

Overview of HYDRAFloods processing

HYDRAFloods Training
11 October 2021



- HYDRAFloods background
- What is HYDRAFloods?
- Example uses
- Exercise



Challenges

- Water maps from many institutions lead to information overload
 - Different data and methods used
- Limited access to information on how maps were created
- Methods are not available for others (closed source)

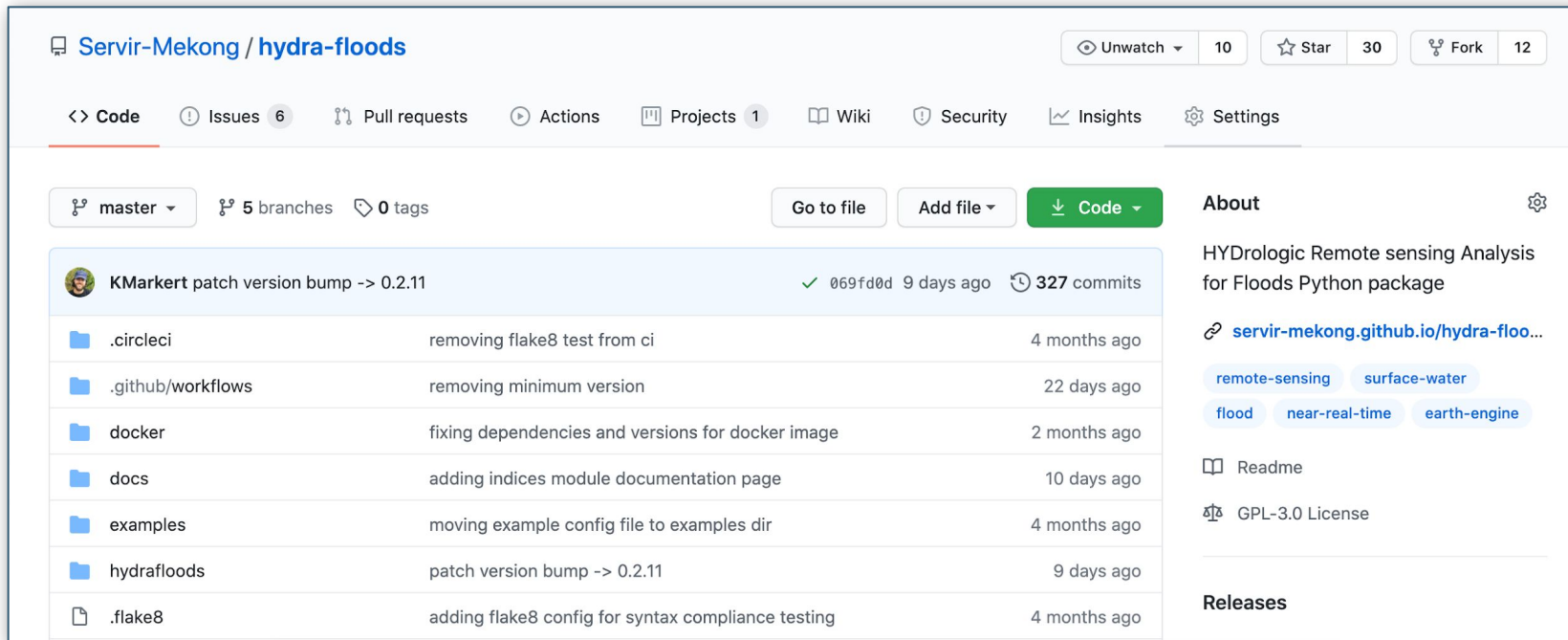
Challenges

- Cloudy conditions during the Asian Monsoon render optical imagery useless
 - Many sensors are required to monitor flood events
- Maps generated using individual data tiles = smaller coverage area
- Data volume
 - One Sentinel 1 scene is ~1 GB in size at ~10 m spatial resolution!!!

Solution - HYDRAFloods

- **HYD**rologic **R**emote sensing **A**nalysis for **Floods**
- Open source - anyone can use/modify for free
- Documented to increase transparency
- Cloud-based - overcome big data challenges
- End-to-End processing - users have all the tools needed to create their own high quality surface water map
- Leverage multiple sensors easily with common syntax and data fusion workflows

- Open source - anyone can use/modify for free




The screenshot shows the GitHub repository page for **Servir-Mekong / hydra-floods**. The repository has 10 watchers, 30 stars, and 12 forks. The main navigation bar includes links for Code, Issues (6), Pull requests, Actions, Projects (1), Wiki, Security, Insights, and Settings. Below the navigation bar, there are buttons for 'Go to file', 'Add file', and 'Code'. The repository is currently on the 'master' branch, with 5 branches and 0 tags. A recent commit by KMarkert is highlighted, showing a patch version bump to 0.2.11. The commit message is 'removing flake8 test from ci' and it was made 4 months ago. The commit details table lists several files and their changes:

File	Change	Time
.circleci	removing flake8 test from ci	4 months ago
.github/workflows	removing minimum version	22 days ago
docker	fixing dependencies and versions for docker image	2 months ago
docs	adding indices module documentation page	10 days ago
examples	moving example config file to examples dir	4 months ago
hydrafloods	patch version bump -> 0.2.11	9 days ago
.flake8	adding flake8 config for syntax compliance testing	4 months ago

The 'About' section describes the repository as 'HYDrologic Remote sensing Analysis for Floods Python package' and provides a link to the repository page. It also lists tags for 'remote-sensing', 'surface-water', 'flood', 'near-real-time', and 'earth-engine'. The 'Releases' section is also visible.

- Documented to increase transparency

 Overview

HYDRAFloods Documentation
[Overview](#)
Installation
Getting Started
Using the Dataset class
Algorithms
Workflow Example
Command Line Interface
API Reference

>

Quick Start

To highlight a quick example of the `hydraflooods` API and simplicity to produce high-quality surface water maps we provide a quick example of mapping surface water using Sentinel-1 over the confluence of the Mekong and Tonle Sap rivers in Cambodia, which experiences frequent flooding.

```
# content of example.py Python file

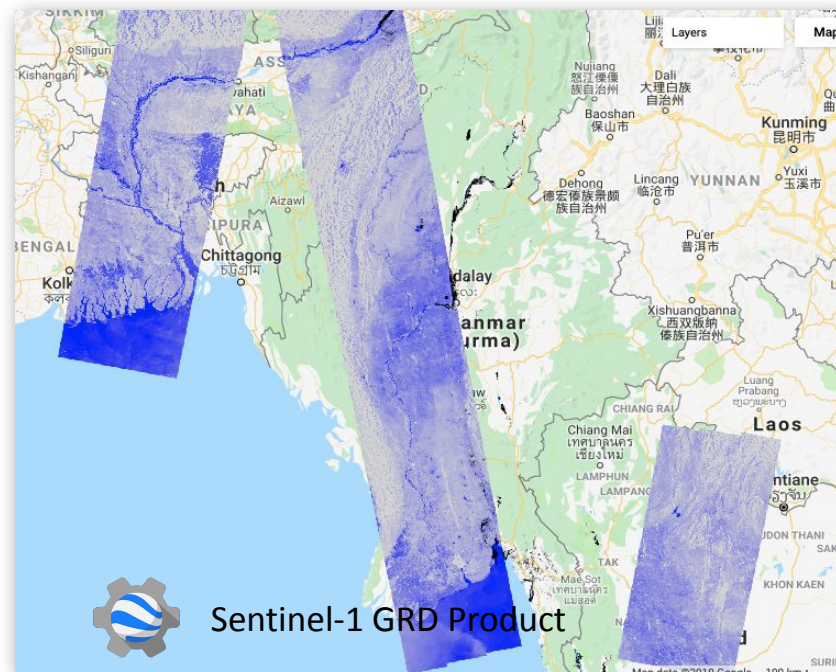
# import the hydraflooods and ee package
import hydraflooods as hf
import ee
ee.Initialize()

# specify start and end time as well as geographic region to process
start_time = "2019-10-05"
end_time = "2019-10-06"
region = ee.Geometry.Rectangle([104, 11.5, 106, 12.5 ])

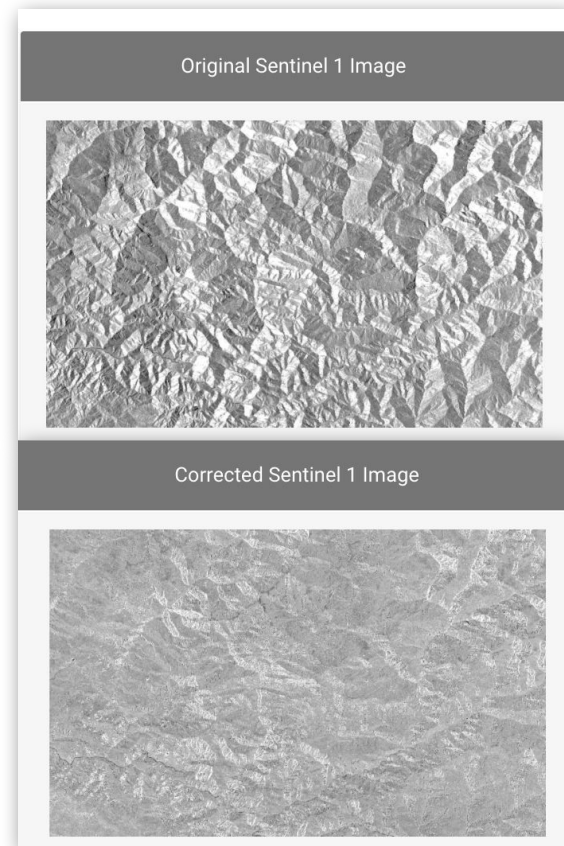
# get the Sentinel-1 collection
# the hf.dataset classes performs the spatial-temporal filtering for you
```

Table of contents
[Quick Start](#)
[Get in touch](#)
[Contribute](#)
[License](#)

- Cloud-based - overcome big data challenges
- Built on top of Google Earth Engine and Google Cloud ecosystem

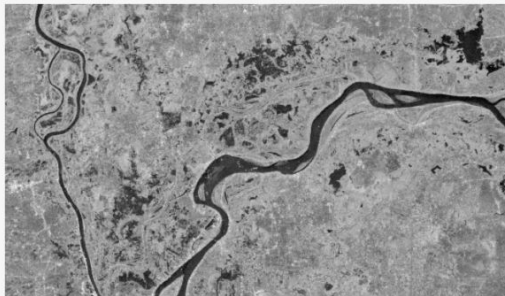


- End-to-End processing - users have all the tools needed to create their own high quality surface water map
 - QA masking
 - SAR speckle filters
 - Terrain correction (SAR and Optical)
 - Time series processing
 - Machine learning workflows
 - Multi-sensor water mapping algorithms



- Leverage multiple sensors easily with common syntax and data fusion workflows

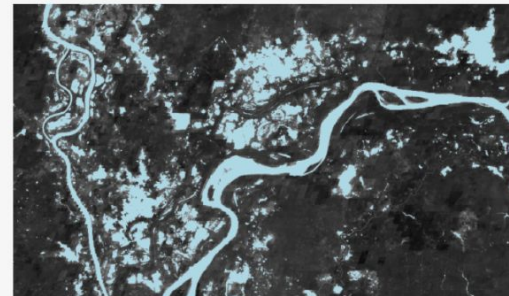
Sentinel 1 2019-12-04



Fused product 2019-12-04



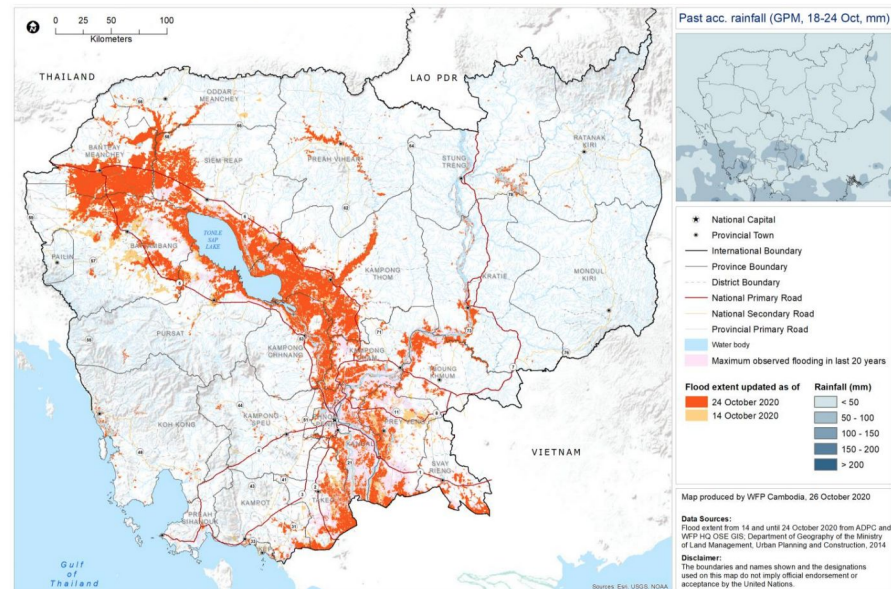
Estimated Water 2019-12-04



WFP Cambodia

- Currently providing combined water maps from multiple sensors
- Provide multi sensor surface water maps
- Uses machine learning and deep learning methods

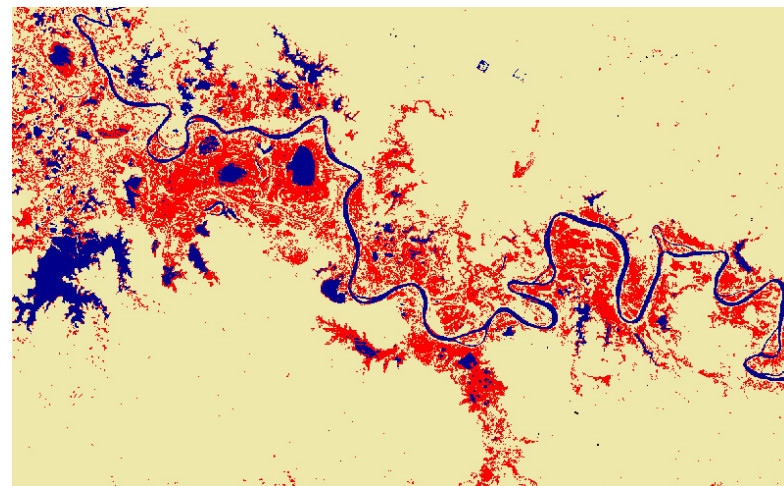
SATELLITE-DETECTED WATER (as of 24 October 2020)



Hurricane Eta & Iota

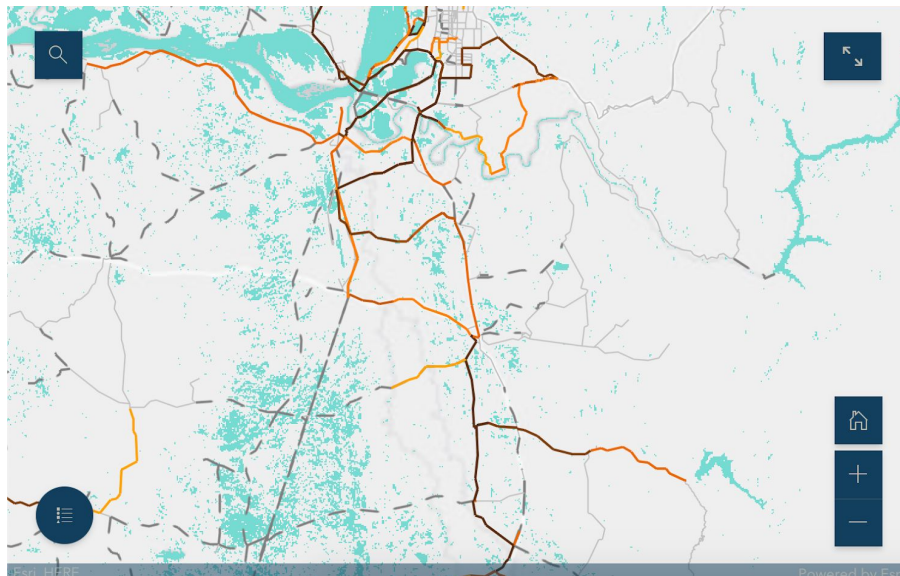
- Automated processing of Sentinel 1 data when available
- Data provided to CEPREDENAC for response efforts

Flooding in Mexico 2020-11-21



Deltares Flood Impact Analysis on Road Networks

- Used to understand how floods can potentially affect road networks and peoples access to critical services



Road usage intensity during flood

Finally, we could recalculate the road usage intensity of the non-flooded segments. From this, the most critical roads during these floods and areas most sensitive to congestion are identified and can be used by first responders for evacuation planning.

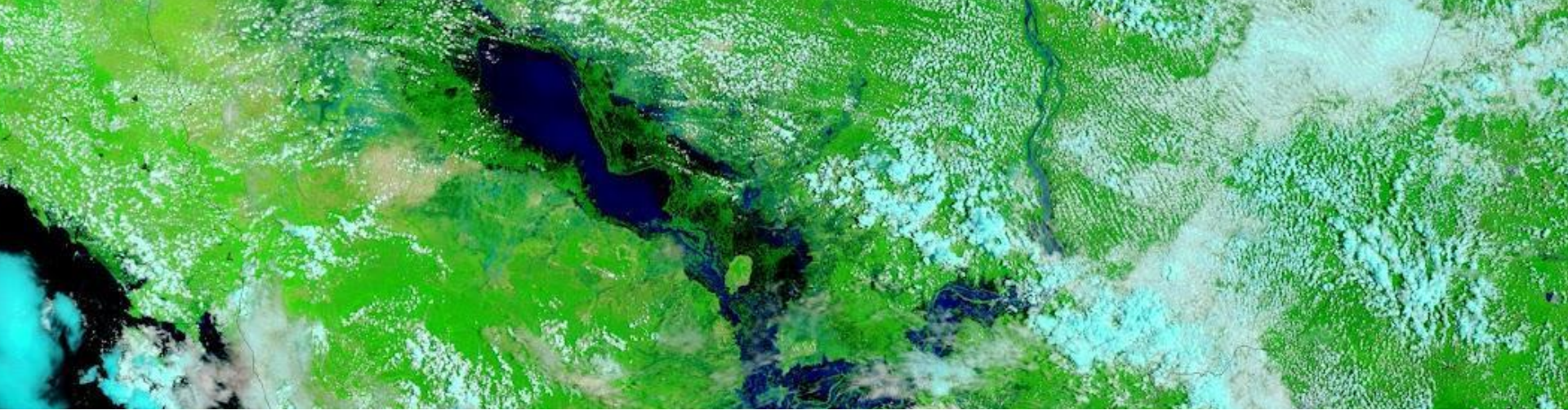
Dark red color scale indicates roads with an increased chance of congestion during floods.

<https://storymaps.arcgis.com/stories/9a130a0e8c424dceb91a42839662c1f3>



Water mapping exercise:

https://colab.research.google.com/drive/1ZtNy_GsLQsAkGoHDK-E02b0CrFm6mqwT?usp=sharing



Thank you for your attention!

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