

Long-term flood monitoring system using Synthetic Aperture Radar (SAR) imagery in tropical climate region: Cambodia as a test case

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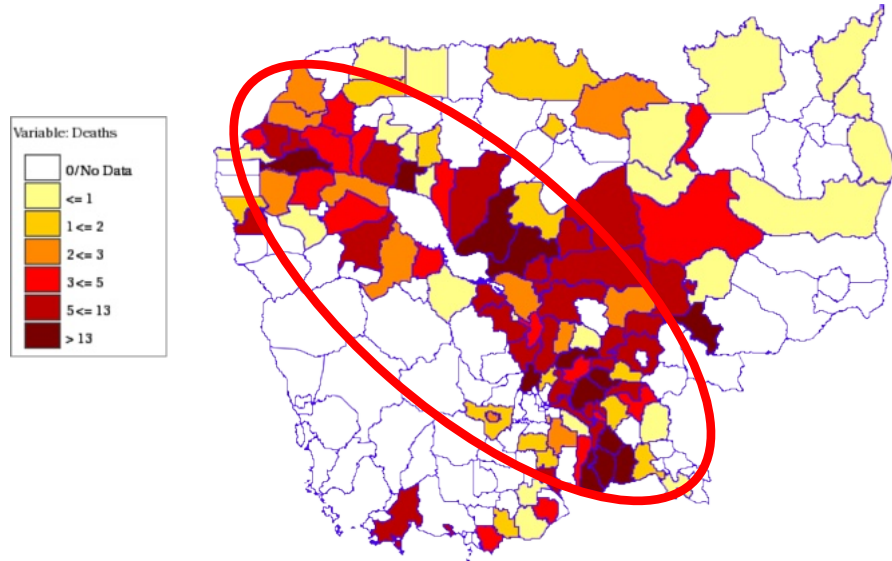
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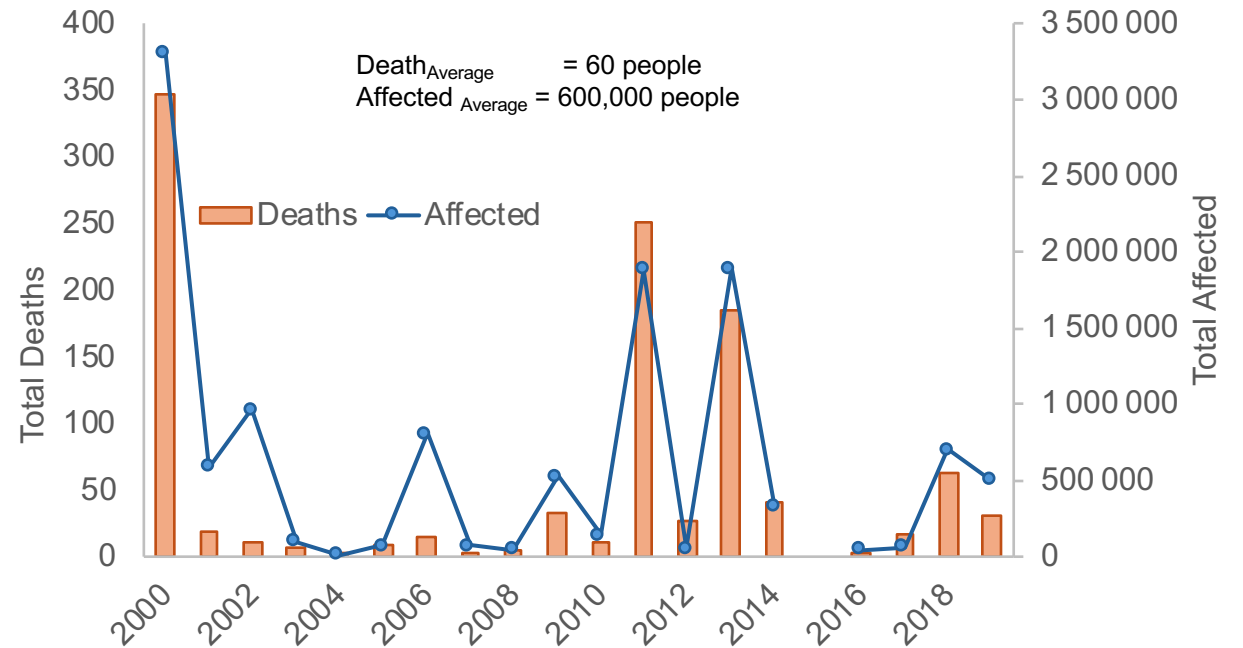
PREZODE in action
in the global South

Floods and its consequences



Source: Cambodia Disaster Damage & Loss Information System (CamDi).
<https://camdi.ncdm.gov.kh/>

Reported Death and Affected People Caused by Flood from 2000-2019



Deaths Reported by Commune

Cambodia is one of the most disaster-prone countries, especially by **flood hazard** due to its low-laying terrain and large central flood plain.

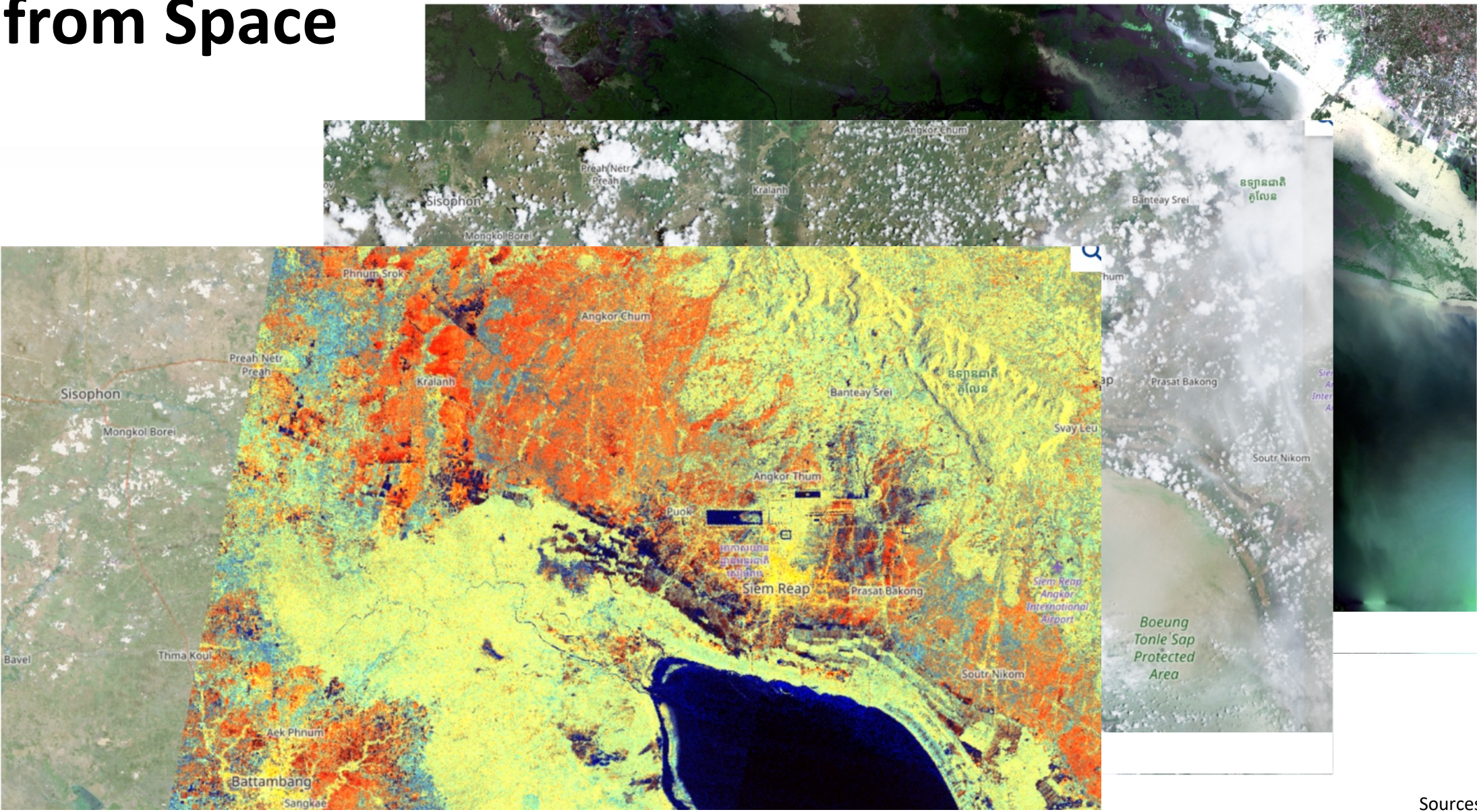
Communes located along central flood plain are highly vulnerable during and after flood events.

Lives on WATER



- Socio-Economic disruption due to infrastructures vulnerable to flooding (e.g., school, health center, and access roads).
- Increase the risk of transmitting water-related diseases such as leptospirosis, or alter the ecology of mosquito-borne diseases such as dengue fever.

Earth from Space



Composite Sentinel-1 image on the September 21, 2020 (R:VV, G: VH, B:VV/VV)

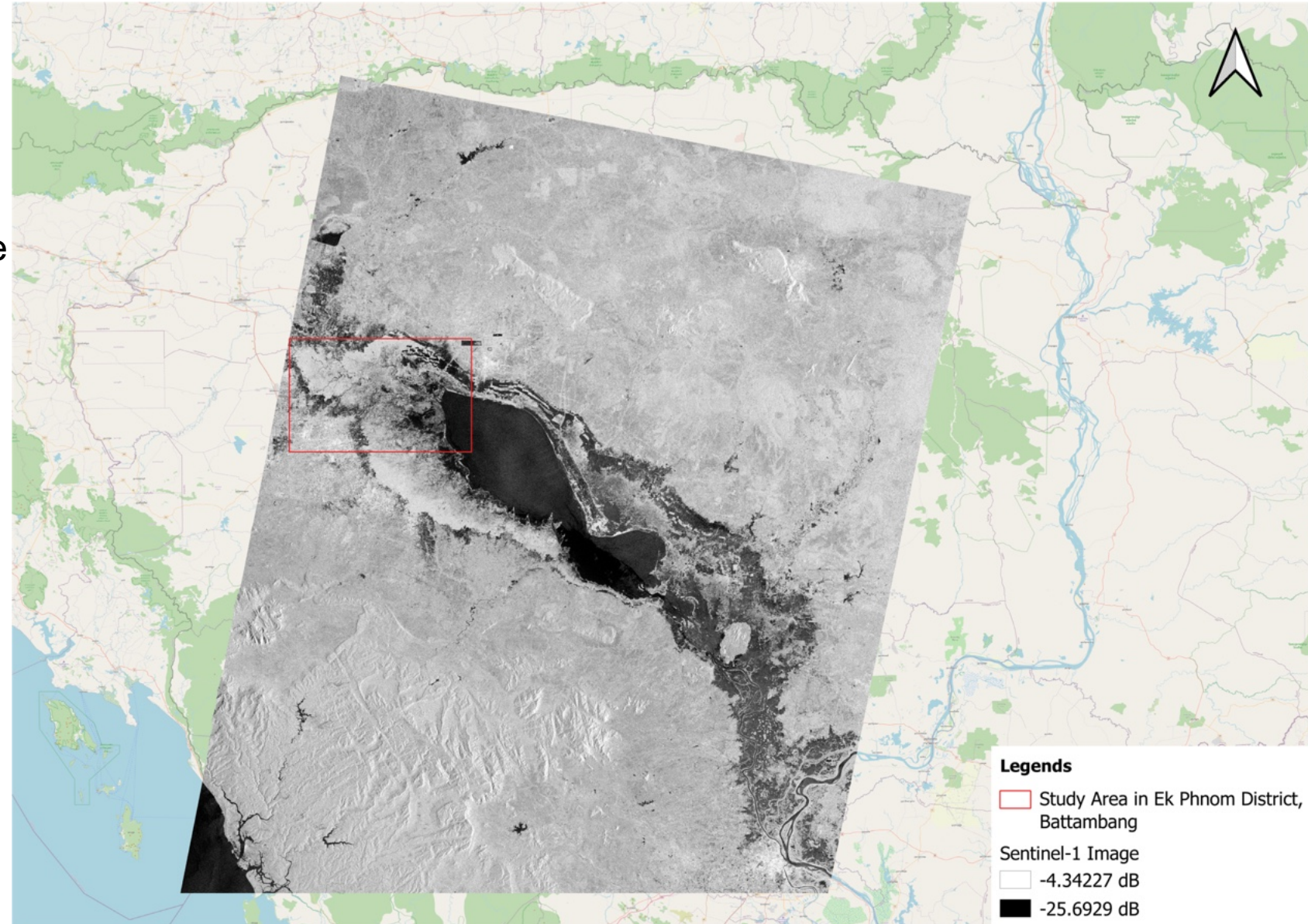
Sources:
<https://browser.dataspace.copernicus.eu/>
PlanetScope NICFI program

Backprea, an diverse indunated floodplain

Study area: located in Ek Phnom district, Battambang province, Cambodia. This area is laying over the flood plain of Tonle Sap Lake and affected by seasonal flood every year.

Flood Detection Approaches:
Thresholding + Region growing

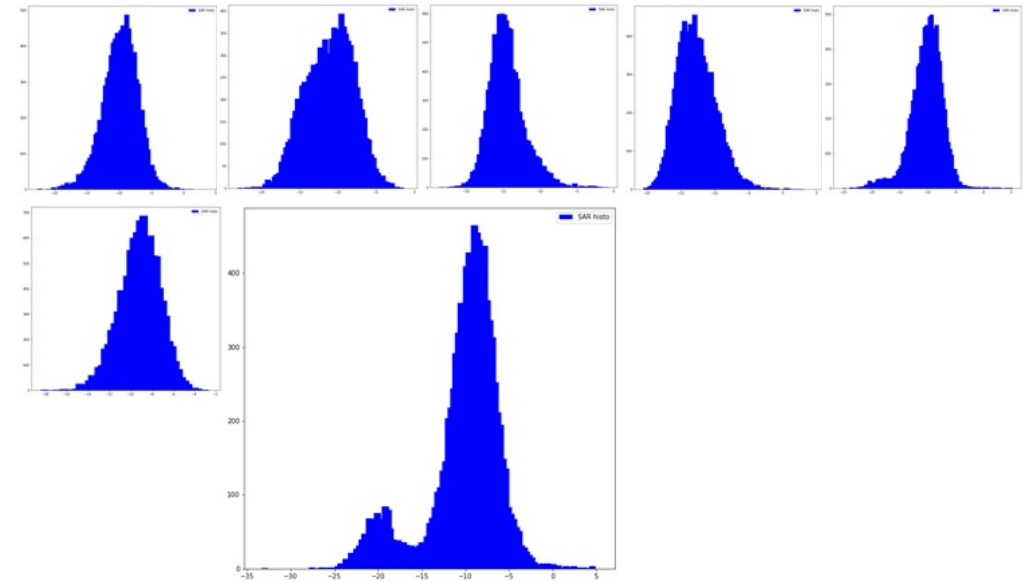
Evaluation: comparison with MODIS sensor (Sakamoto et al., 2007).



Methods

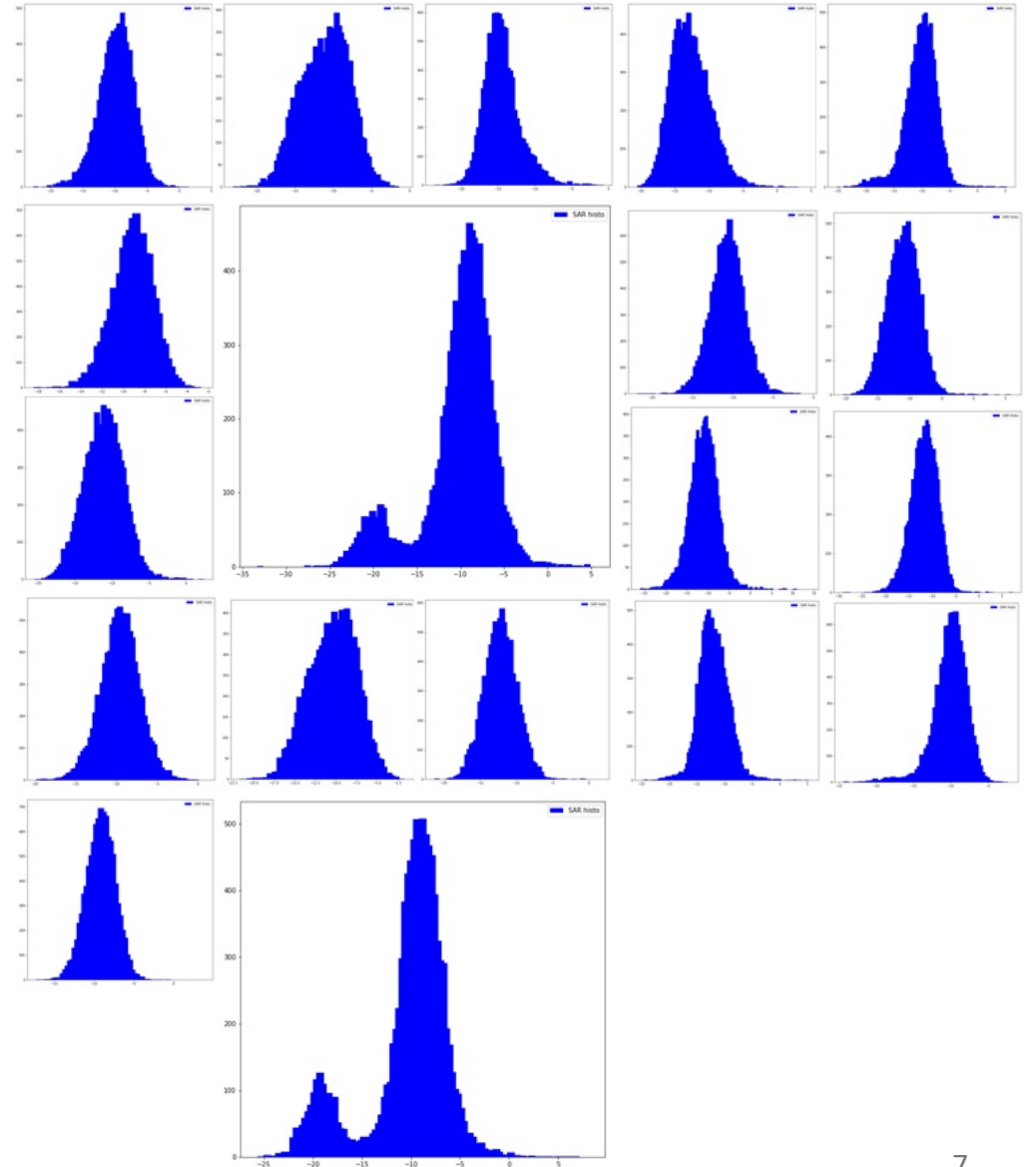
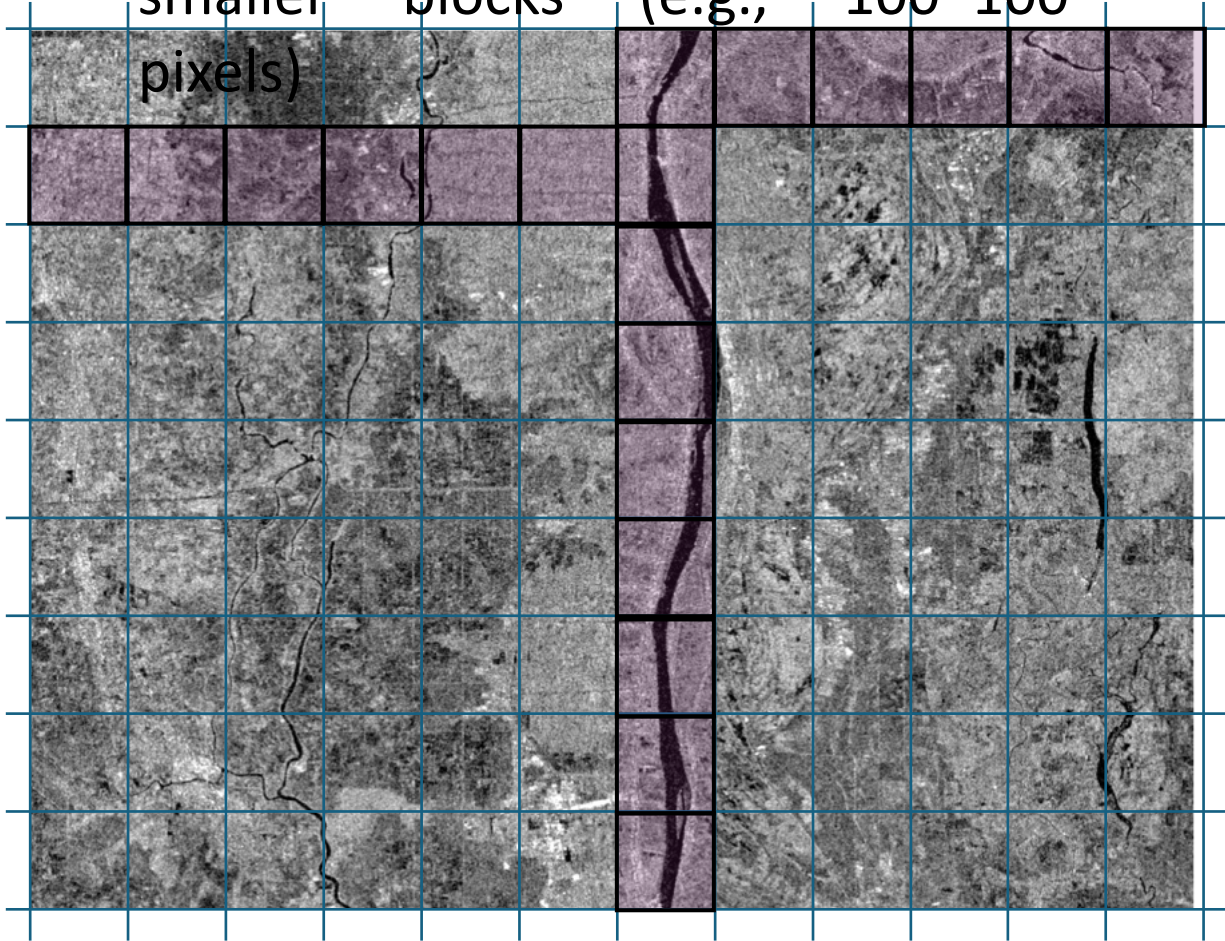
Splitting the input image into smaller blocks (e.g., 100*100

pixels)



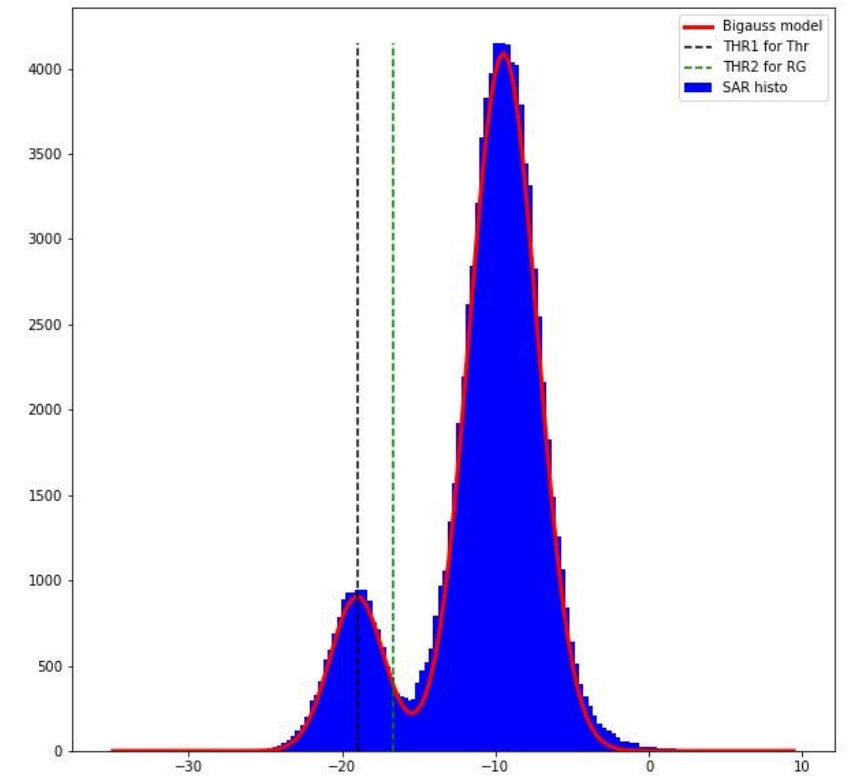
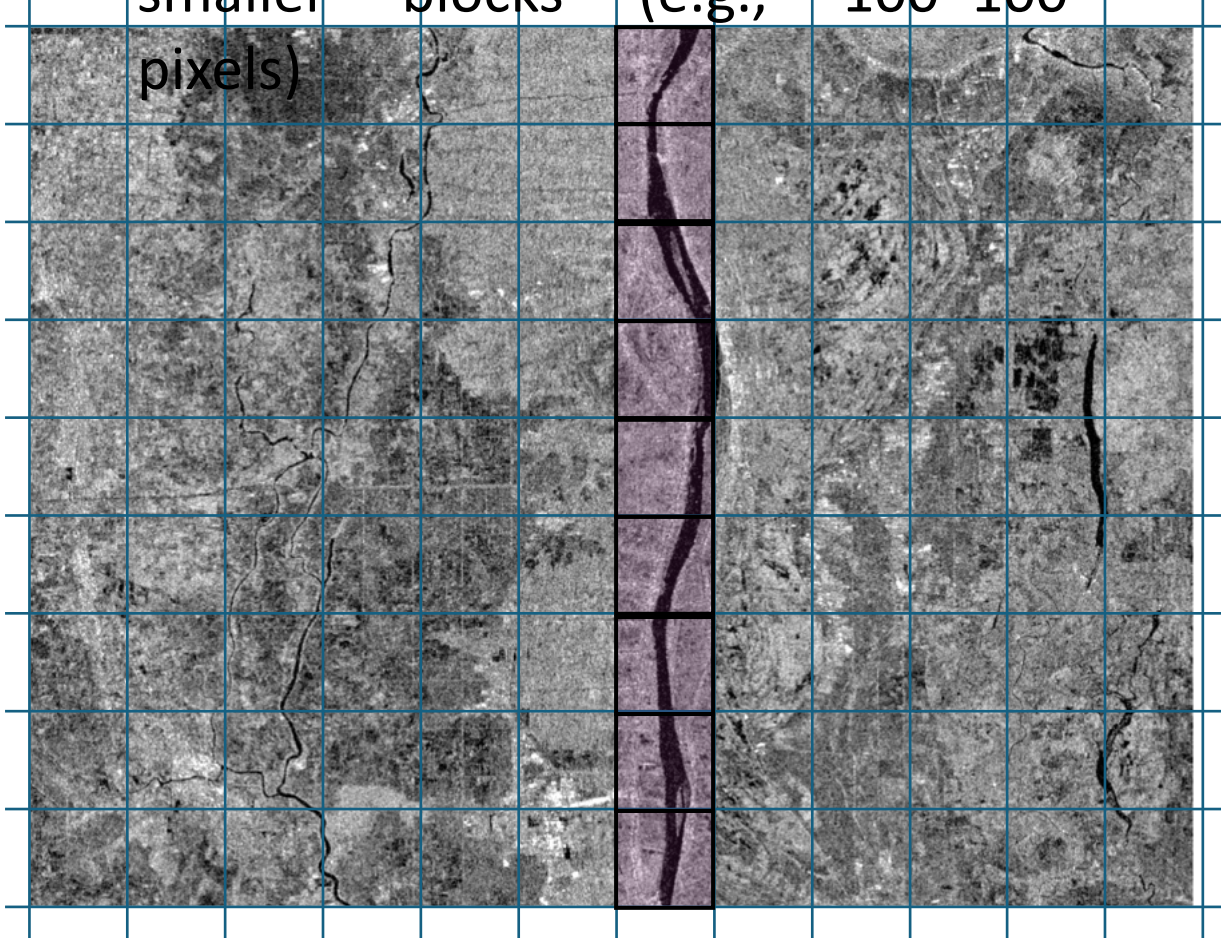
Methods

Splitting the input image into smaller blocks (e.g., 100×100 pixels)



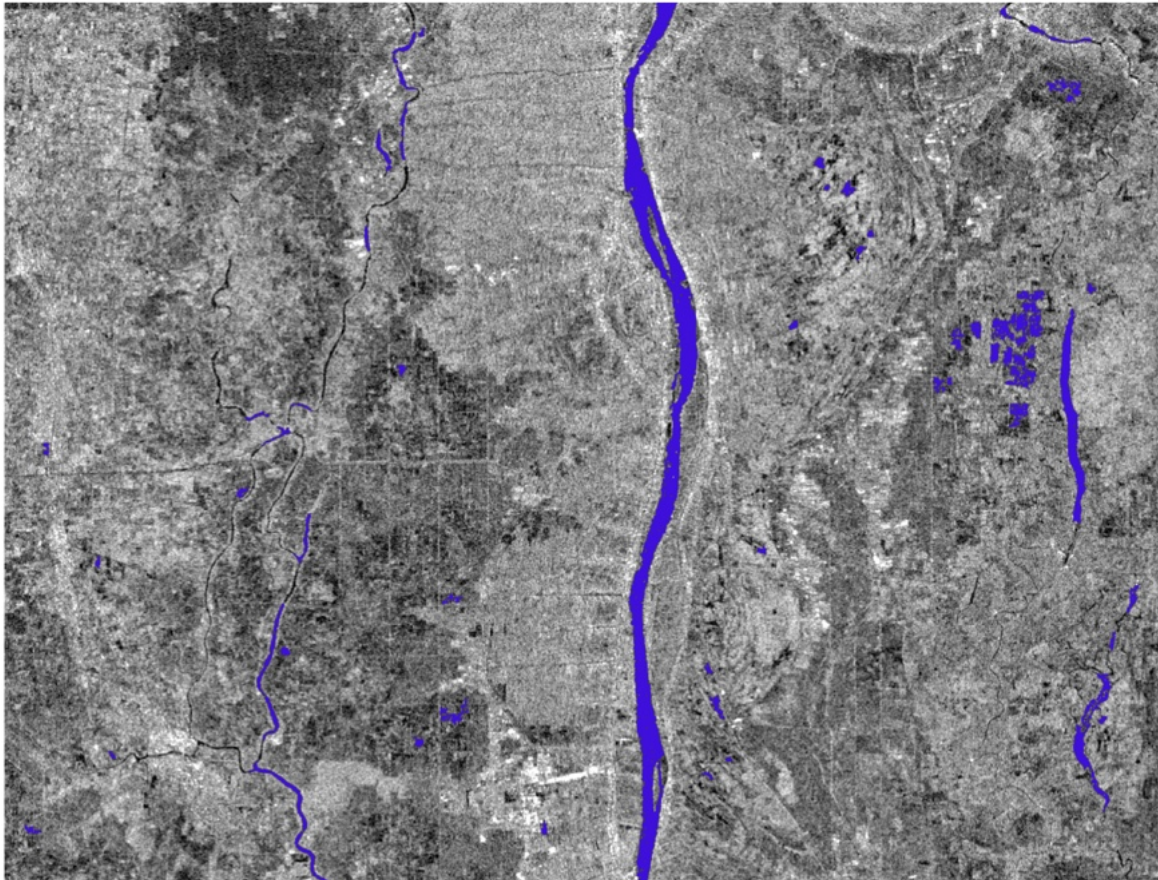
Methods

Splitting the input image into smaller blocks (e.g., 100*100 pixels)

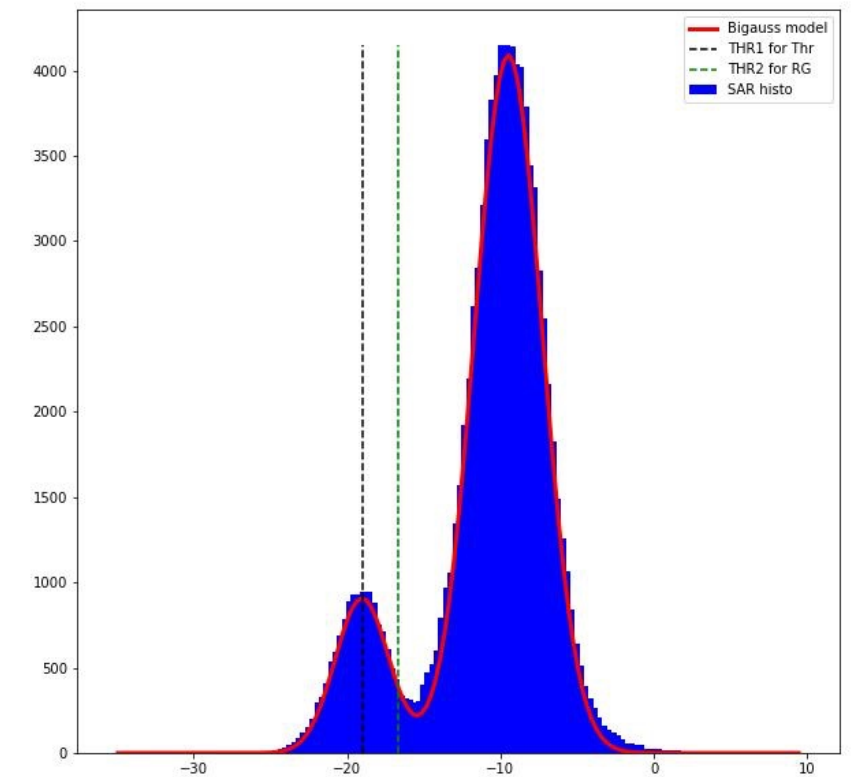


Methods

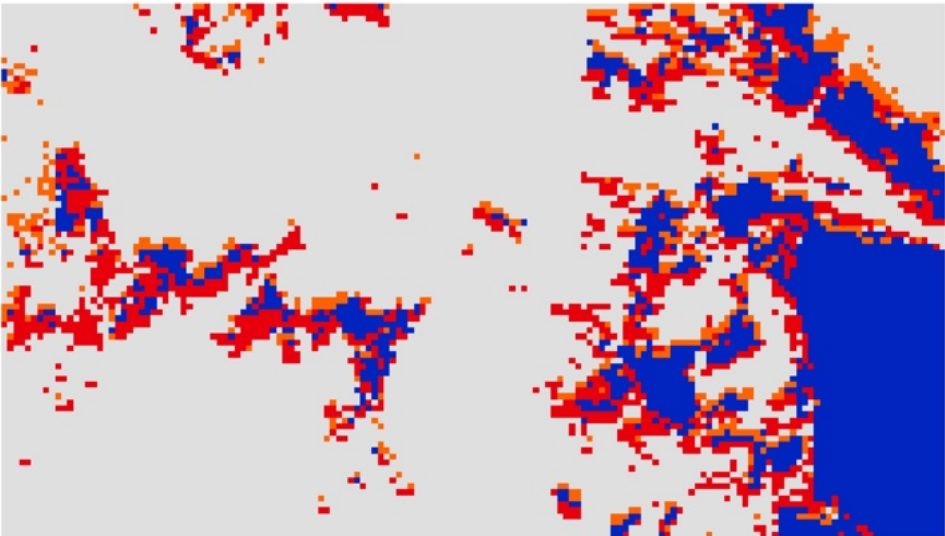
Thresholding + Region Growing



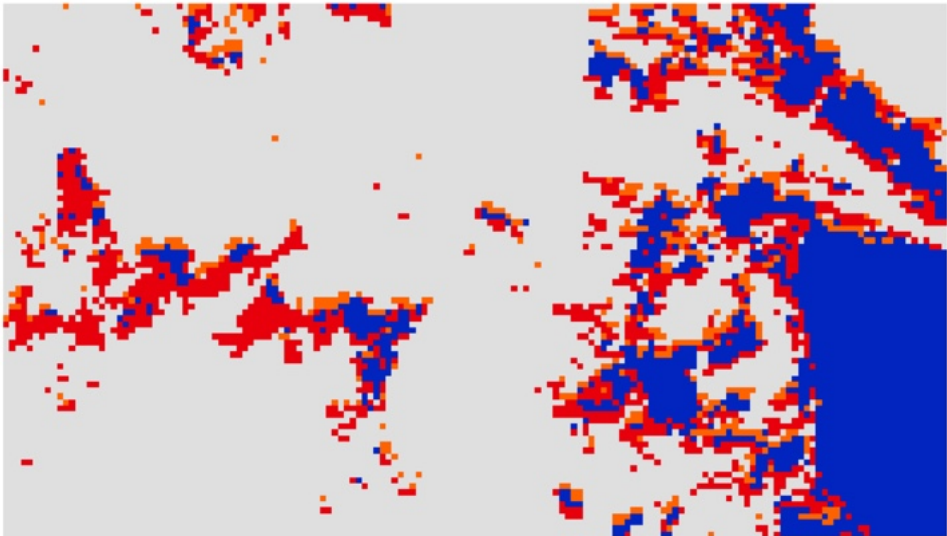
The algorithm also integrates Change Detection on the same principle and will soon integrate VV and VH polarization



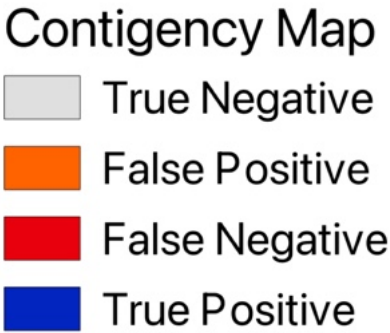
Results and Discussion



November 17, 2023 (VH)

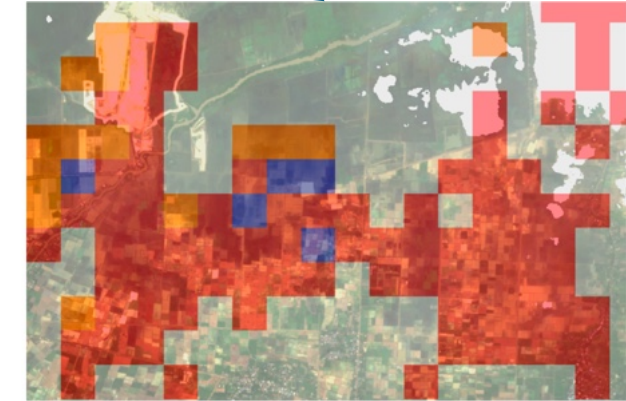
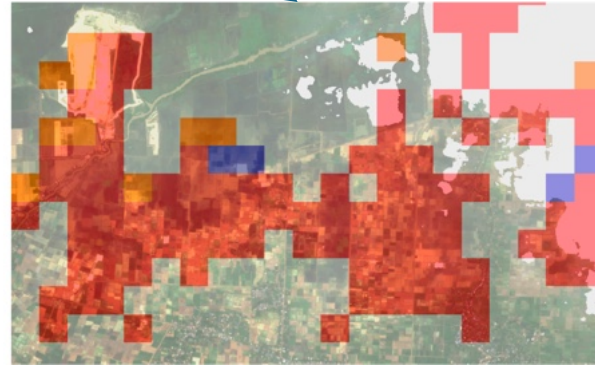
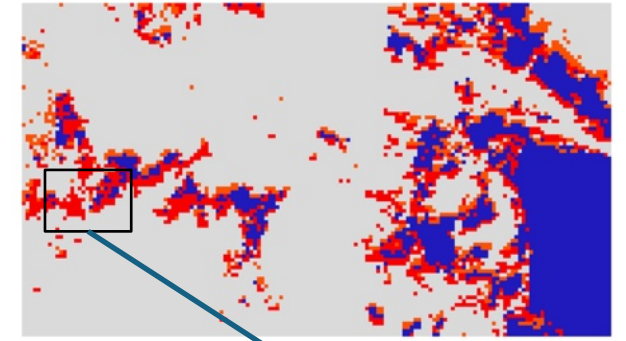
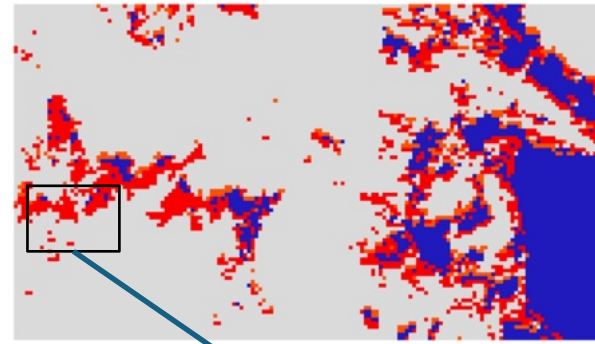


November 17, 2023 (VV)



OA	PA Water	PA Non-Water	UA Water	UA Non-Water
0.8536	0.6113	0.9412	0.79	0.87
0.8533	0.5942	0.947	0.8023	0.8658

Results and Discussion

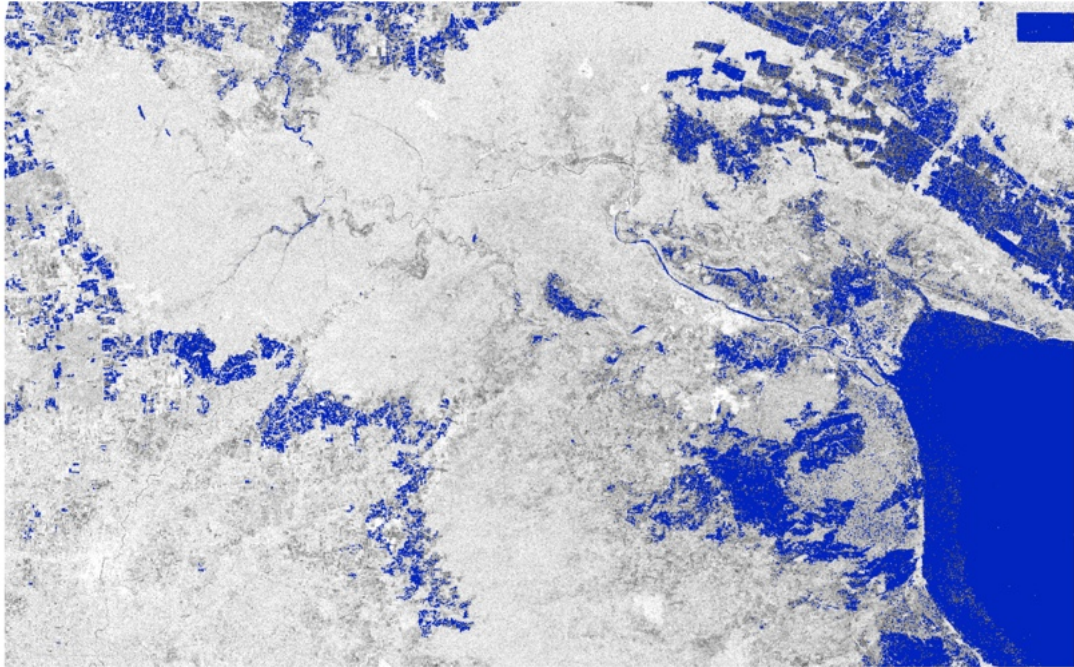


2023-11-17 (VH)

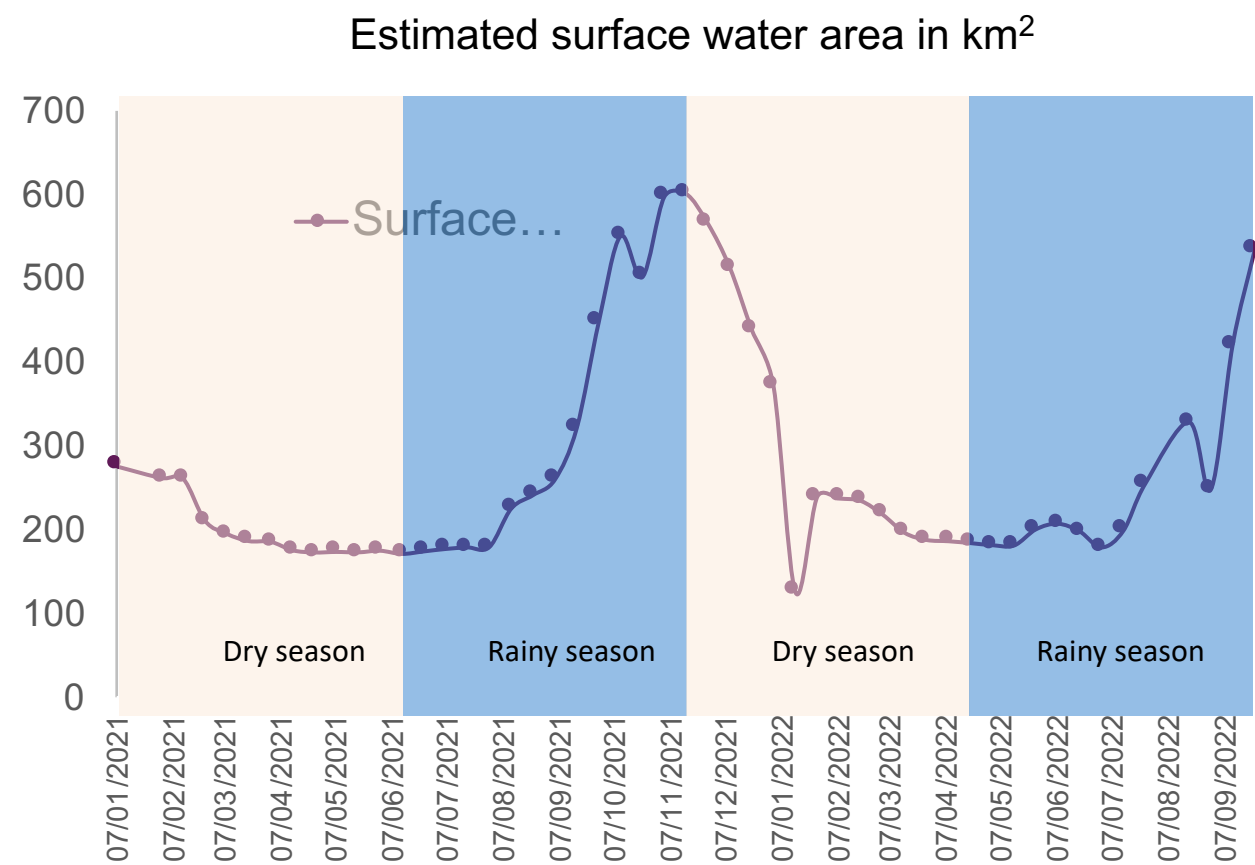
2023-11-17 (VV)



Results and Discussion



Flood Water Extend derived from VV 23/09/2022



Conclusions

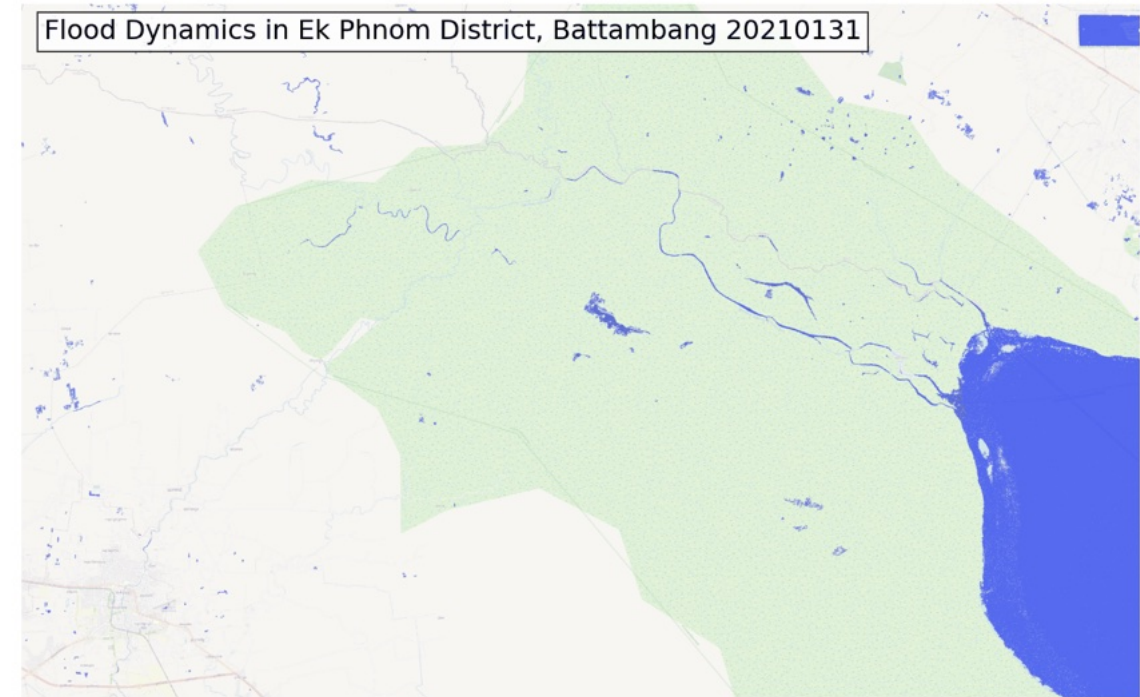
Technical aspect:

- All-weather capability: Sentinel-1's radar imaging works in cloudy and night conditions.
- Dataset accessibility: Free and long-term accessible, high resolution and short revisit time.
- Algorithm allows rapid detection to classify surface water without ground knowledges.

Perspectives:

- Integrate with flood risk and water resources management, as well as for health surveillance system.

Time series of flood extend maps derived from SAR images



Dynamic of flood extend derived from Sentinel-1 (2021-2022) images in Ek Phnom district, Battambang.



Acknowledgement:



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