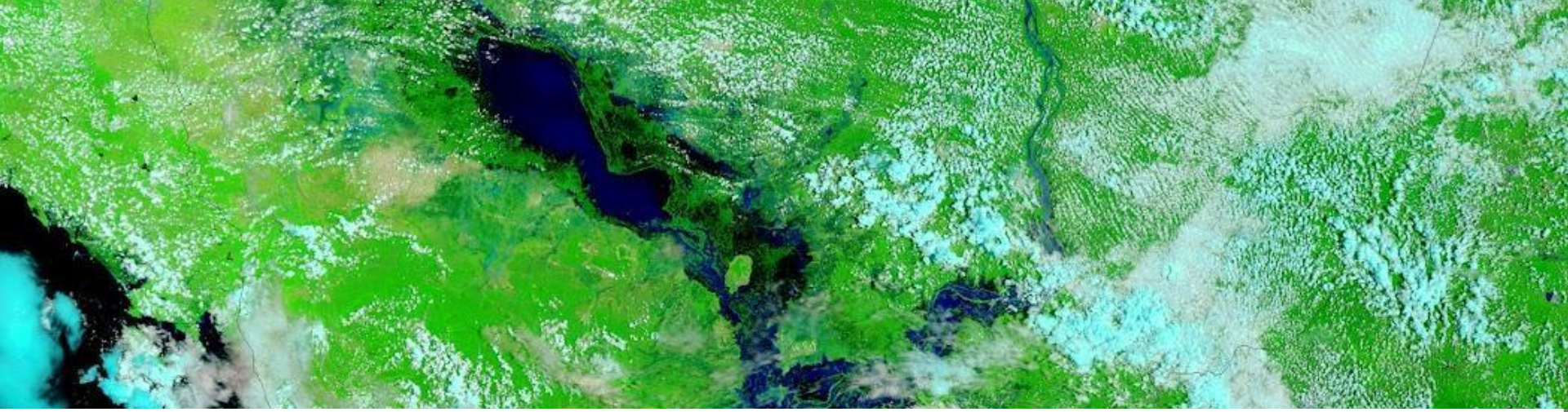


Flood mapping

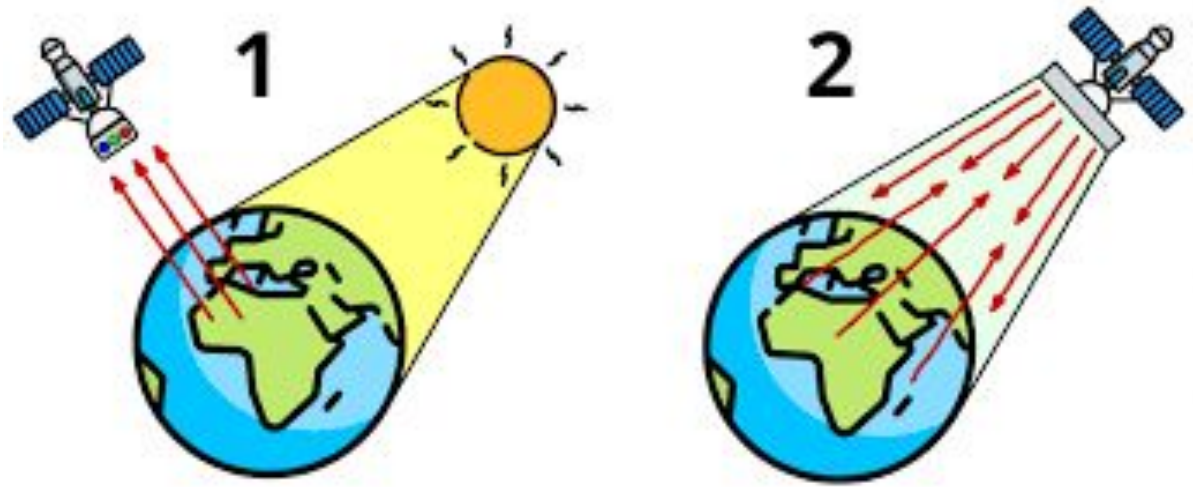
HYDRAFloods Training
13 October 2021

Outline

- Review of water mapping
- Flood mapping introduction
- Classification differencing
- Change detection
- Flood water depth
- Exercise

Types of remote sensing

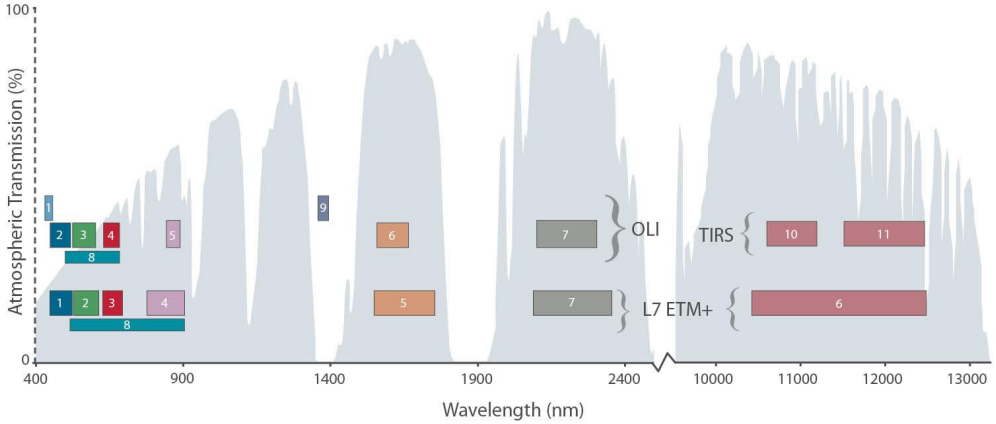
1. Passive Remote Sensing: Energy = Radiation from Earth
2. Active Remote Sensing: Energy = Instrument



https://paititi.info/research-technology/remote-sensing-from-space/

Optical Water Mapping

- Measures reflected light from sun in different wavelengths of the EM
- Combinations of bands can highlight different physical properties

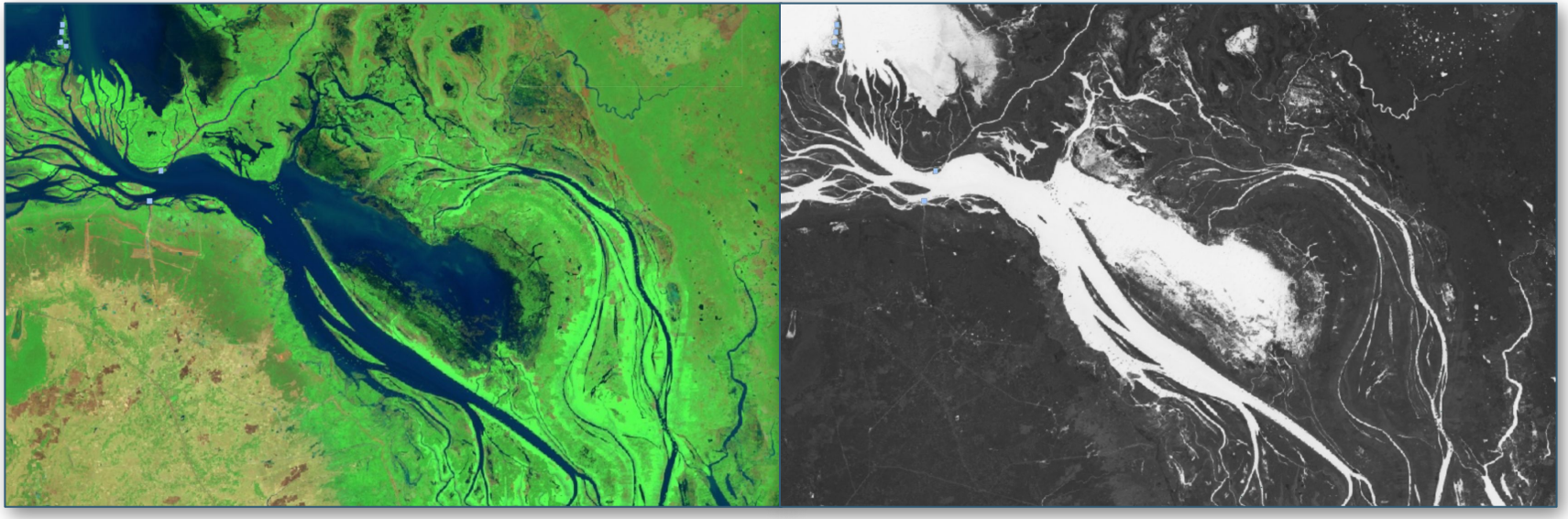


https://landsat.gsfc.nasa.gov/landsat-8/landsat-8-overview

CC BY-SA 3.0, https://commons.wikimedia.org/wiki/File:Satellite_image_of_Italy_in_March_2003.jpg

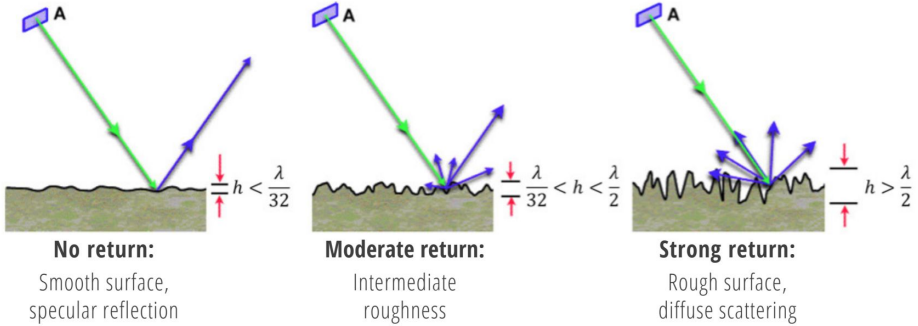
Water Indices

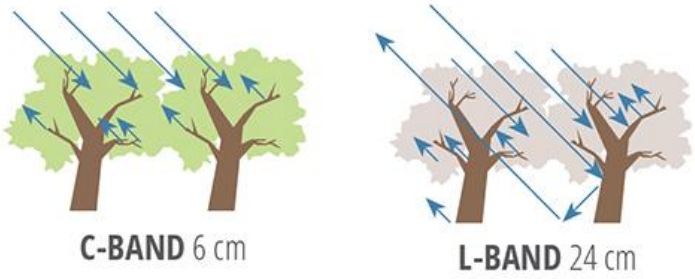
- Used to transform multispectral imagery to highlight water
- Rely heavily on shortwave infrared band



SAR Water Mapping

- **Synthetic Aperture Radar (SAR)** is a type of active remote sensing that is available in all weather conditions
- SAR measures the amount of energy returned to the sensor (backscatter)
- Typically SAR sensors operate in a few frequencies (X, C, L, and P bands)



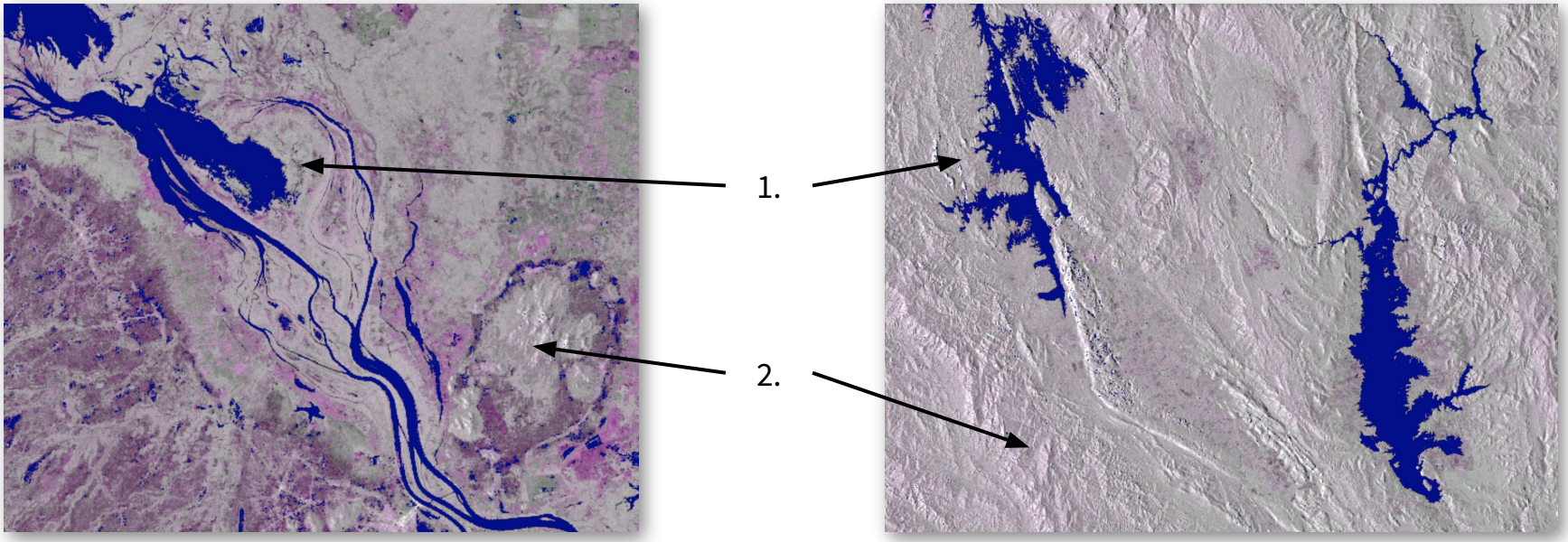


https://gis1.servirglobal.net/TrainingMaterials/SAR/Chp2Content.pdf

https://earthdata.nasa.gov/learn/backgrounders/what-is-sar

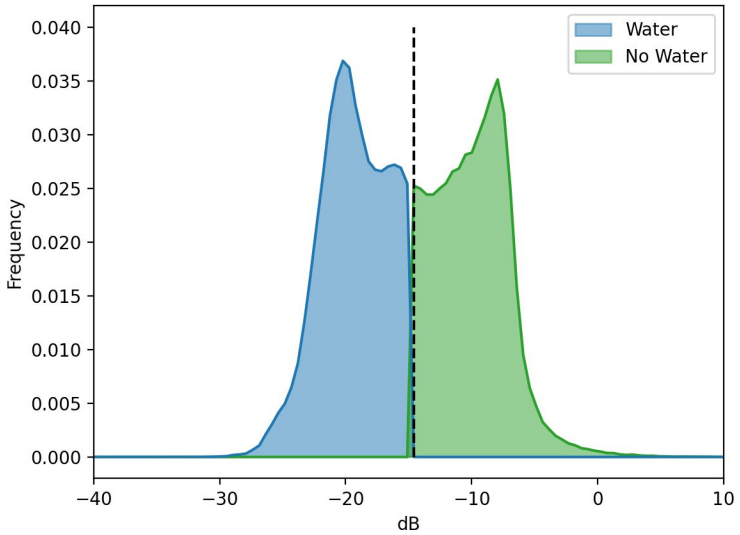
SAR Water Mapping

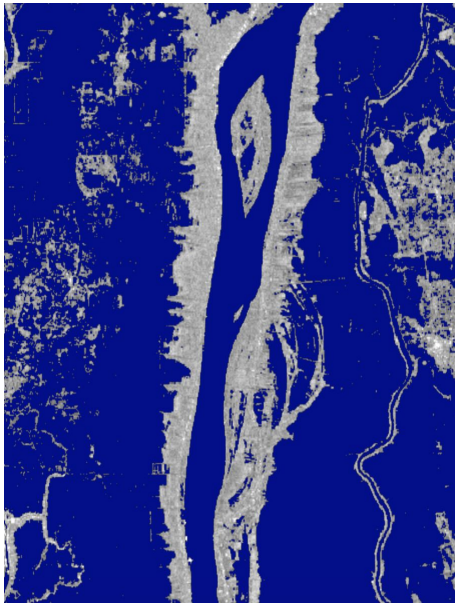
1. Water - specular reflection (low intensity)
2. Land - scattering by vegetation (high intensity)



Thresholding Algorithms

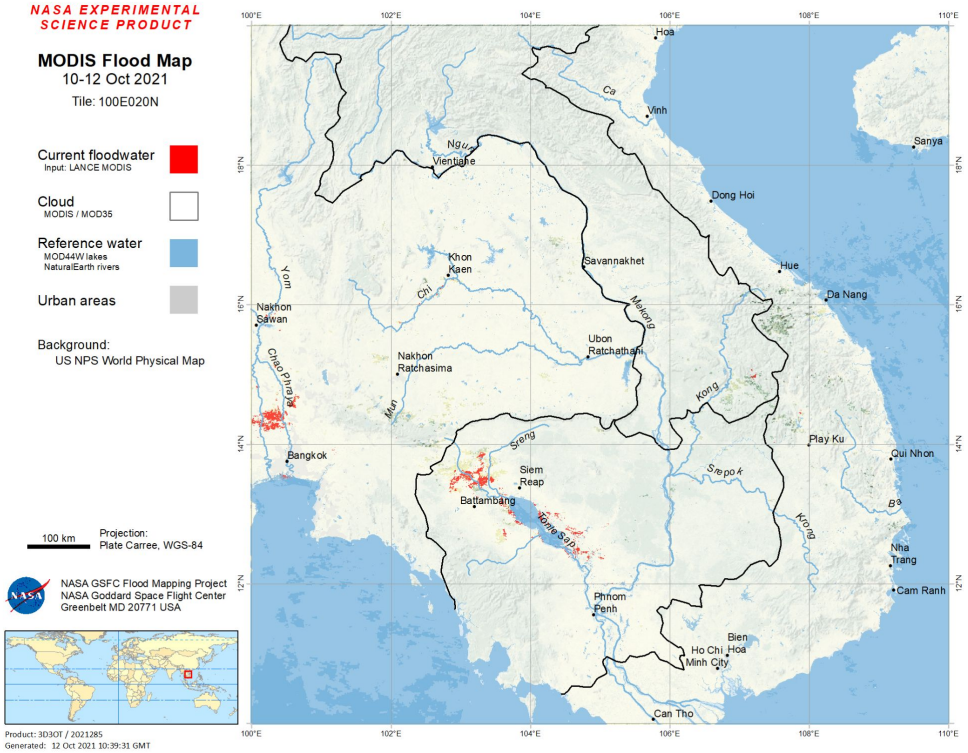
- Simplest form of image segmentation
- Uses a single value to classify image into binary classes
- Manual identification of threshold is timely and subjective





Flood mapping

- Remote sensing sensors do not explicitly detect floods
- Floods need to be **extracted from surface water**

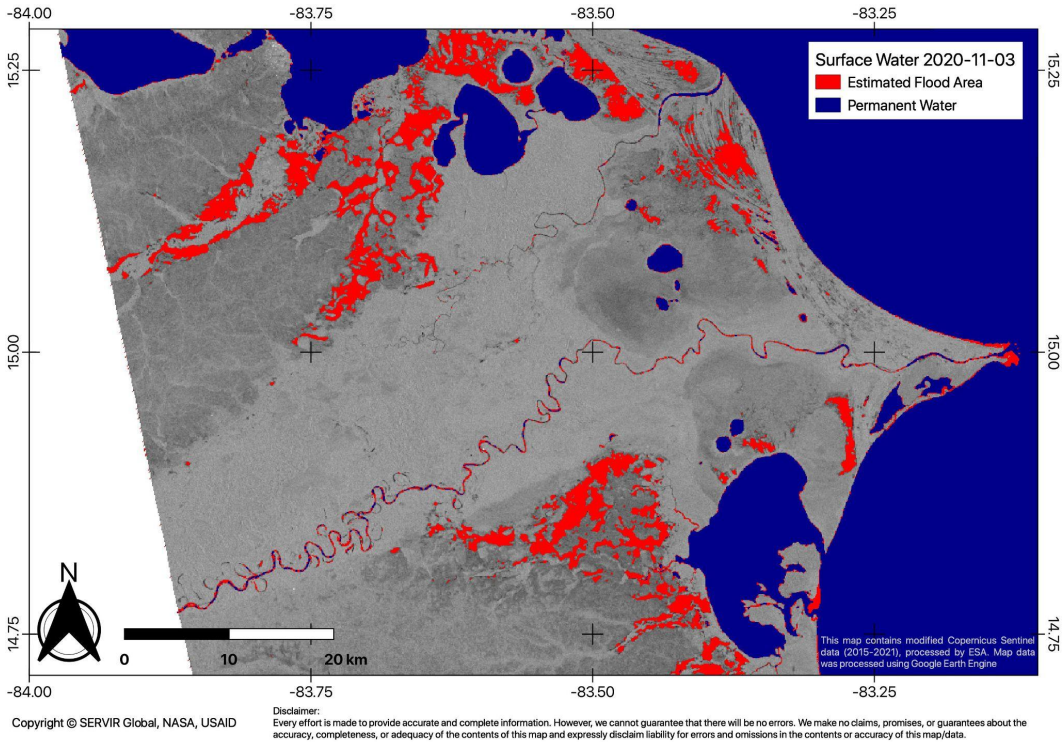


https://floodmap.modaps.eosdis.nasa.gov/index.php

Comparing to permanent water

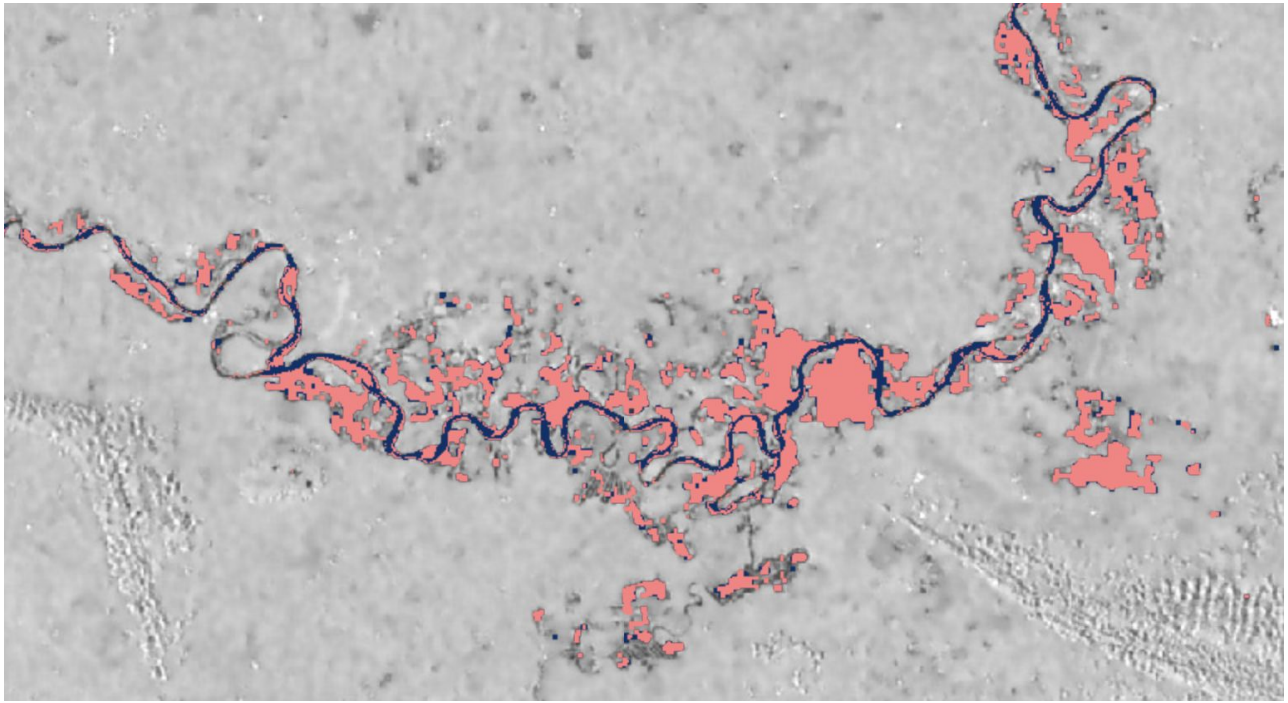
- Use historical information to define “permanent water”
- Possible sources:

1. JRC Global Surface Water Mapping Layers
2. Process all of imagery for a region to derive permanent water



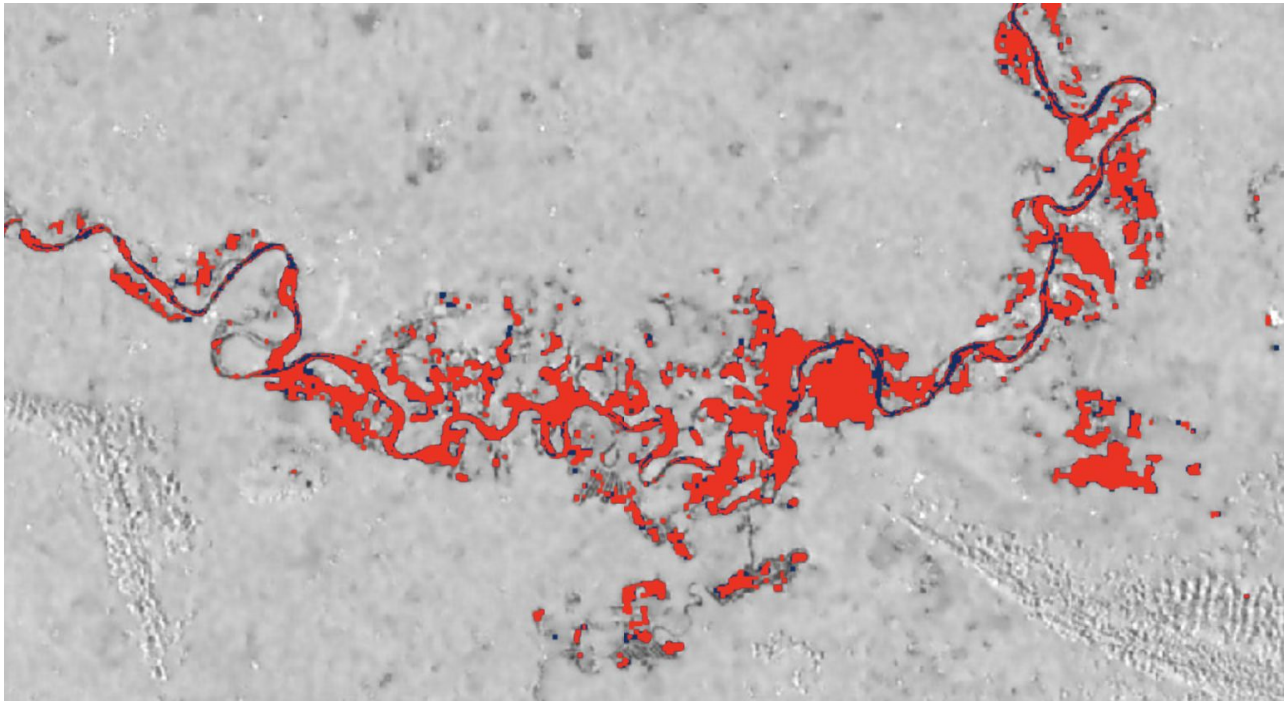
Comparing to permanent water

JRC yearly permanent water



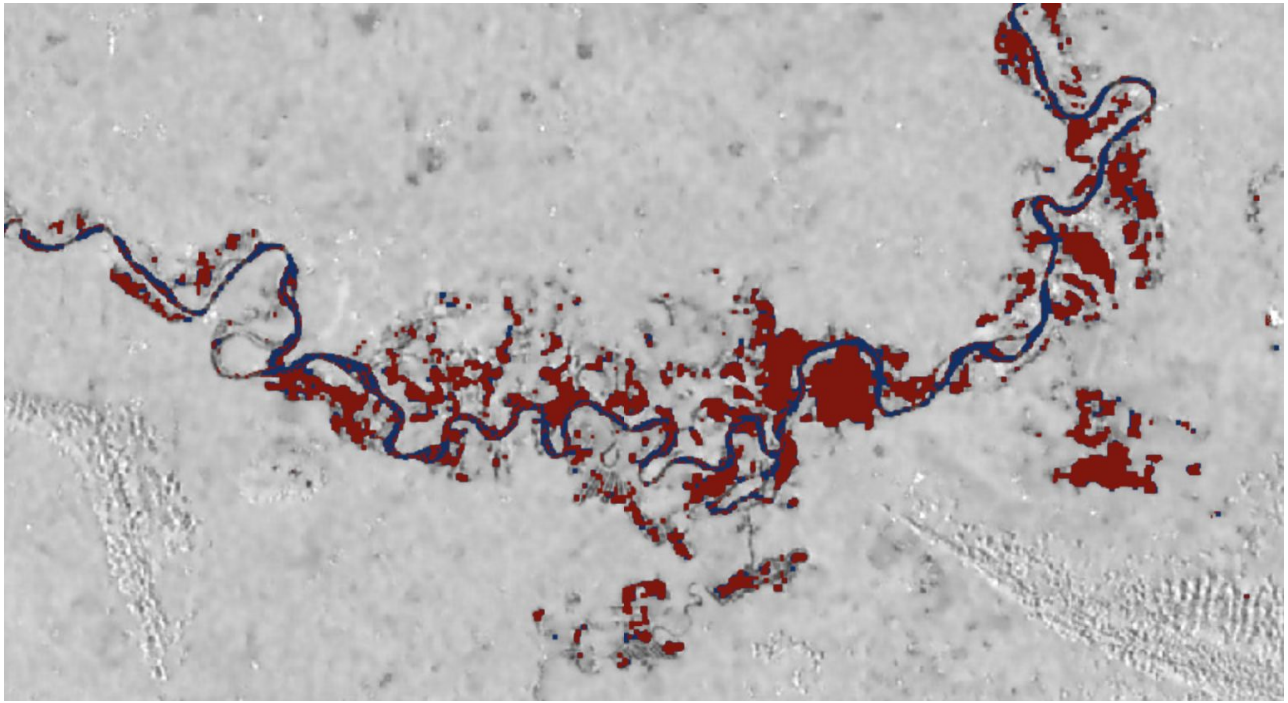
Comparing to permanent water

JRC water occurrence permanent water



Comparing to permanent water

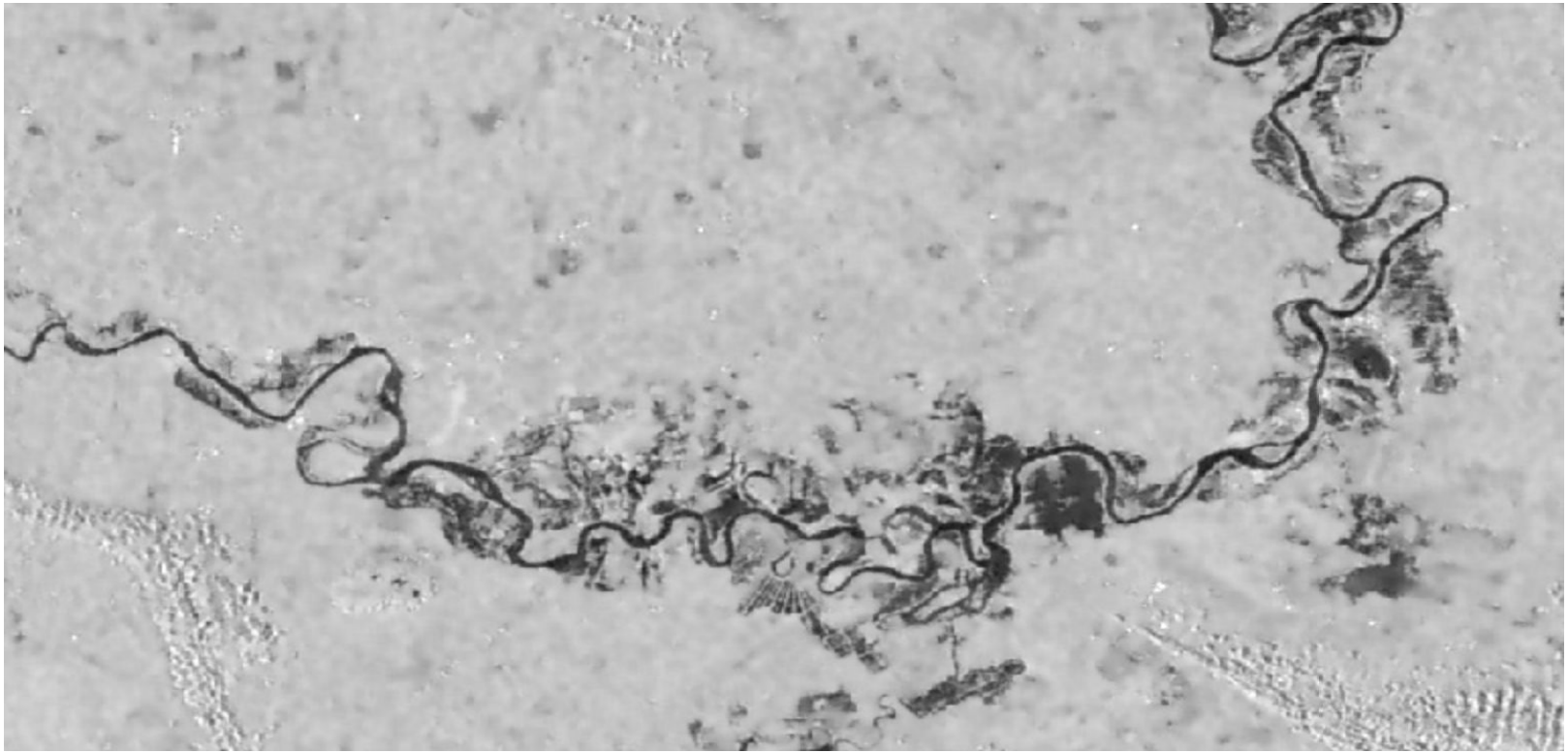
JRC seasonal occurrence permanent water



Pre- and post-event analysis

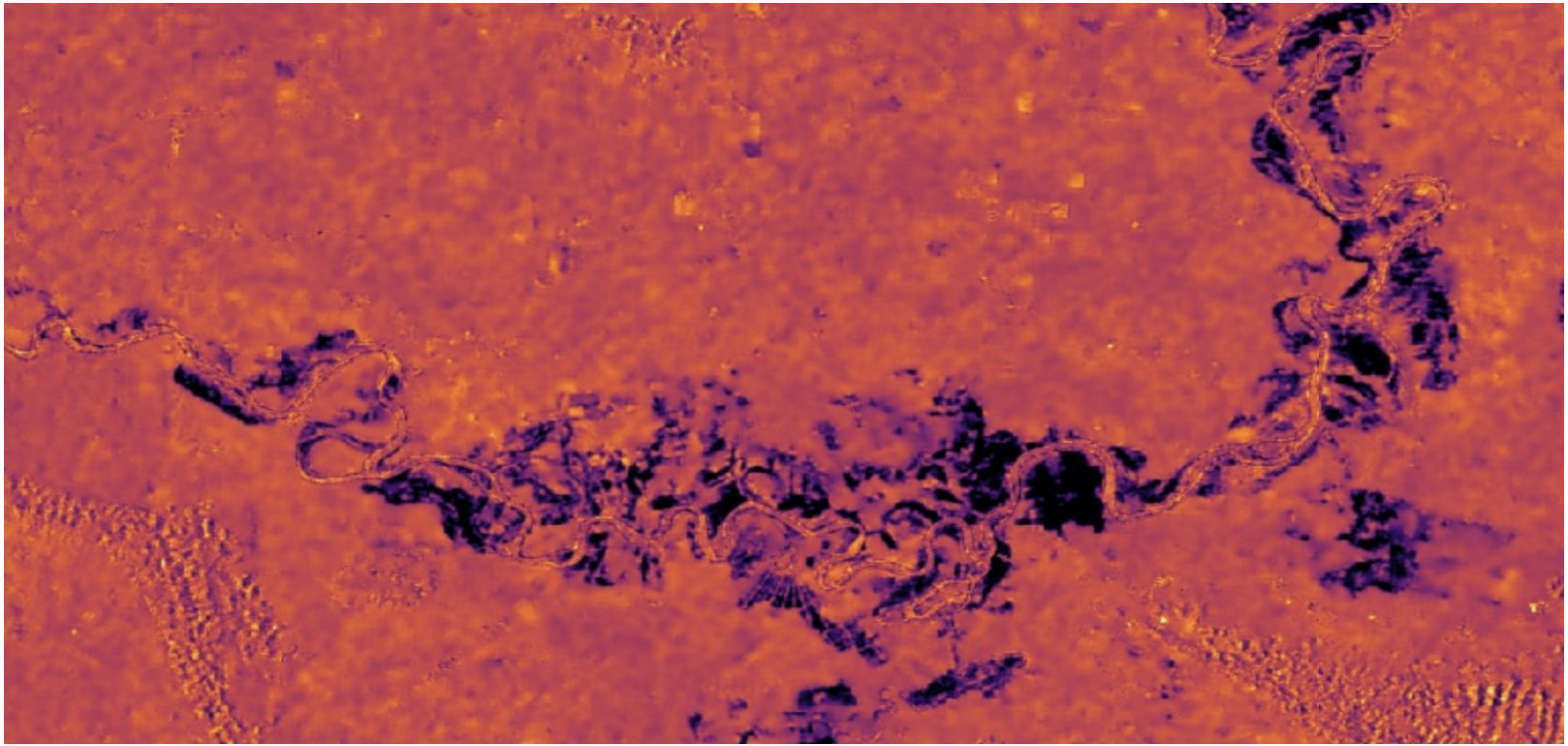
Change detection

Change detection

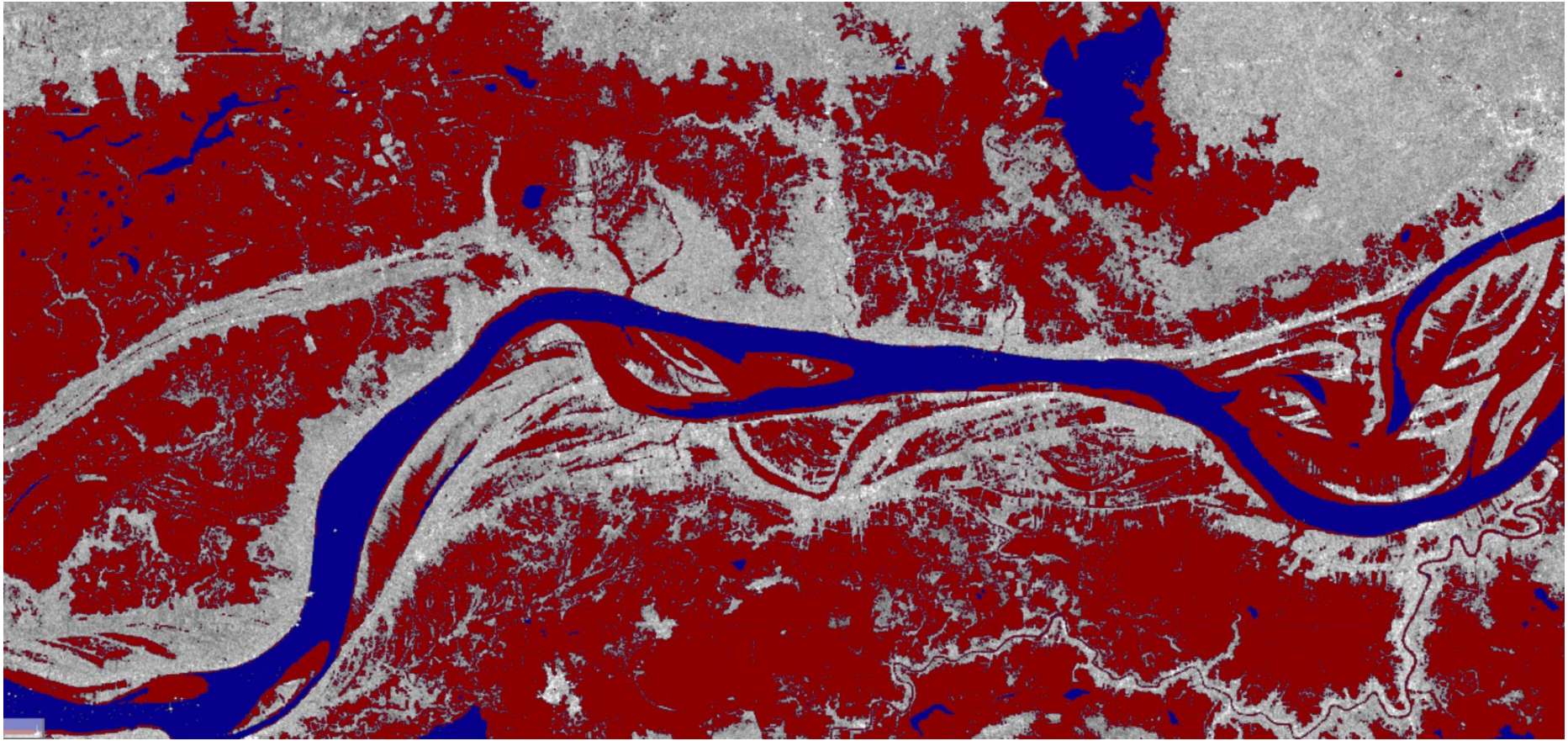


Pre- and post-event analysis

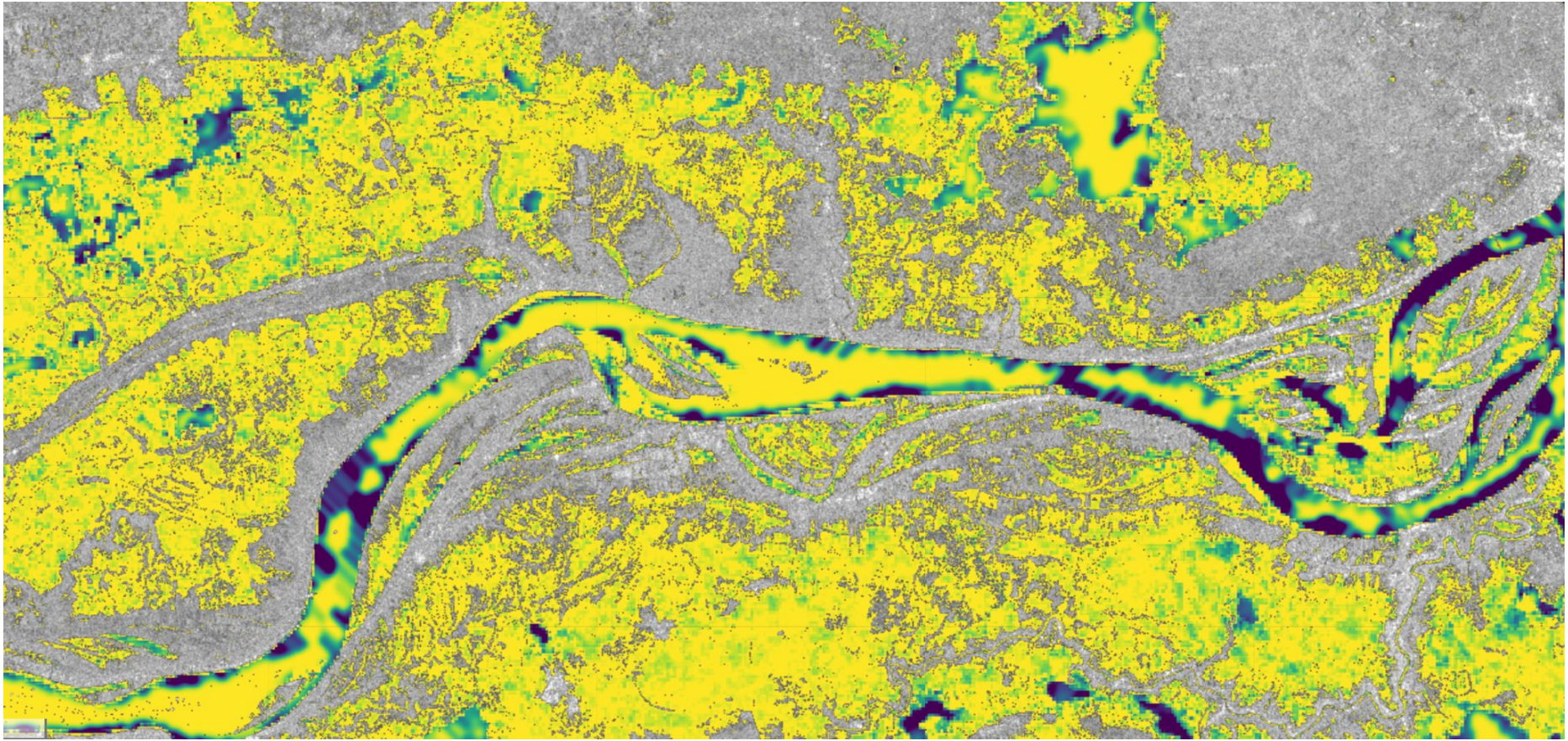
Change detection



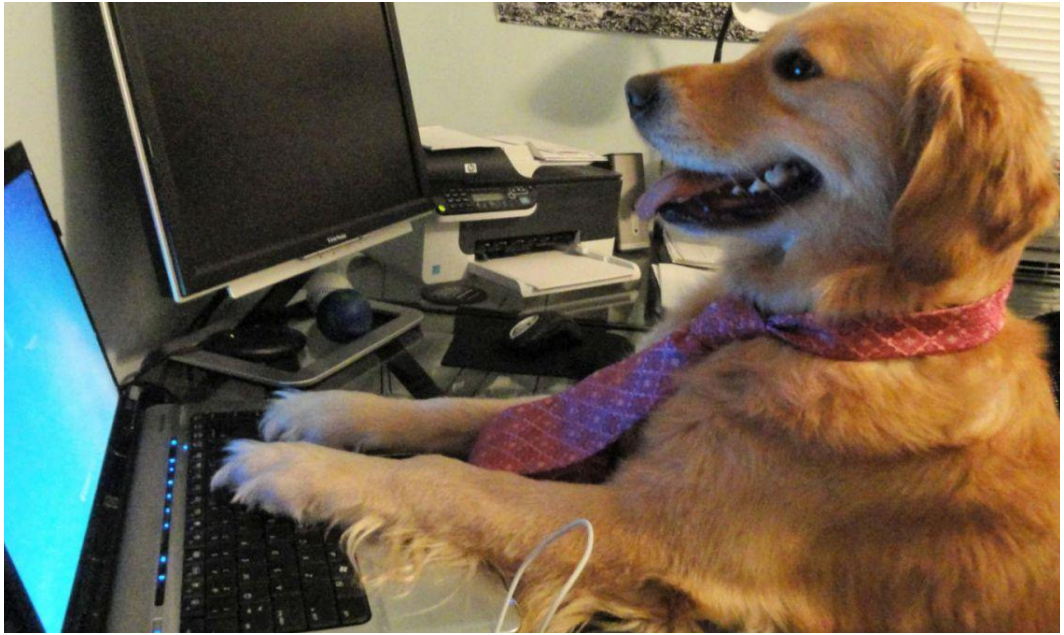
Flood water depth



Flood water depth

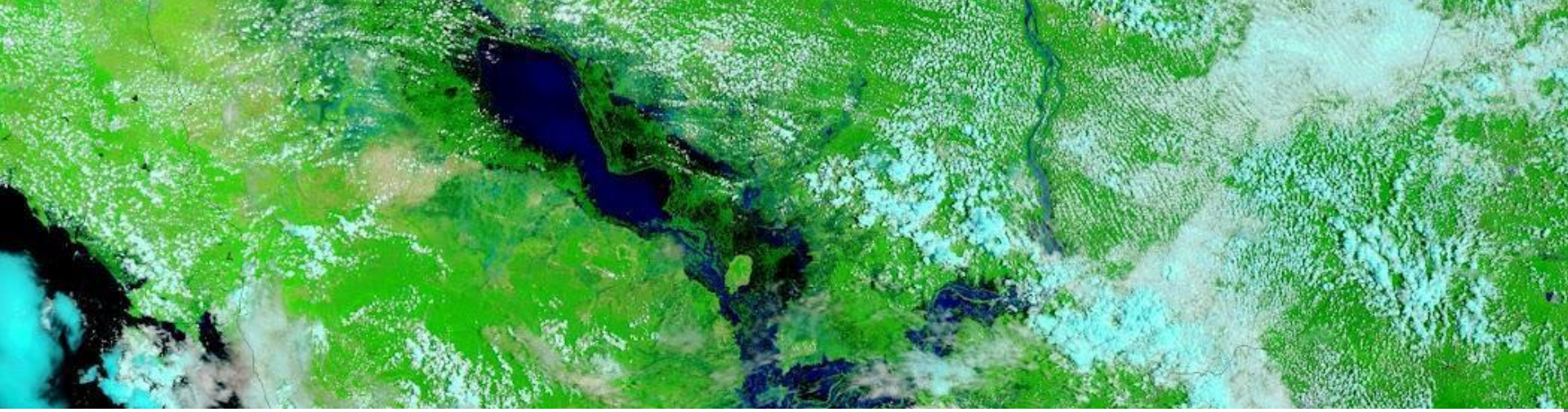


Exercise



Data fusion exercise:

https://colab.research.google.com/drive/1PXekFXP4twyk0kac_m7hD-SOIdezHSOm?usp=sharing



Thank you for your attention!

kel.markert@nasa.gov