



SAR-based flood mapping services to assess the risk and measure the impact

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Introduction

- Floods are the most frequent weather disasters in the world and the costliest in terms of economic losses.
- Mapping flood extension is fundamental to ascertain the damage, extremely useful information for relief organizations and the re-insurance sector.
- According to statistics of the International Charter “Space and Major Disaster,” ~52.3% of the total number of activations are triggered by flood events.
- By 2050, worldwide annual losses due to flooding are predicted to reach \$1 trillion for coastal cities.

Introduction

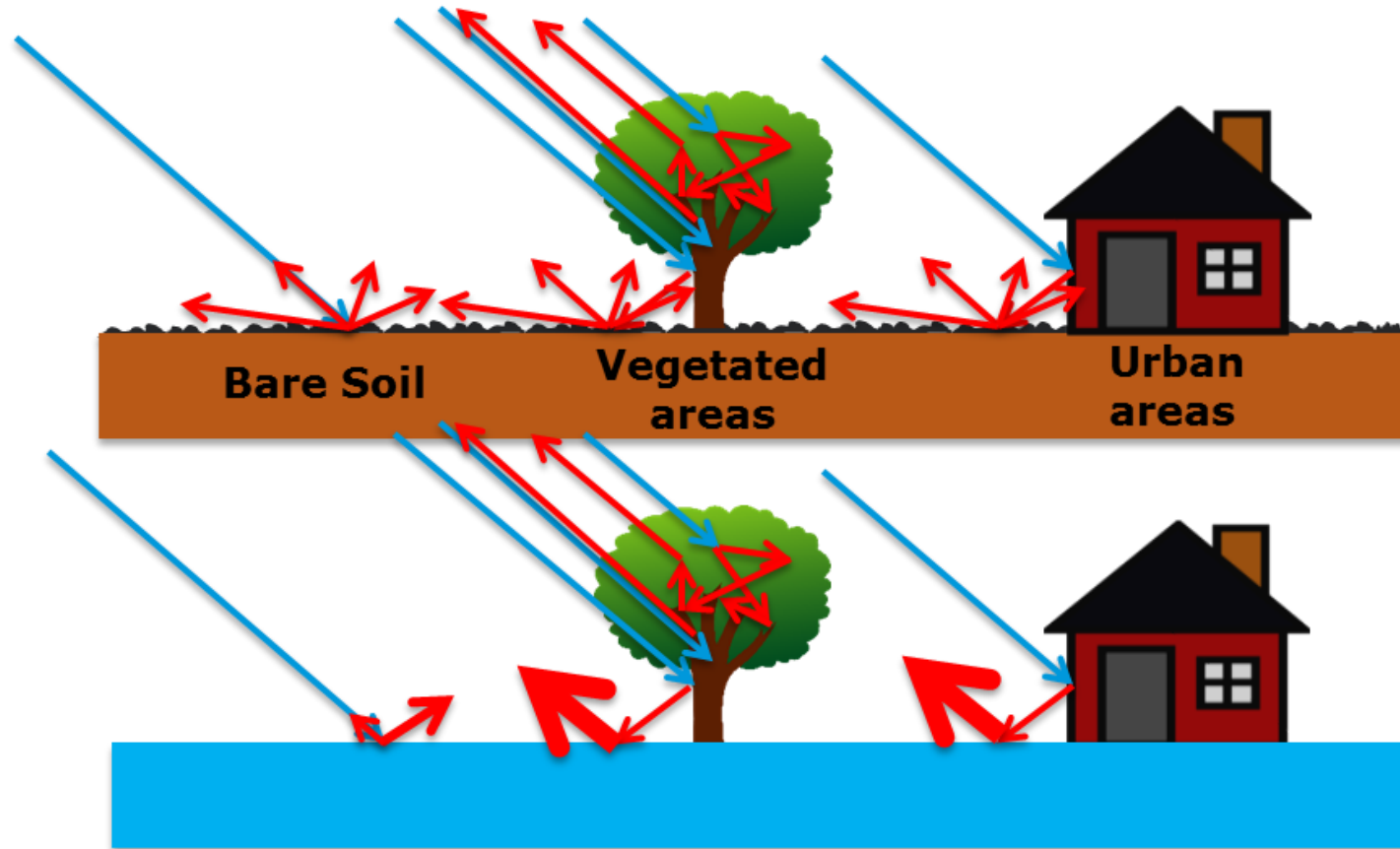
- In flood risk prone areas, myriad of activities and projects on a global and local level have been implemented with the focus to mitigate the impact of the increasing frequency and intensity of flood.
- The implementation of Disaster Risk Management and the rapid response financing in the wake of a natural disaster, requires a deep knowledge of the environmental situation and the potential affected areas.
- A raising awareness of satellite-based crisis information has led to an increase in requests to corresponding value adders to support civil-protection and relief organizations with disaster-related mapping and analysis.

Introduction

- SAR data are quite effective to monitor floods because of their all-weather capability, the very high spatial resolution of the new generation of instruments, and the short revisit time of the present and future satellite constellations.
- New generation of SAR satellite missions provide an unprecedented possibility to develop automatic algorithm for detecting floodwater in urban areas, paving the way to assess the risk.
- The scientific literature of mapping surface water from SAR imagery is rapidly growing, and significantly so over the past decade and it coincides with launches of Earth-orbiting satellites carrying very high-resolution SAR instruments (e.g. TerraSAR-X, COSMO-SkyMed, Radarsat-2, Sentinel-1).

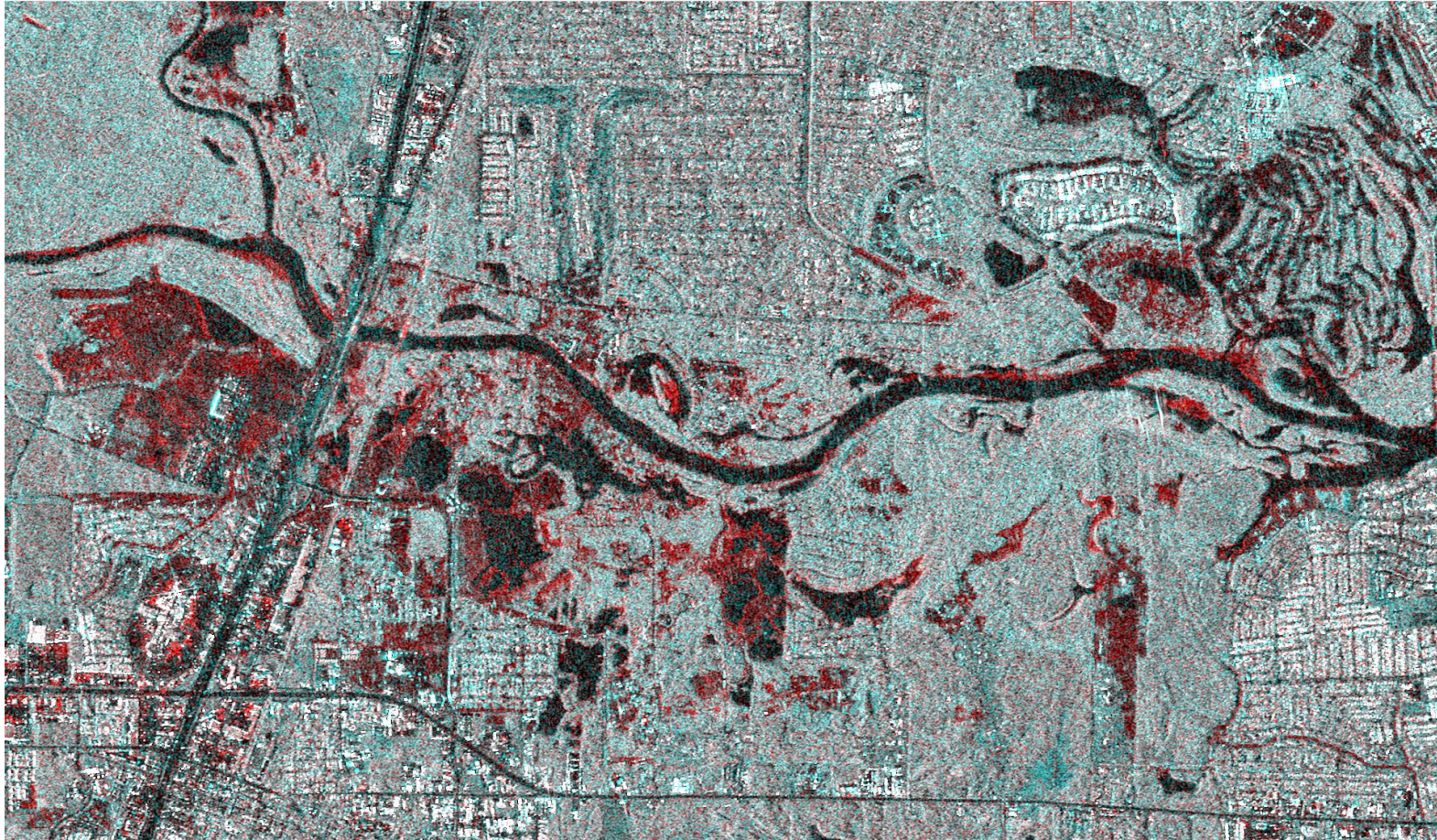
SAR scattering mechanisms

Flood vs No Flood

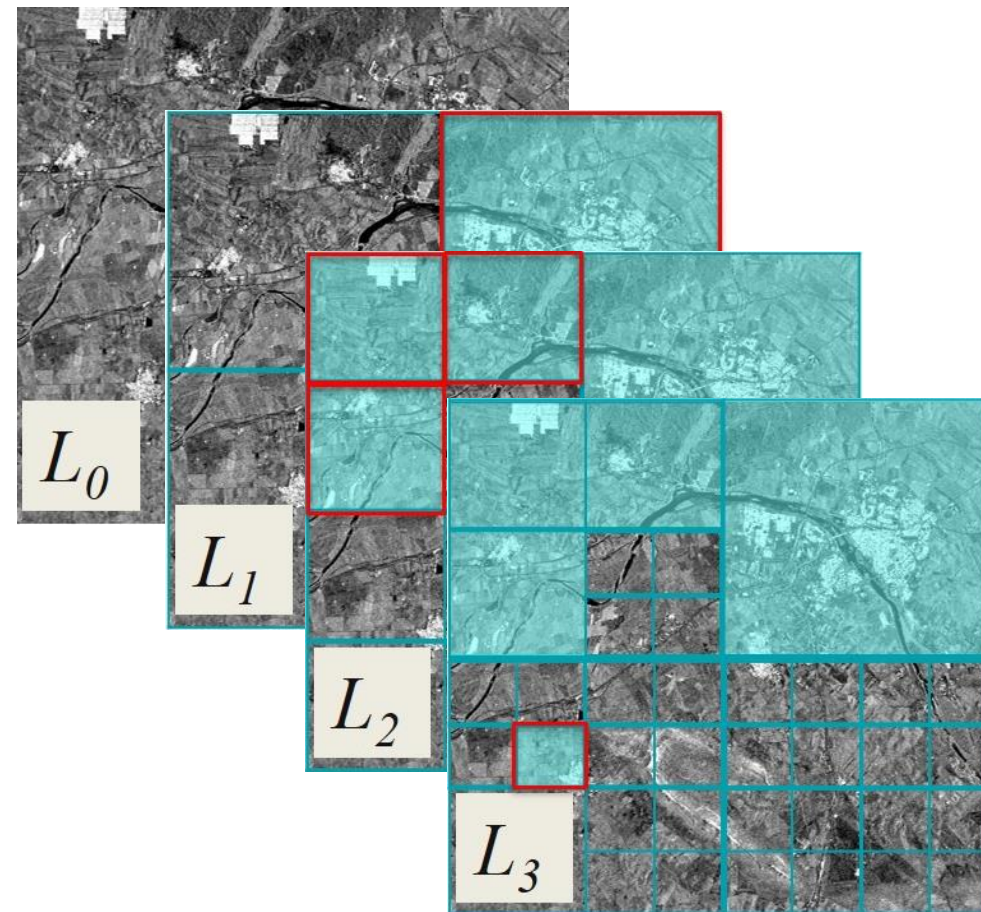
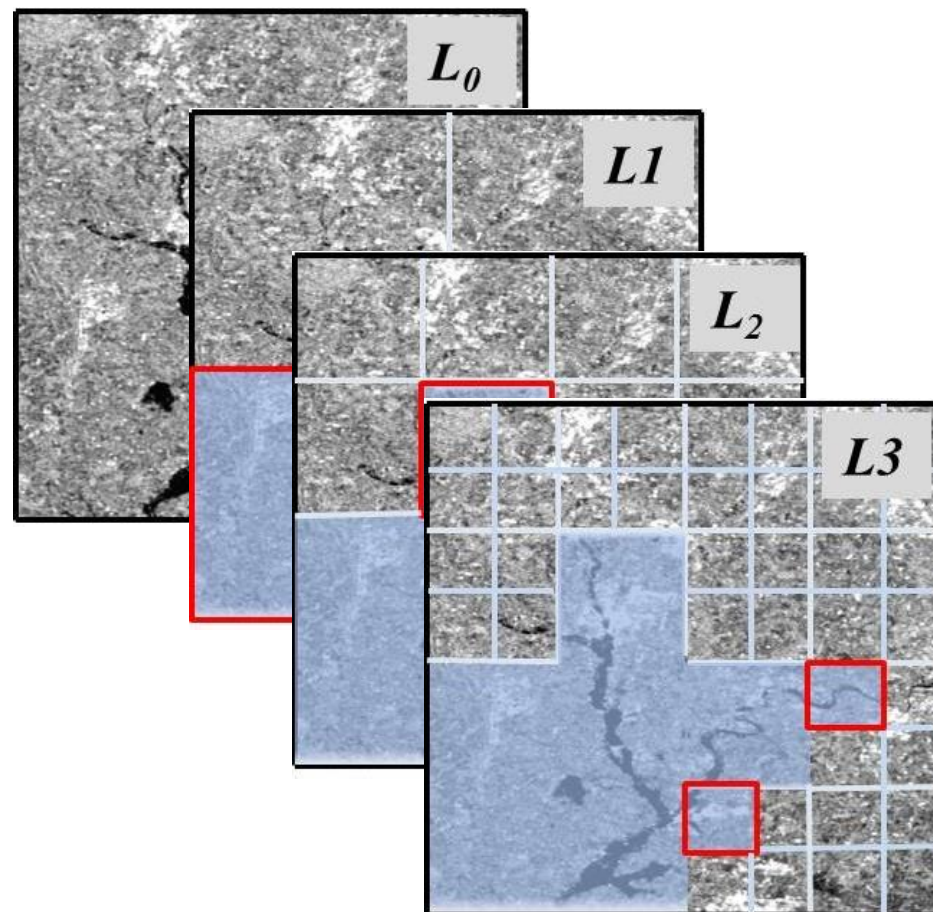


Sentinel-1, Texas Flood 2017

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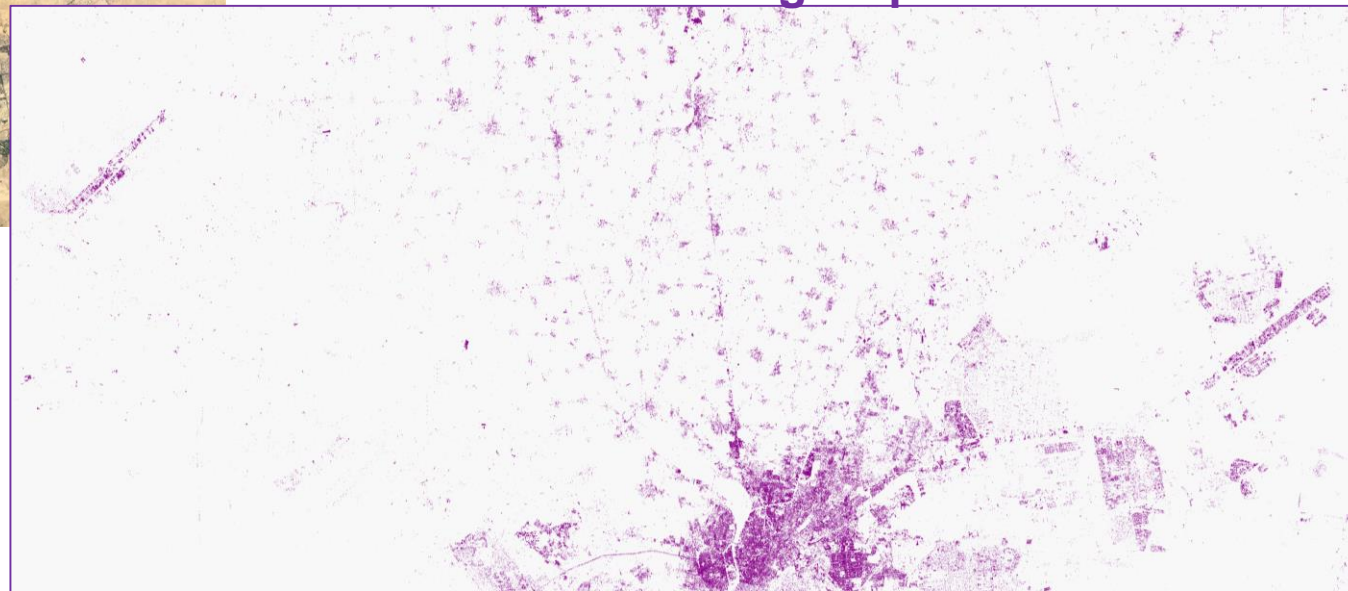
SAR-based mapping algorithm (HSBA)



SAR-based building maps



Sentinel-1 building map

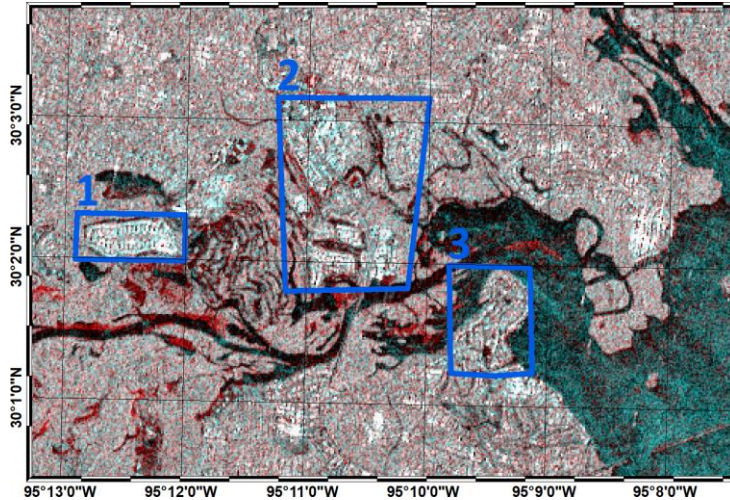


Sentinel-1, Texas Urban Flood 2017

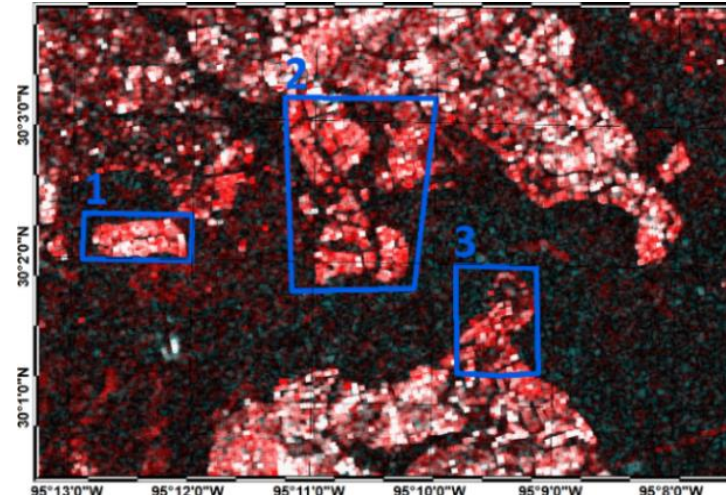
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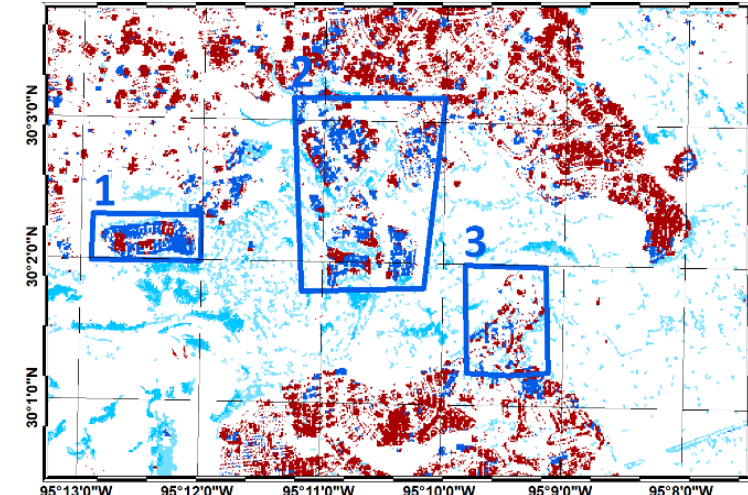
RGB Intensity



RGB coherence



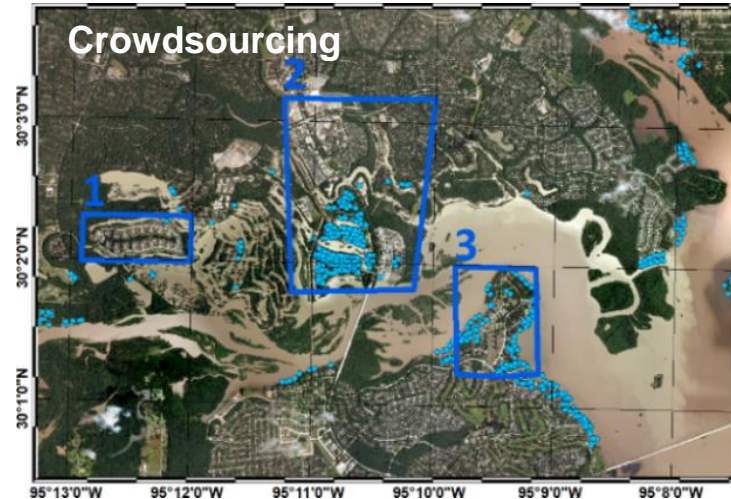
Flood map



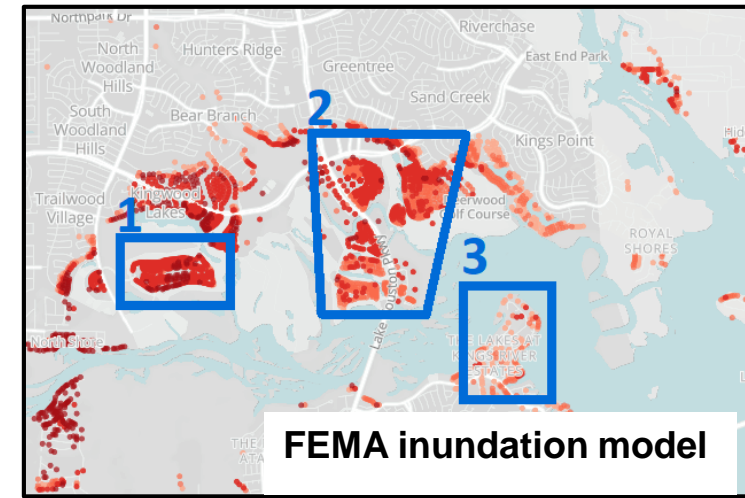
Aerial photo of AOI 1



Crowdsourcing



FEMA inundation model



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M. Chini, R. Pelich, L. Pulvirenti, N. Pierdicca, R. Hostache, P. Matgen, "Sentinel-1 InSAR Coherence to Detect Floodwater in Urban Areas: Houston and Hurricane Harvey as A Test Case", *Remote Sensing*, Vol. 11, No. 2, 107, pp. 1-20, 2019.

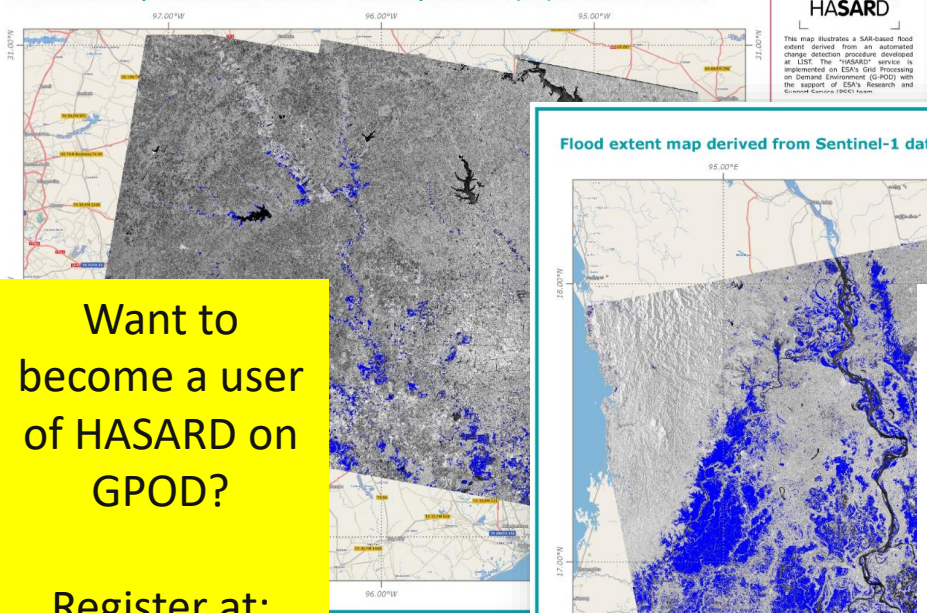
Flood mapping service on ESA GPOD

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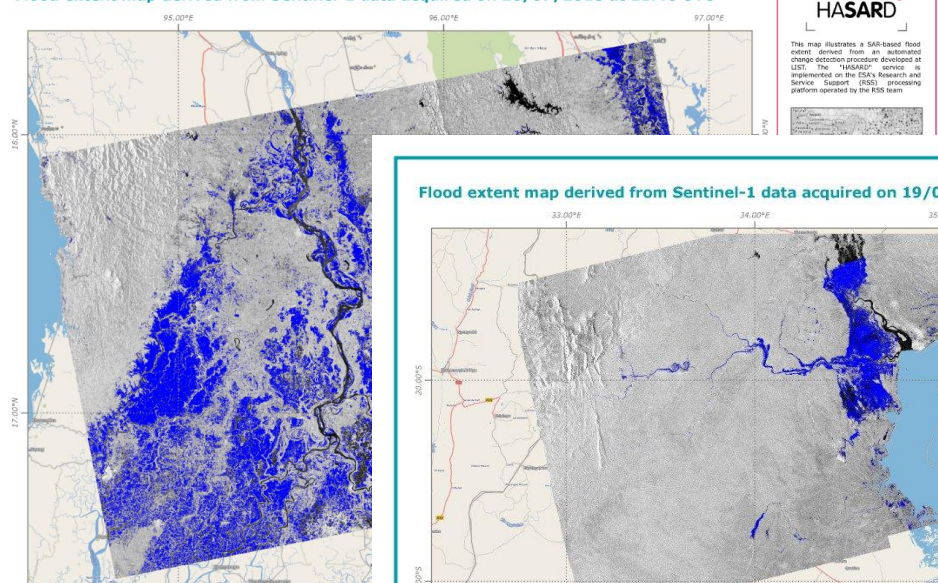
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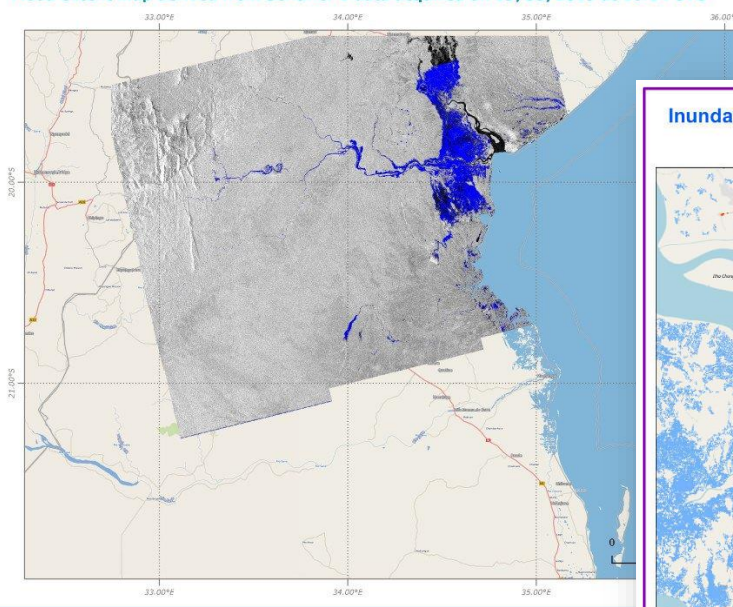
Flood extent map derived from Sentinel-1 data acquired on 30/08/2017 at 12:22 UTC



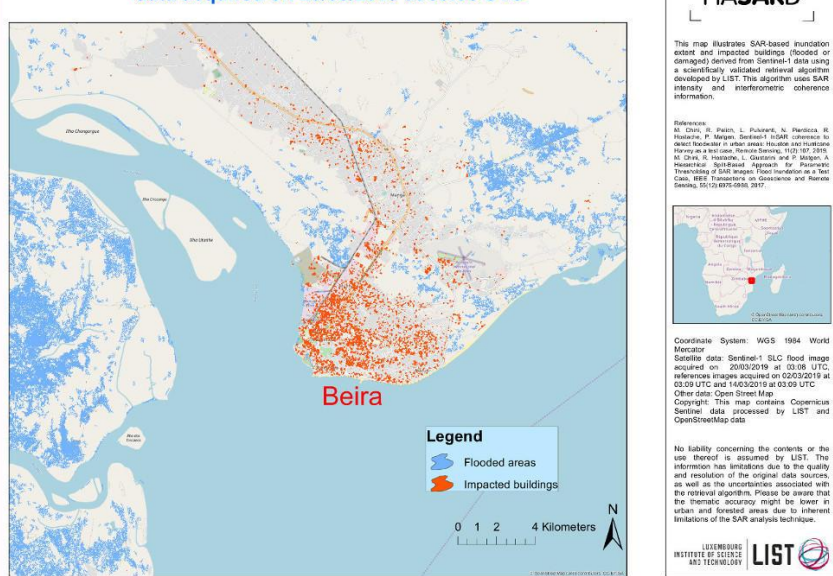
Flood extent map derived from Sentinel-1 data acquired on 26/07/2018 at 11:46 UTC



Flood extent map derived from Sentinel-1 data acquired on 19/03/2019 at 16:14 UTC



Inundation extent and impacted buildings derived from Sentinel-1 data acquired on 20/03/2019 at 03:08 UTC



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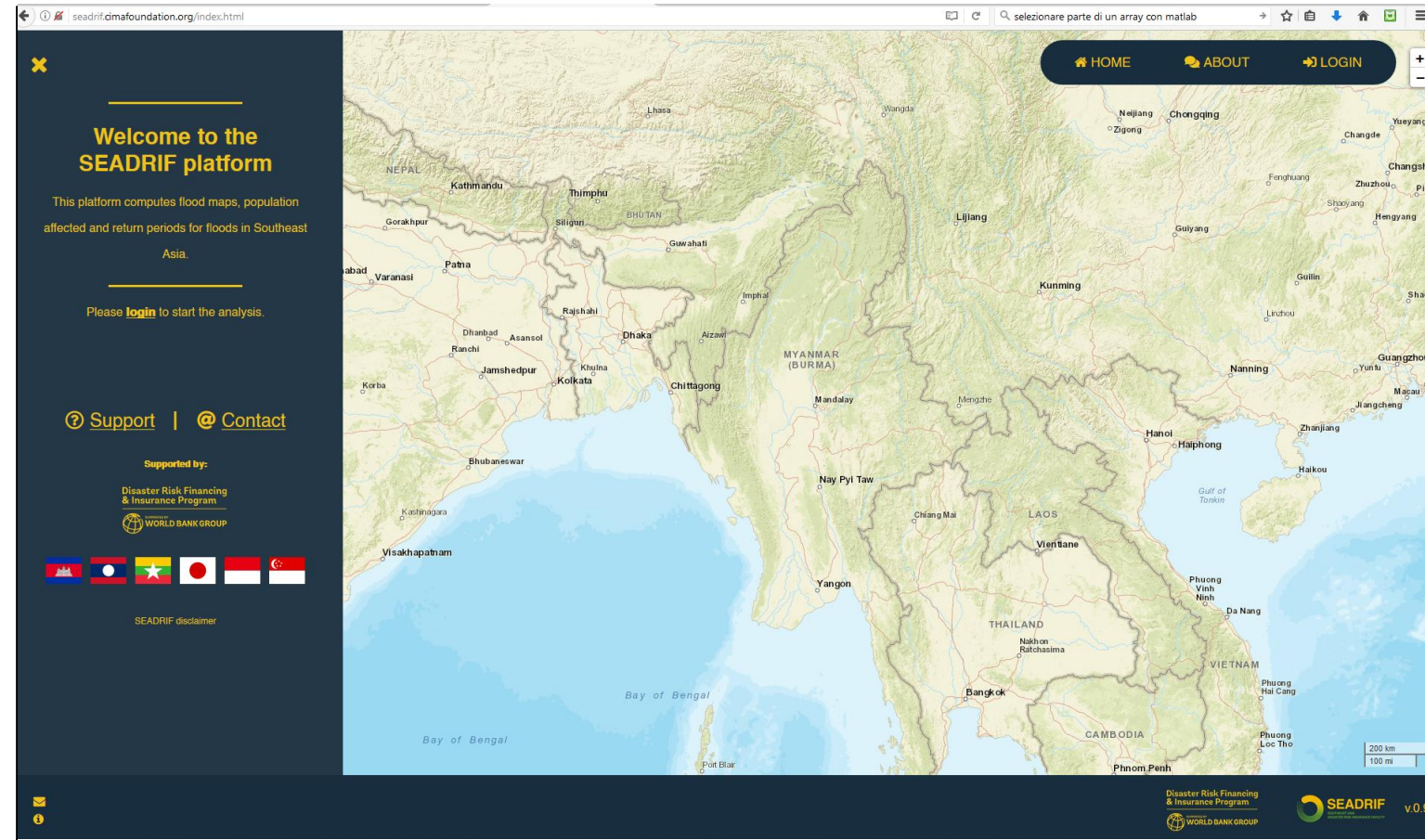
Flood mapping service on WASDI



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- It works on the DIAS platforms to facilitate the development and deploy of EO Data processors.
- It is the technological base of the eDRIFT project (ESA) that is providing pre-operational EO Services developed by LIST, DELTARES, CIMA and DLR for the World Bank SEADRIF platform, to estimate the number of people affected by a flood in the South East ASIA area (www.seadrif.org) .

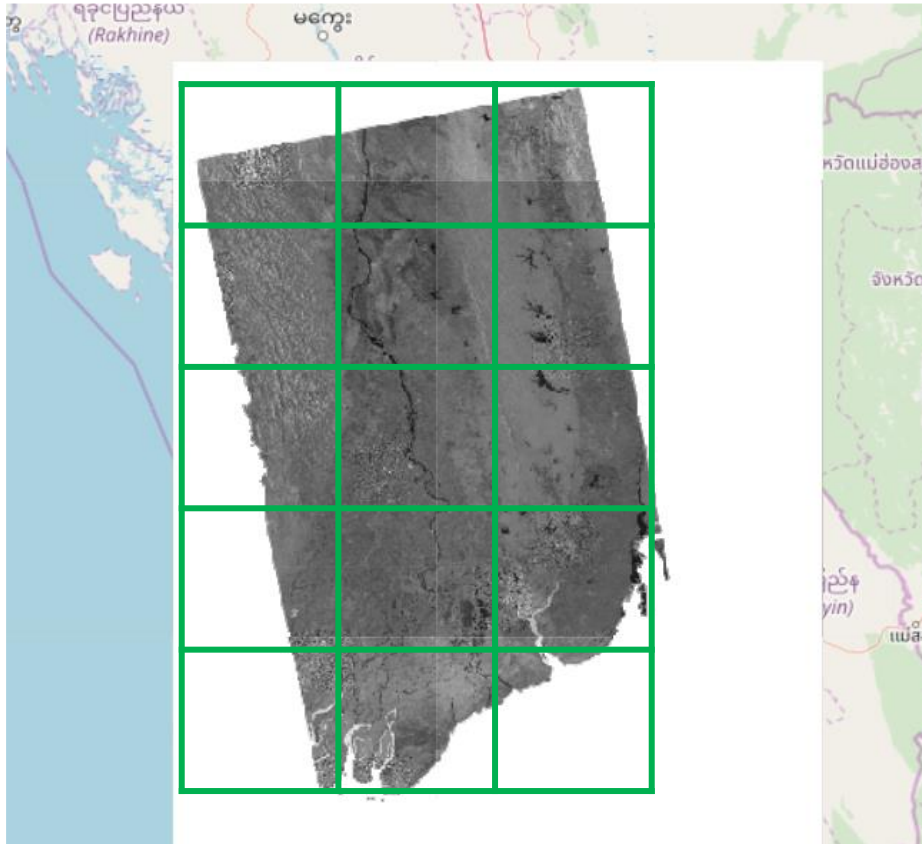
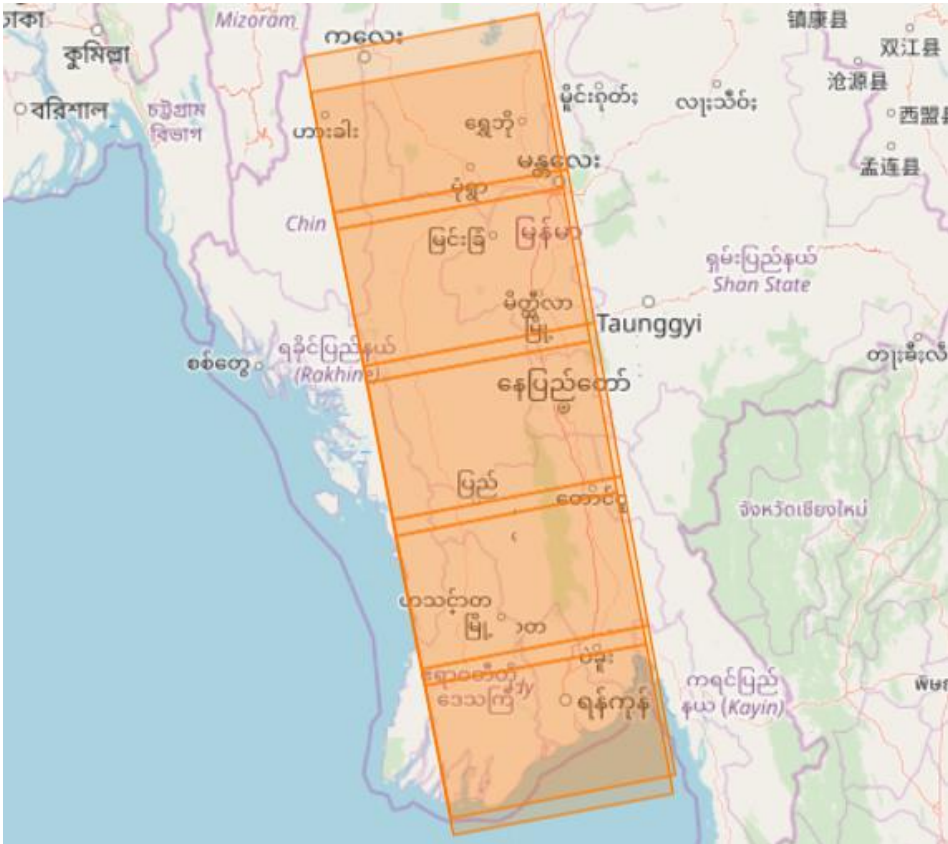


Near real time large-scale flood monitoring in South East Asia

- To enhance use of satellite EO-based analytics supporting decision making in disaster risk financing industry.
- Understanding disaster risk in all its dimensions of vulnerability, exposure of persons and assets, hazard characteristics, etc.
- Contributing to enhancing disaster preparedness, better forecasting events, allowing to take action in anticipation of events
- Strengthening emergency response (e.g. parametric insurance)

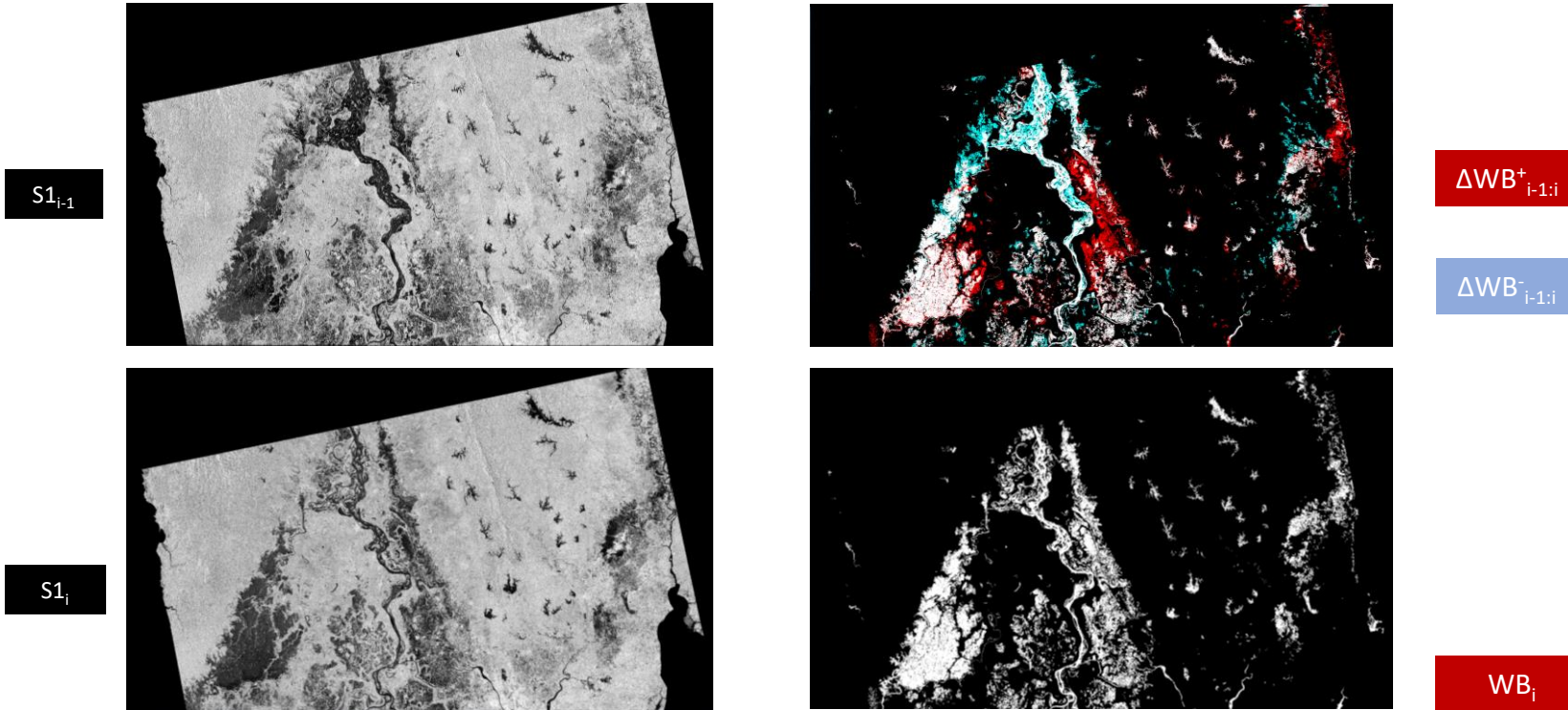
Near real time large-scale flood monitoring in South East Asia

Systematic processing of Sentinel-1 images



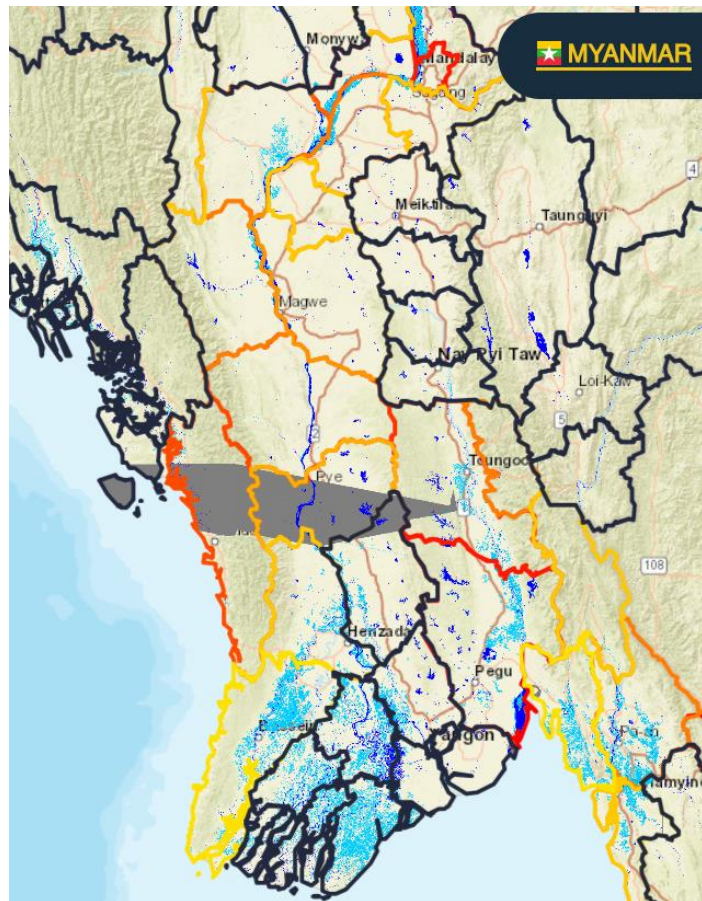
Near real time large-scale flood monitoring in South East Asia

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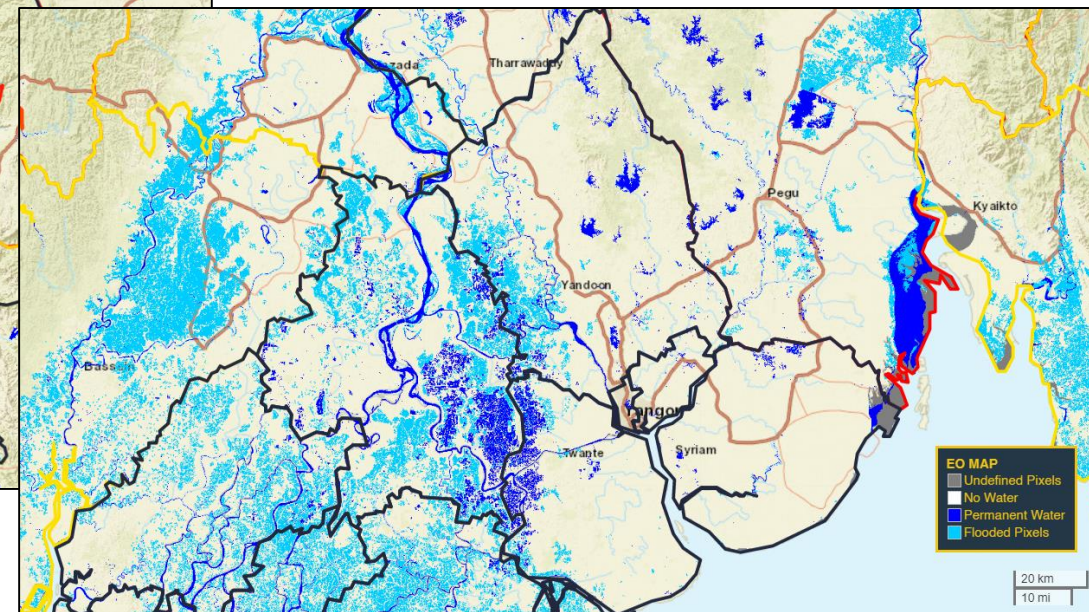
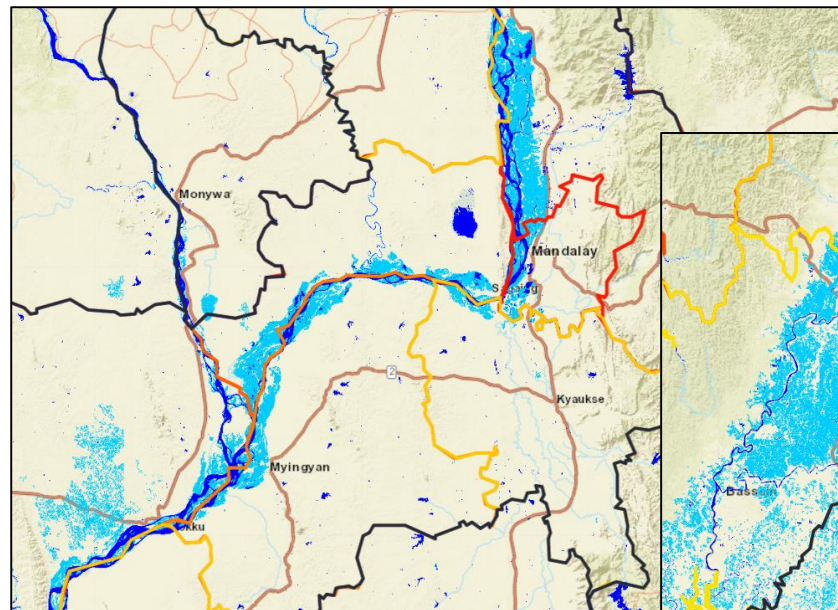


Near real time large-scale flood monitoring in South East Asia

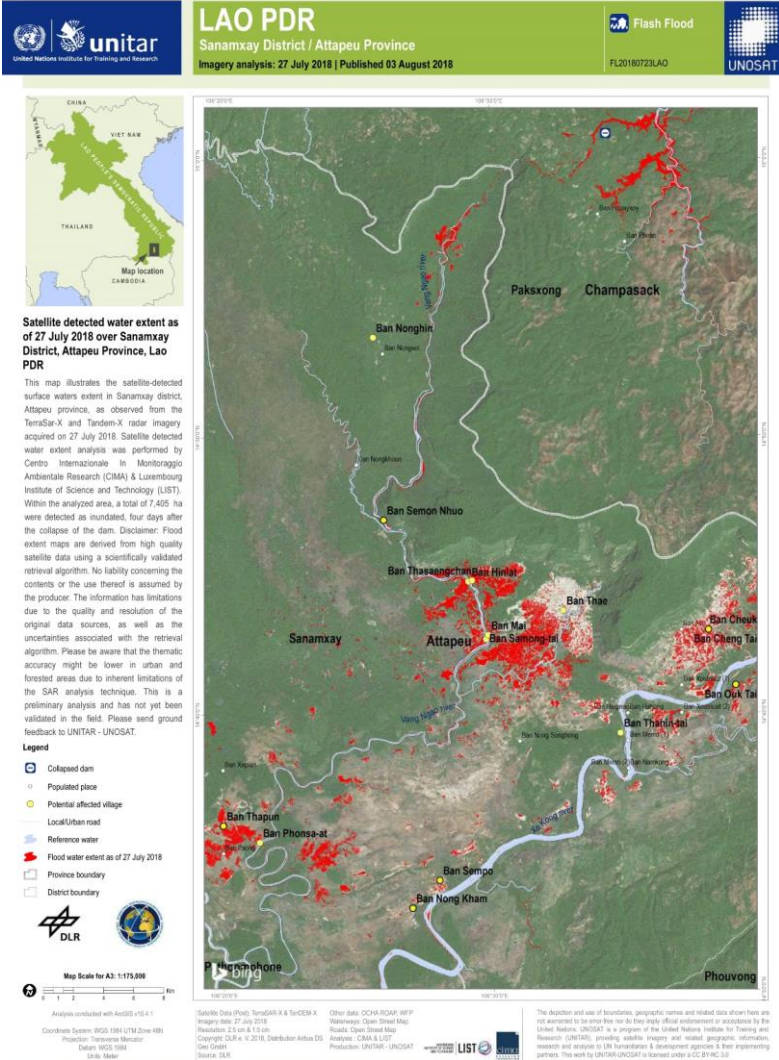
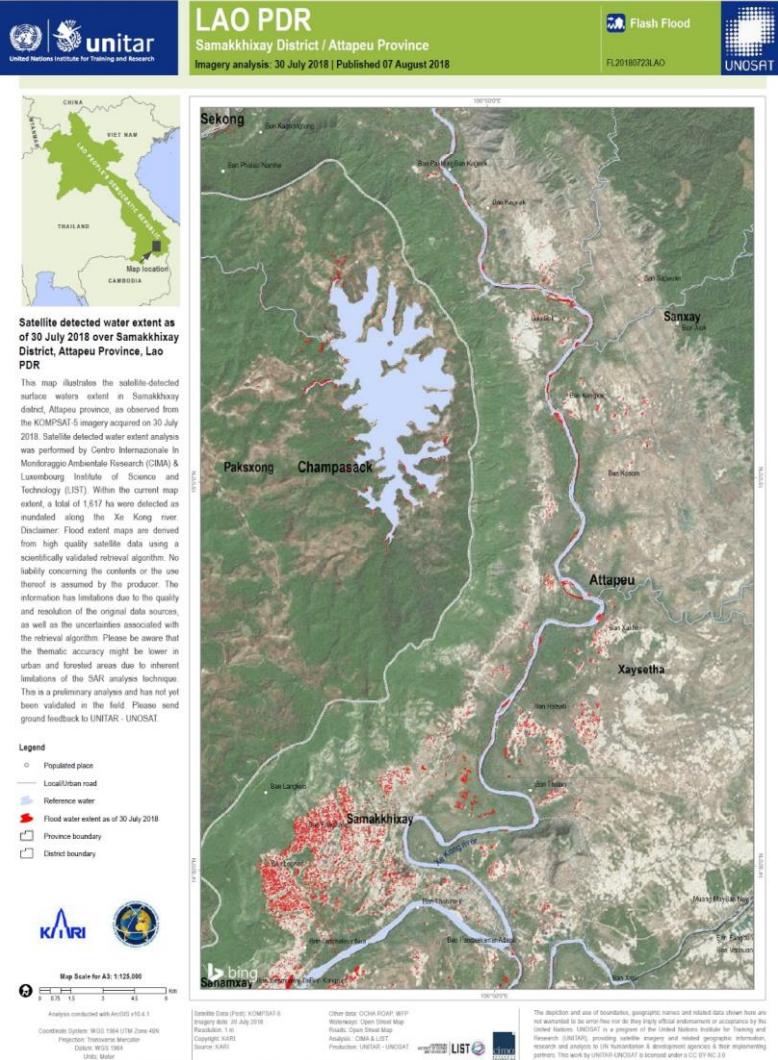
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SEADRIF platform



International Disaster Charter activations



Thank you!

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