://fluvisat.com)



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Fluvisat.com

Reach Info

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Reach Name: Congo
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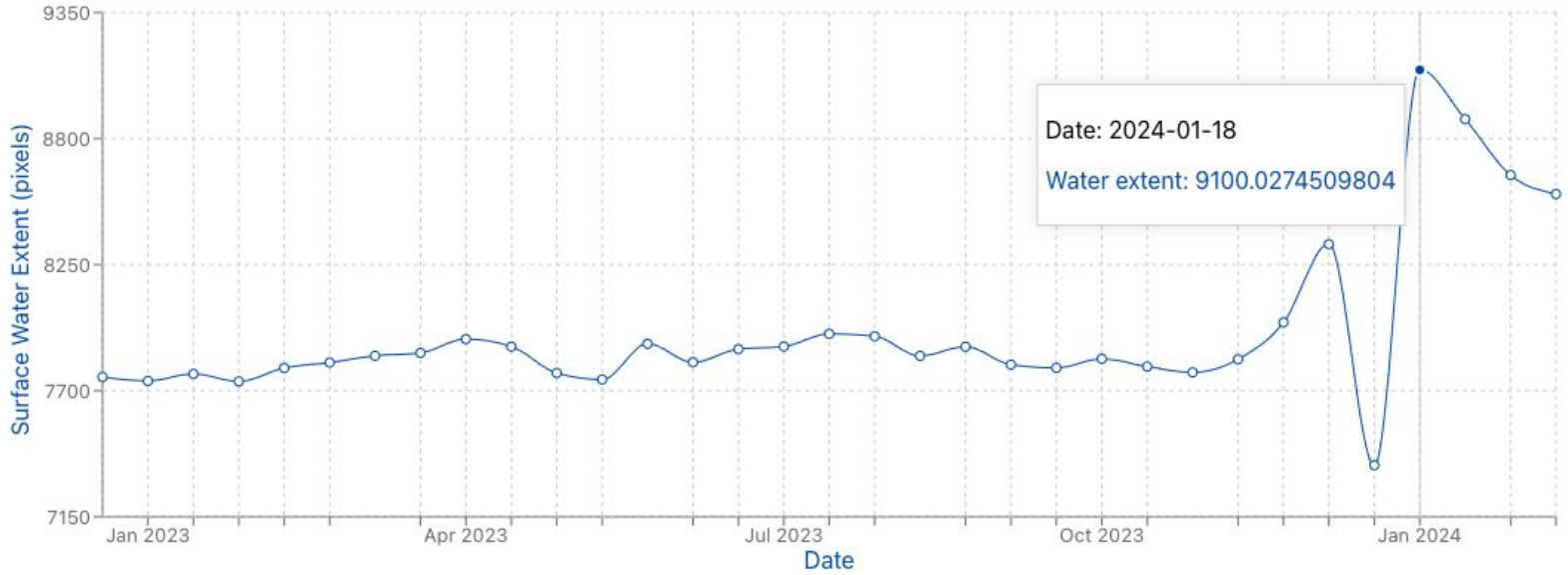
Lat: -2.285353275662314
Lon: 16.1752546481215

Inundated Pixels



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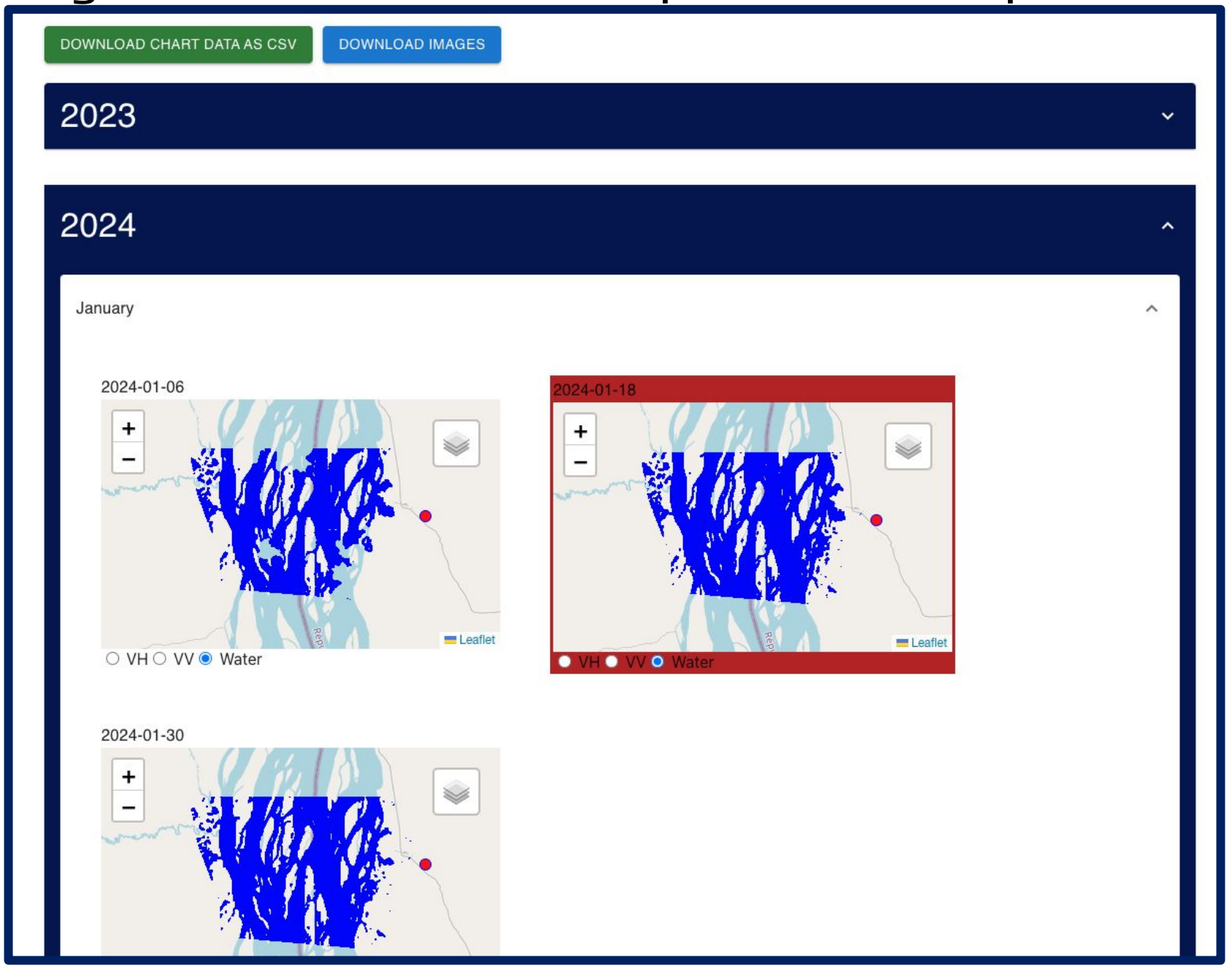

NEWS | October 27, 2020

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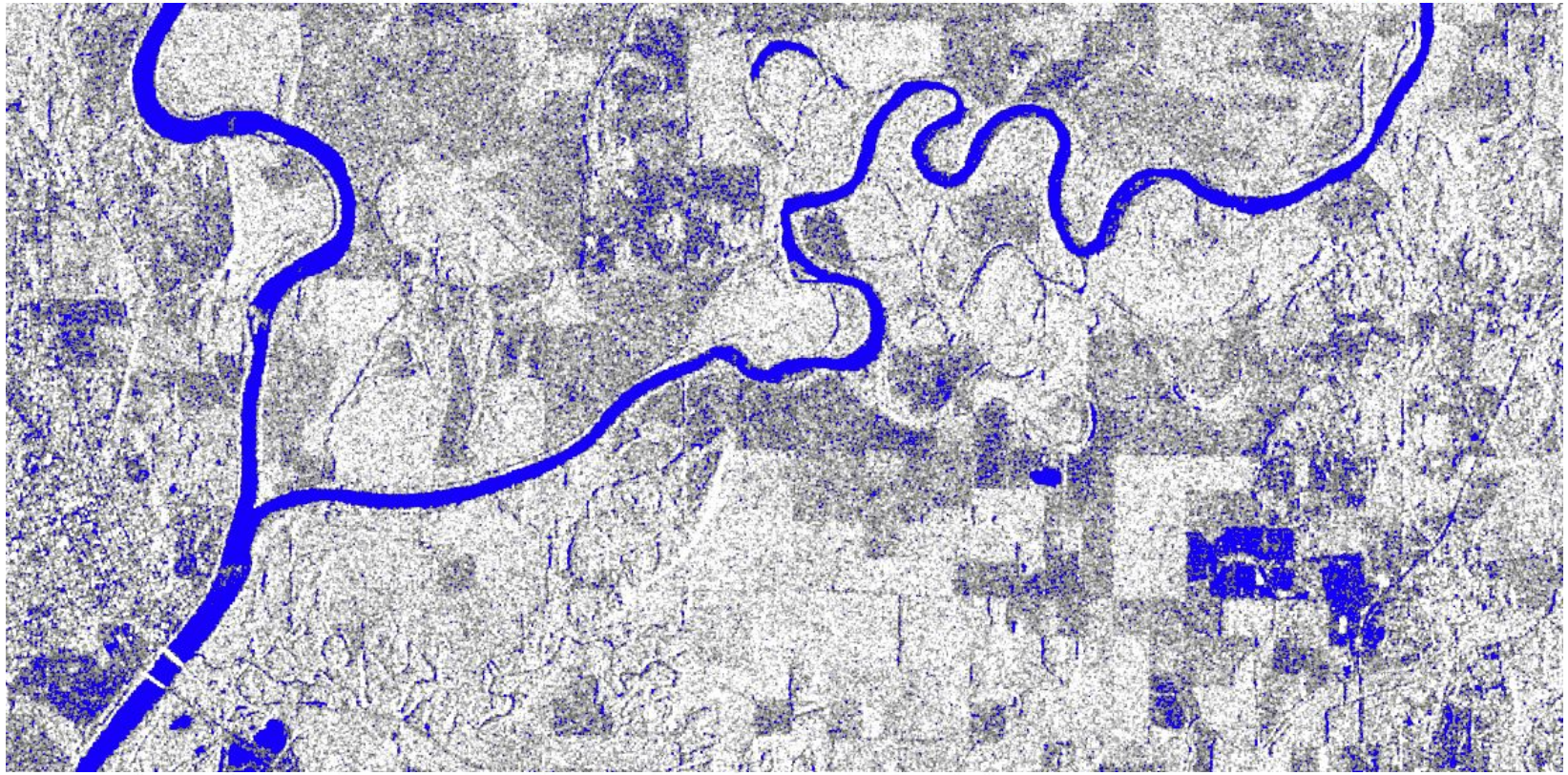

Credits: Chandana Gangodagamage, NASA Goddard Space Flight Center/University of Maryland