

Large floods-and tsunami detection workshop

By means of artificial intelligence in the GoogleEarthEngine platform

M. Sc. Gina Maricela Schwendemann, Scientific Associate ZKI

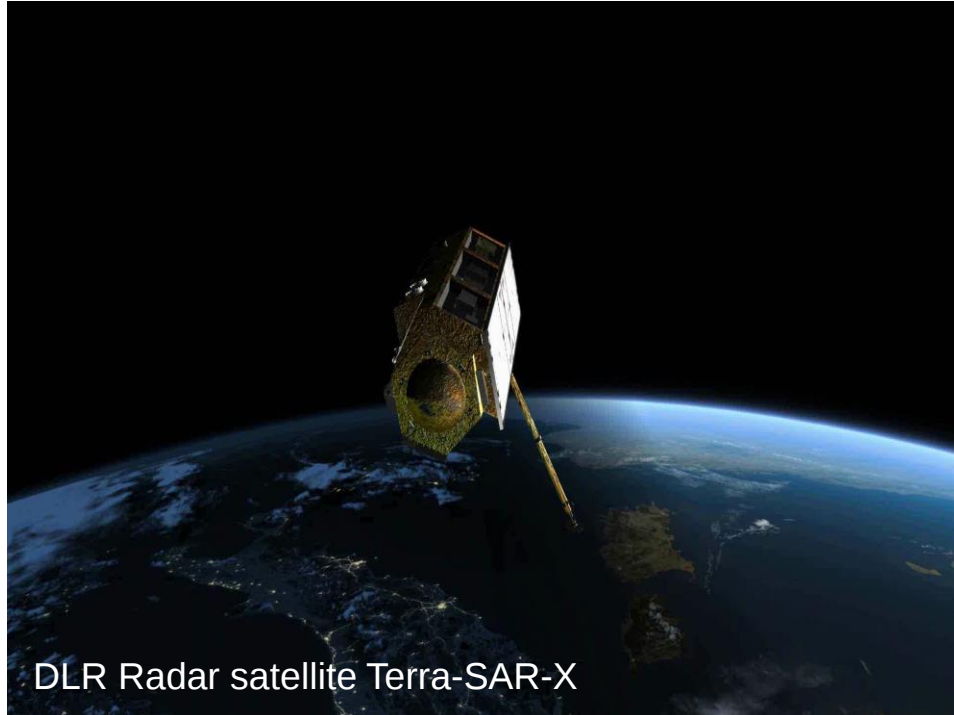
German Aerospace Center (DLR)
Earth Observation Center (EOC)



Content



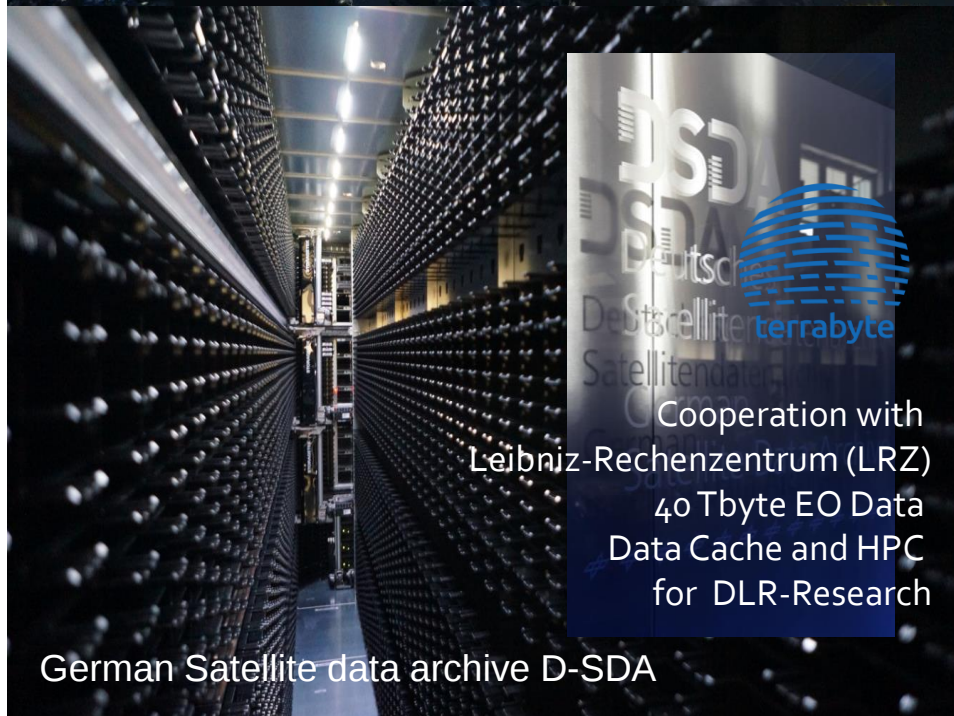
- DLR – ZKI – Charter Space and Major Disasters
- Tsunami detection example
- Floods detection examples
- Hands-on flood detection in GEE platform
 - Clean the images from noise
 - Mosaic the images
 - Visualize a precipitation chart
 - Water mask detection
 - Export the flood mask to Google Drive
 - Download the flood mask from Google drive
 - Visualize the flood's mask in a GIS software
 - Export the map as PDF
 - Print the map



DLR Radar satellite Terra-SAR-X



DLR Ground station GARS O'Higgins, Antarktis



Cooperation with
Leibniz-Rechenzentrum (LRZ)
40 Tbyte EO Data
Data Cache and HPC
for DLR-Research

German Satellite data archive D-SDA



ZKI Emergency crises office

ZKI – center for satellite-based crisis information



- Provides a on call duty service for
 - Provision of satellite and airborne imagery
 - Rapid mapping and damage assessment
 - Monitoring of crisis situations
- Has a substantial focus on research & development
- Involvement of ZKI on national and international level



- Since 1999 (officially founded 2004): > 700 activations with more than 1500 products



Natural Disasters



Humanitarian Relief



Civil Security



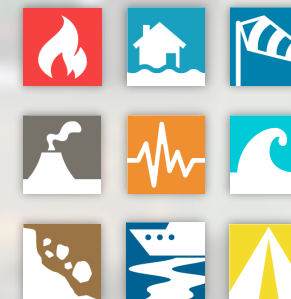
ZKI

by DFD/DLR

Official foundation in 2004

FROM RESEARCH TO APPLICATION

PRODUCTS, SERVICES, INFORMATION SYSTEMS



2013-2020



2021-2024



Handover
EMS Rapid Mapping -> 2012/2015
Security Service EA ->2015
to Industry-consortium / EU Agencies

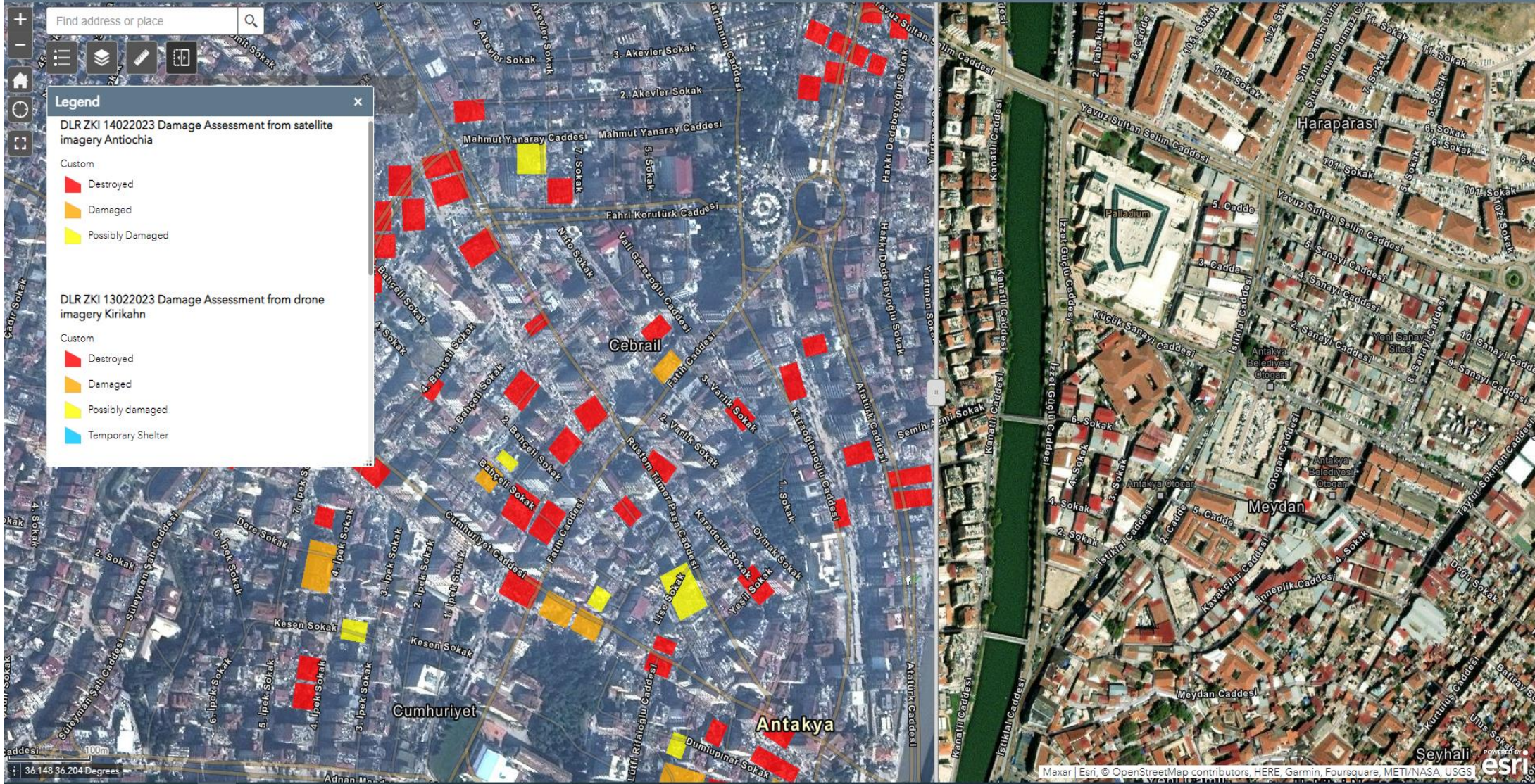
still involved in Copernicus Service Evolution

Handover
2021



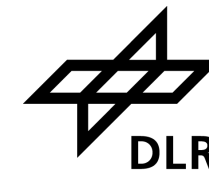
Federal Agency for
Cartography and Geodesy





Floods in Ahr Valley, Germany in 2021

3D Visualization and analysis for improved situation assessment



LoD-2 model simulating the flood event



3D model post-event



UAV images +
3D laser
scanning data +
extrusion of the
buildings

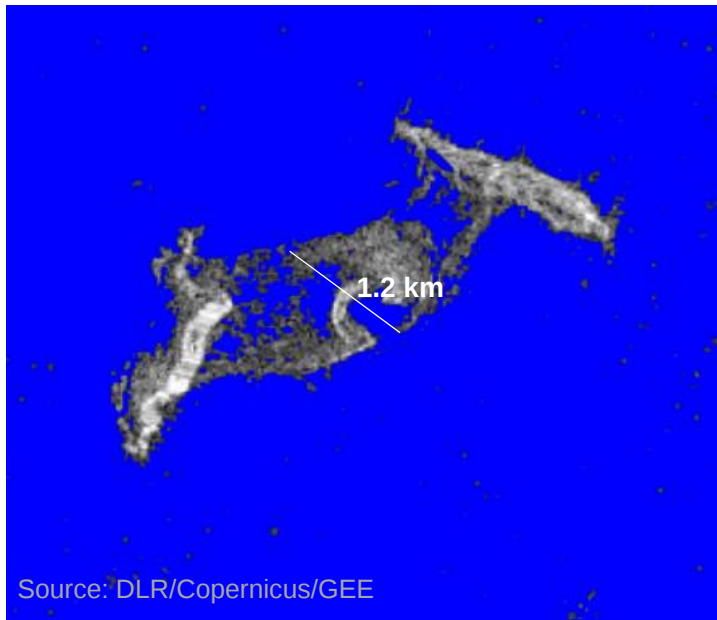


Tsunami in Hunga Tonga, Tonga

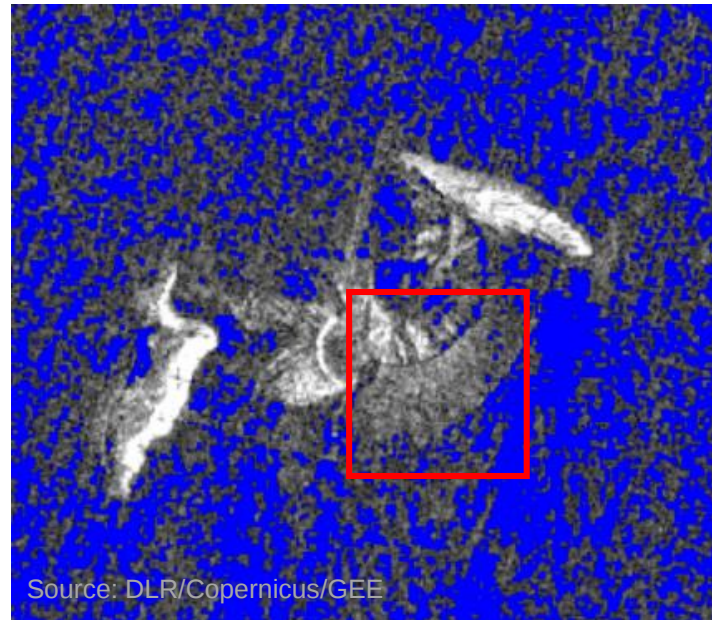
Volcanic eruption on January, 15th 2022



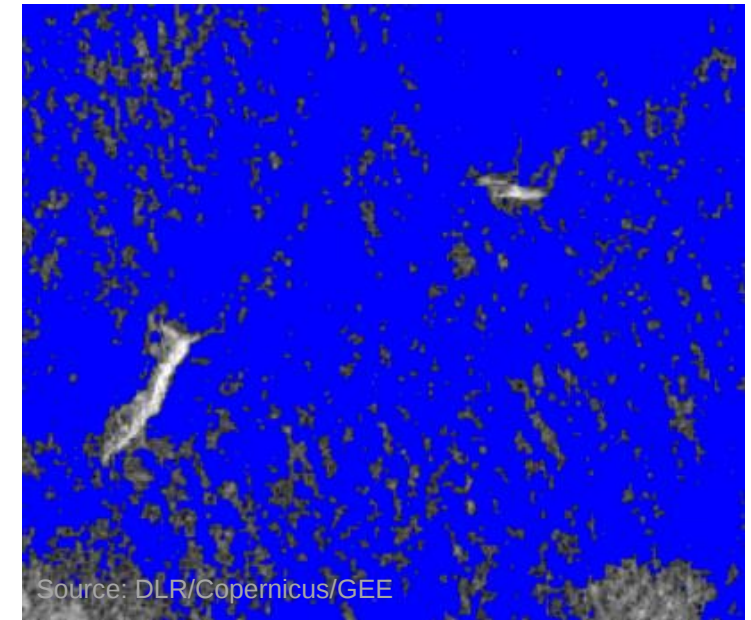
Before event: December, 10th 2021



12 days before event: January, 03rd 2022



Hours after event: January, 15th 2022



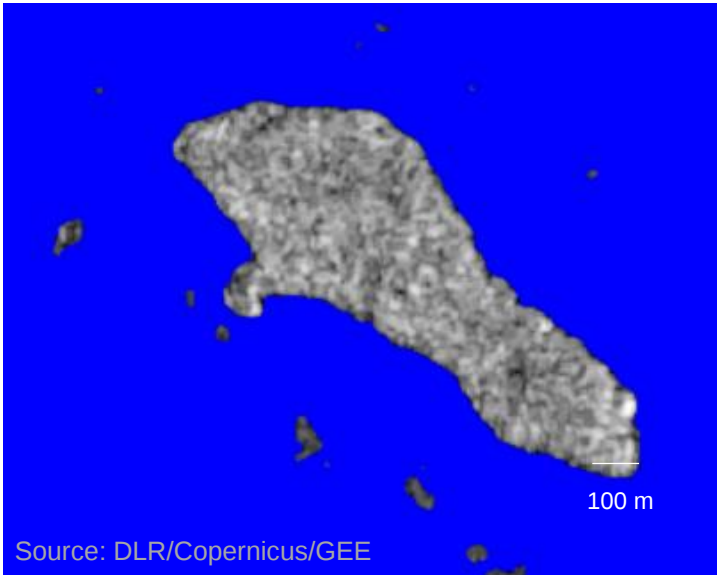
- Hunga Ha'apai Volcano seen from free Sentinel-1 (RADAR image, 10 m resolution).
- Red boxes highlight the ocean shaking anomalously showing high waves around the island.

Tsunami in Mango island, Tonga

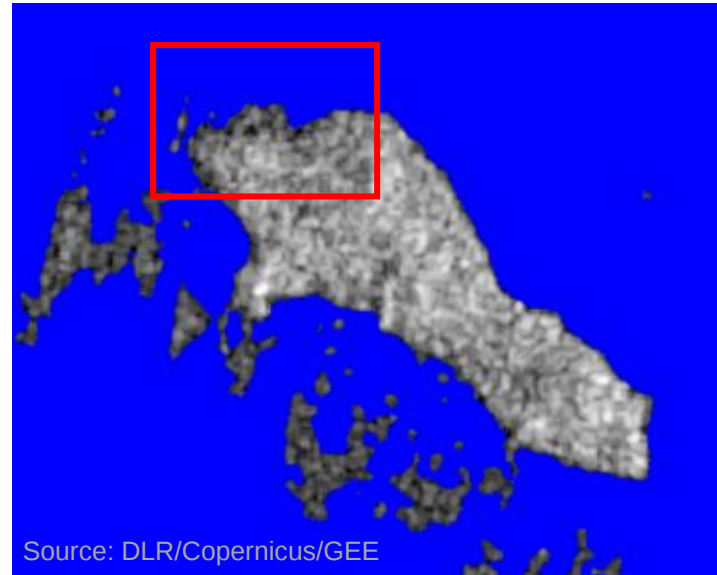
Volcanic eruption on January, 15th 2022



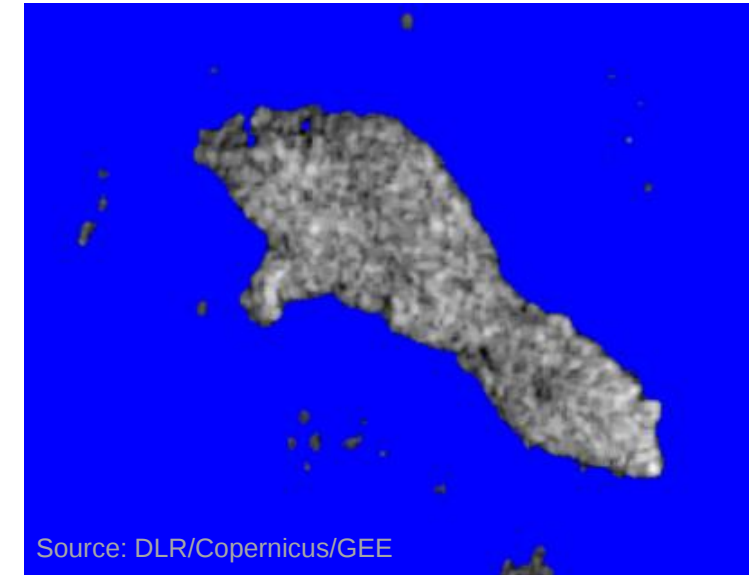
December, 10th 2021



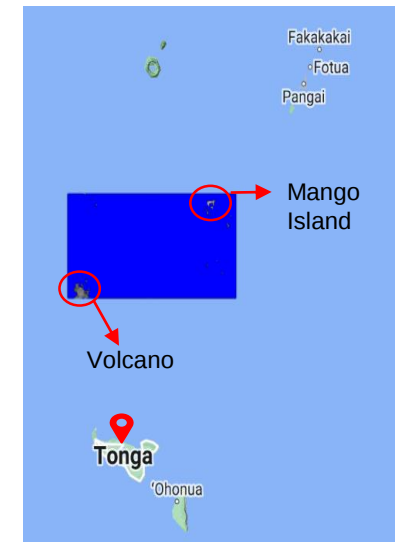
January 15th 2022



January, 27th 2022

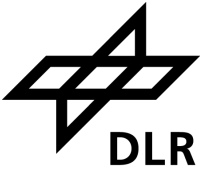


- Images before, during and after the volcanic eruption.
- The volcano is situated 70 km away from Mango Island.
- The northern part of the island was damaged by the tsunami.



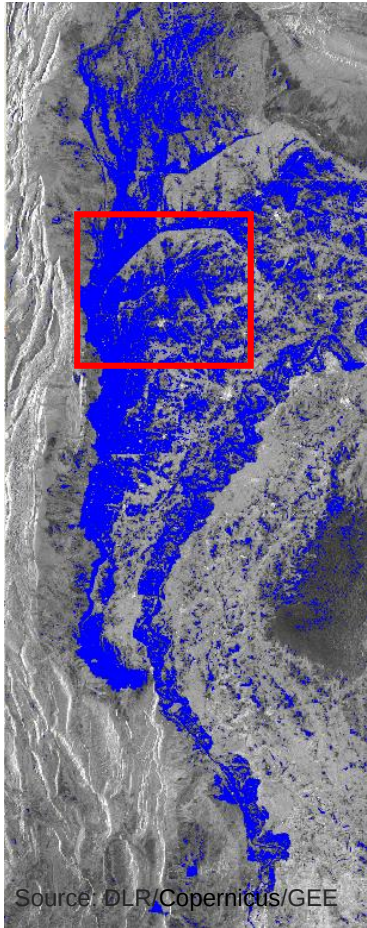
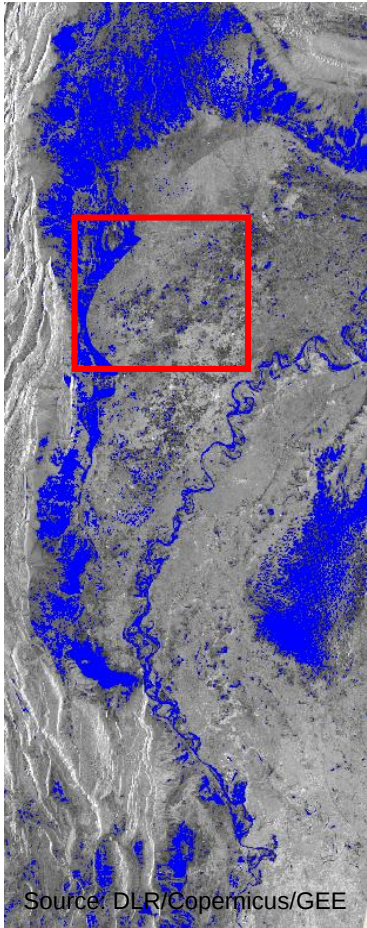
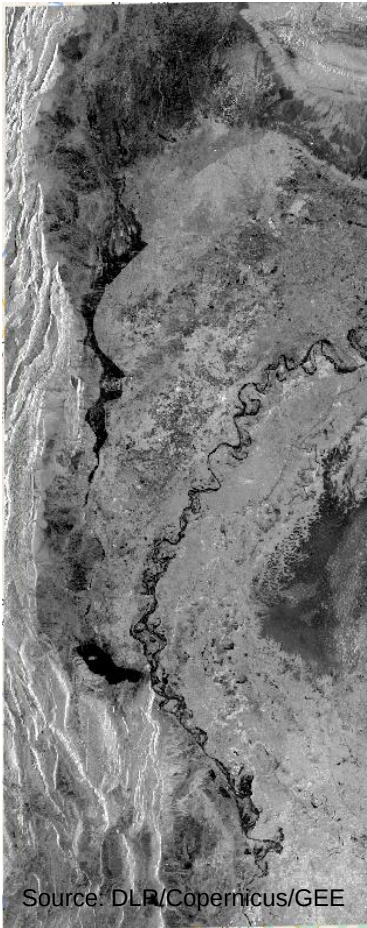
- The waves reached up to 15 m tall in the island group (Mango Island, Atata).
- The eruption blast was heard 2,300 km away in New Zealand (©Reuters).

Floods in Sindh, Pakistan

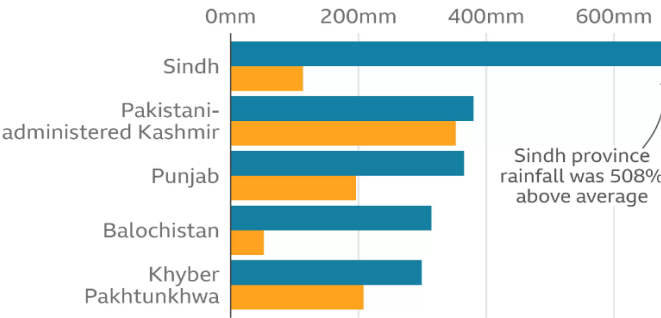


Before: July 2022

After: August, 30th 2022



Rainfall well above average in most regions
Rainfall in 2022 compared to **average rainfall**, 1 Jul-30 Aug



Note: The average rainfall figures are for 1961-2010
Source: Pakistan Meteorological Department

Pakistan floods situation report



Source: Pakistan Government, UN, 30 Aug 2022

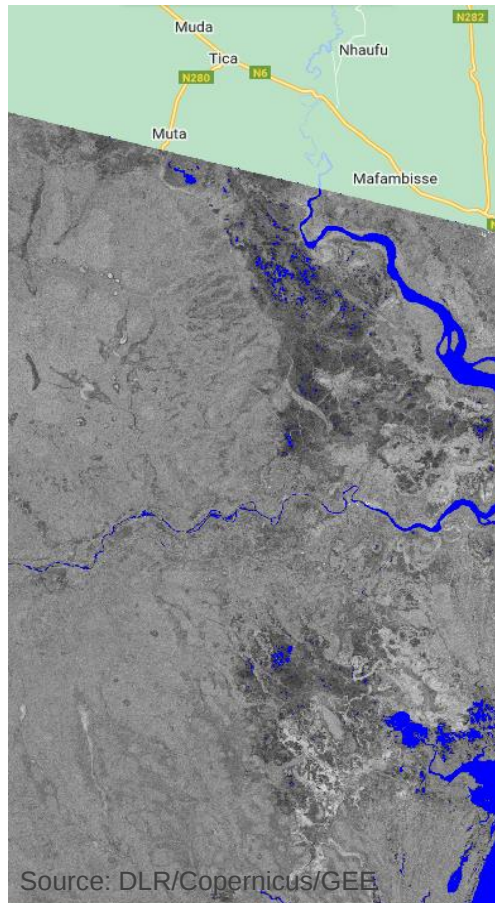
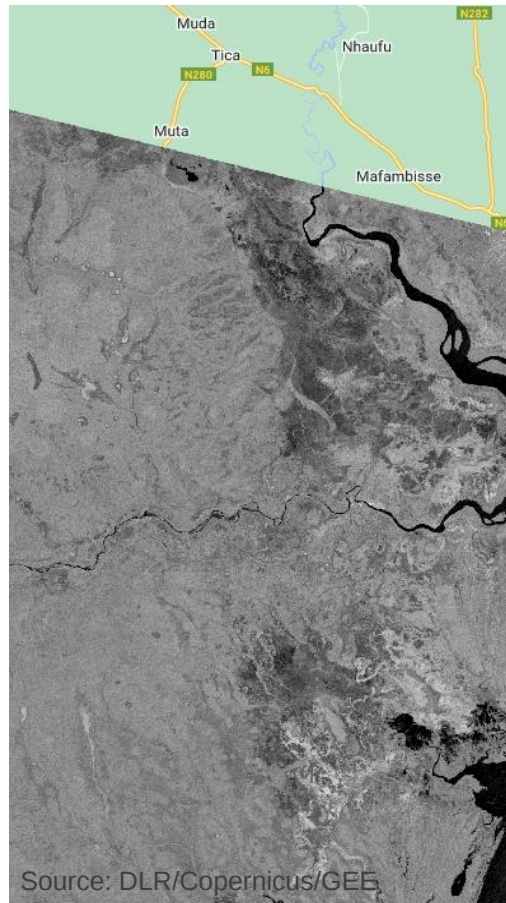
Floods in Beira, Mozambique

Cyclon Idai:

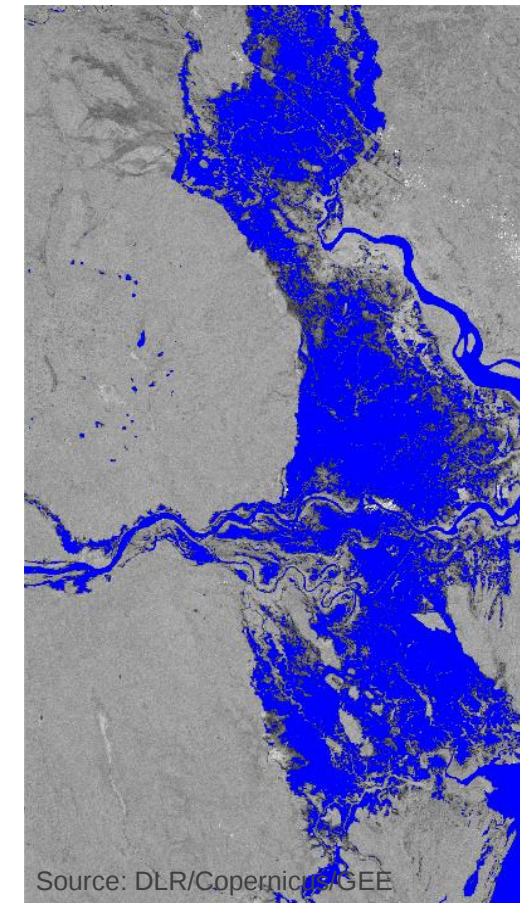
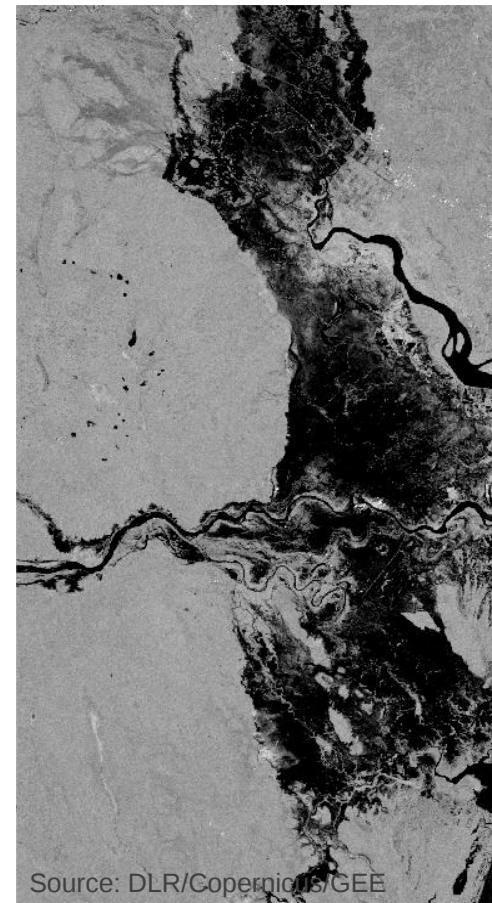
>3M affected people and >1M casualties in Zimbabwe, Malawi and Mozambique (ICRC).



Before: February, 18th 2019



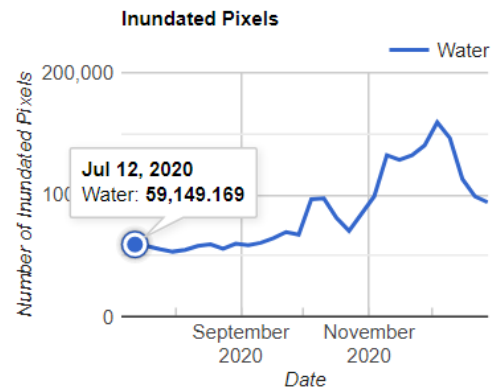
After: March, 20th 2019



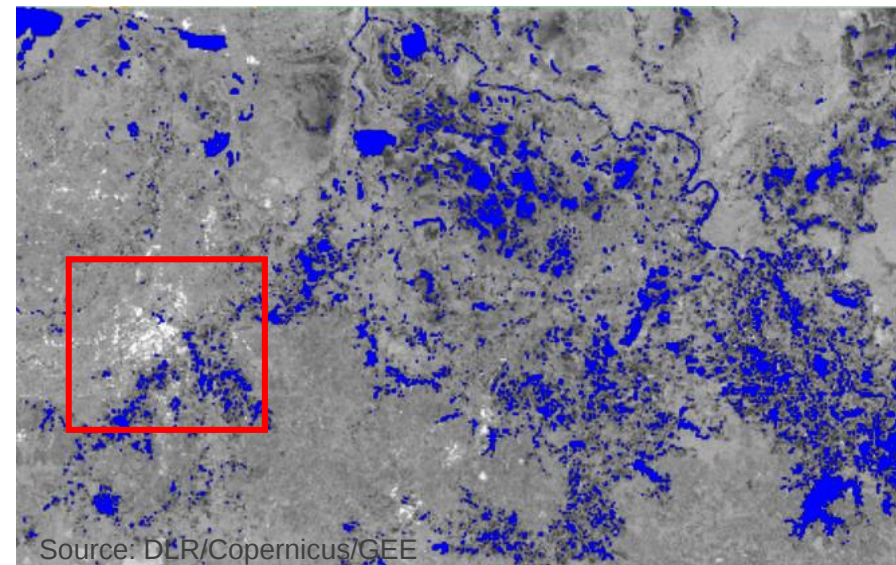
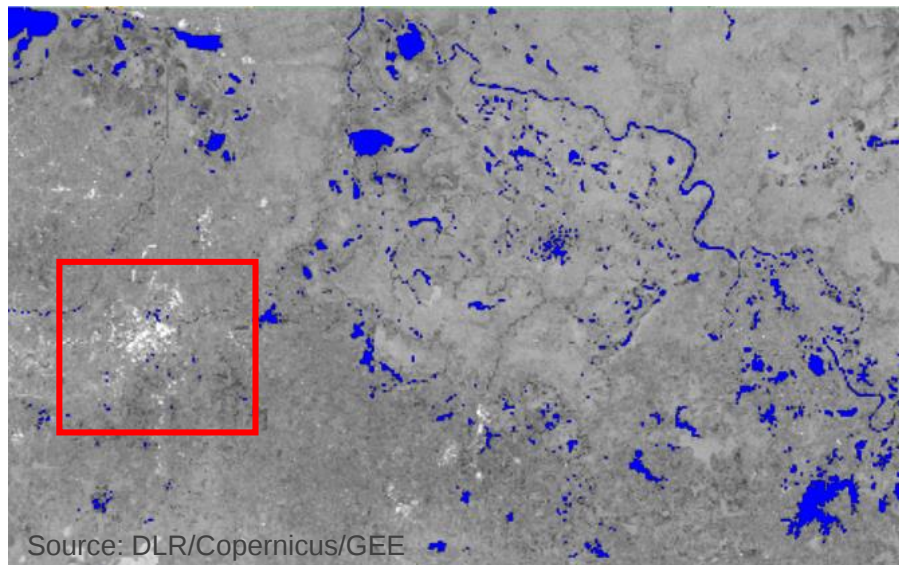
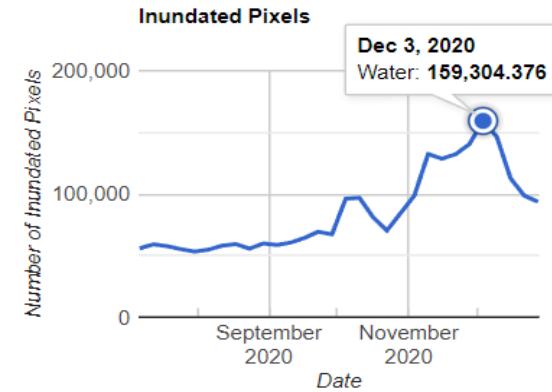
Floods in Tabasco, Mexico



Before



After



Hands-on: Floods detection

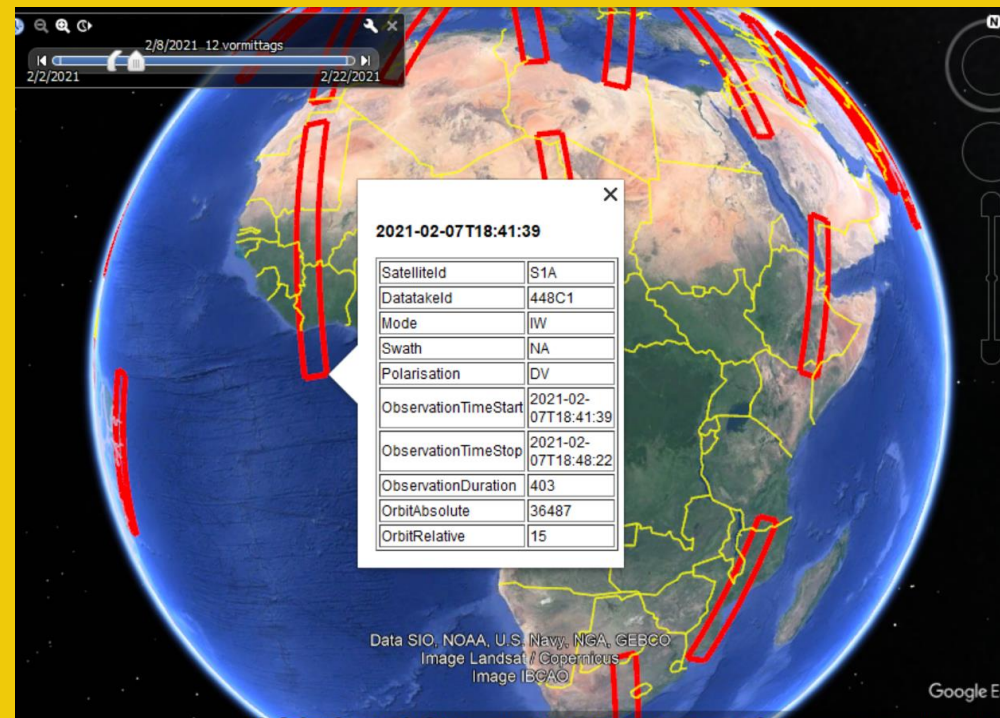
1 option

<https://dataspace.copernicus.eu/>

Data Access → Catalogue API
→ Data → Sentinel 1 →
Sentinel 1 radar mission →
Sentinel-1 → Observation
Scenario → Acquisition
segments

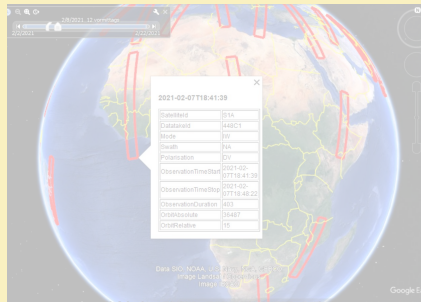
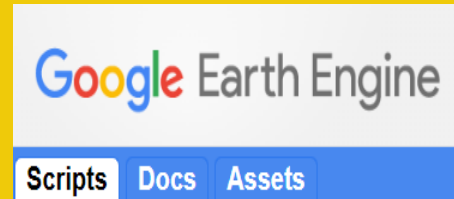
2 option: Acquisition segments' address

<https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-1/observation-scenario/acquisition-segments>

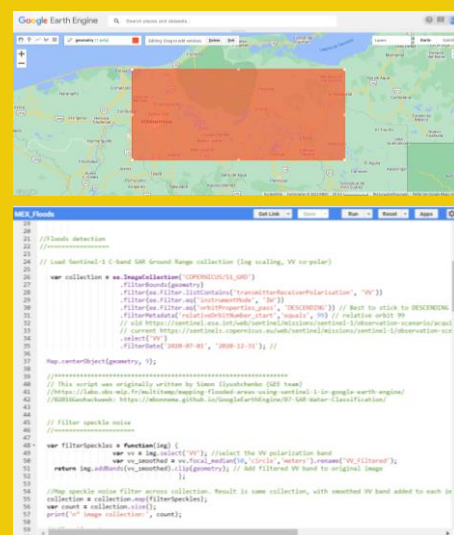


Data was sent
to your email

Workflow for floods detection



<https://dataspace.copernicus.eu/>



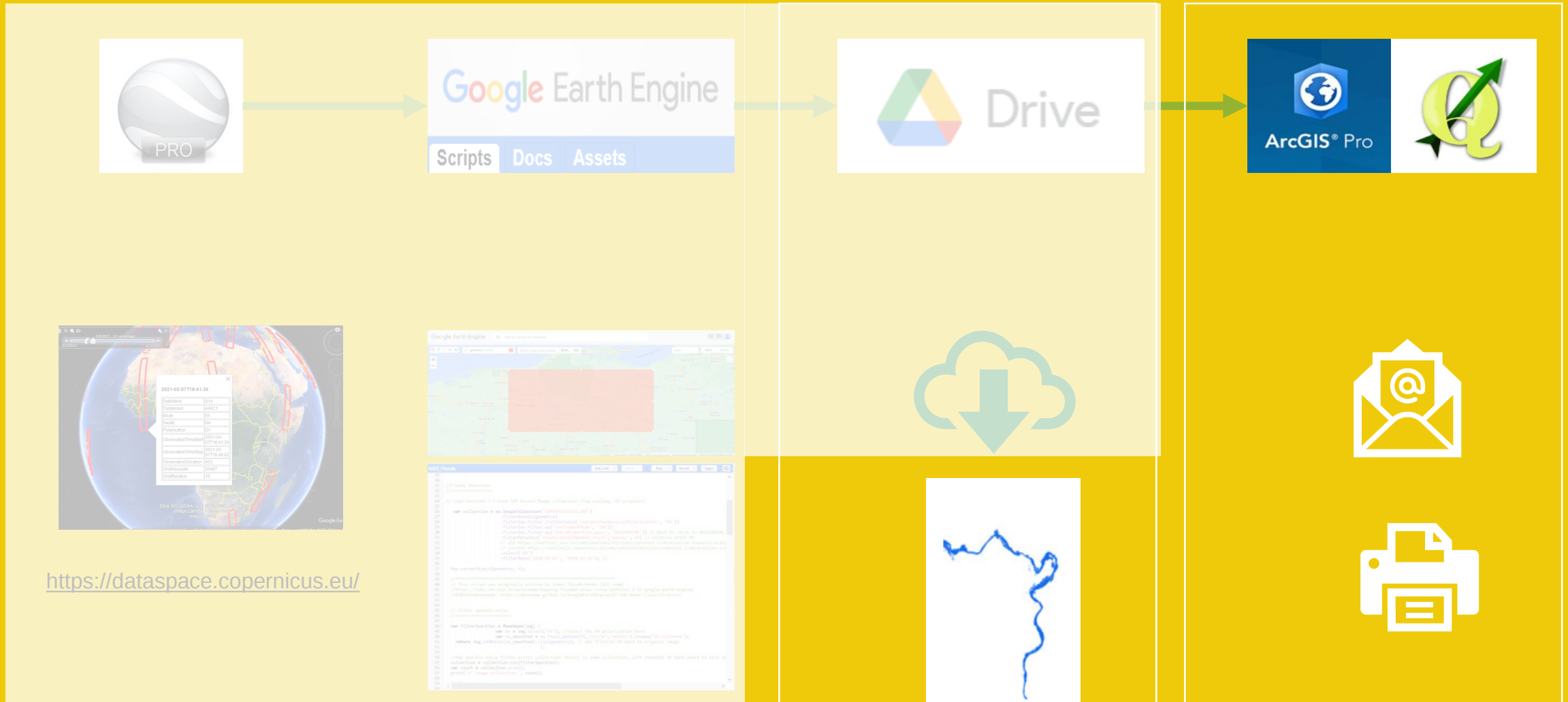


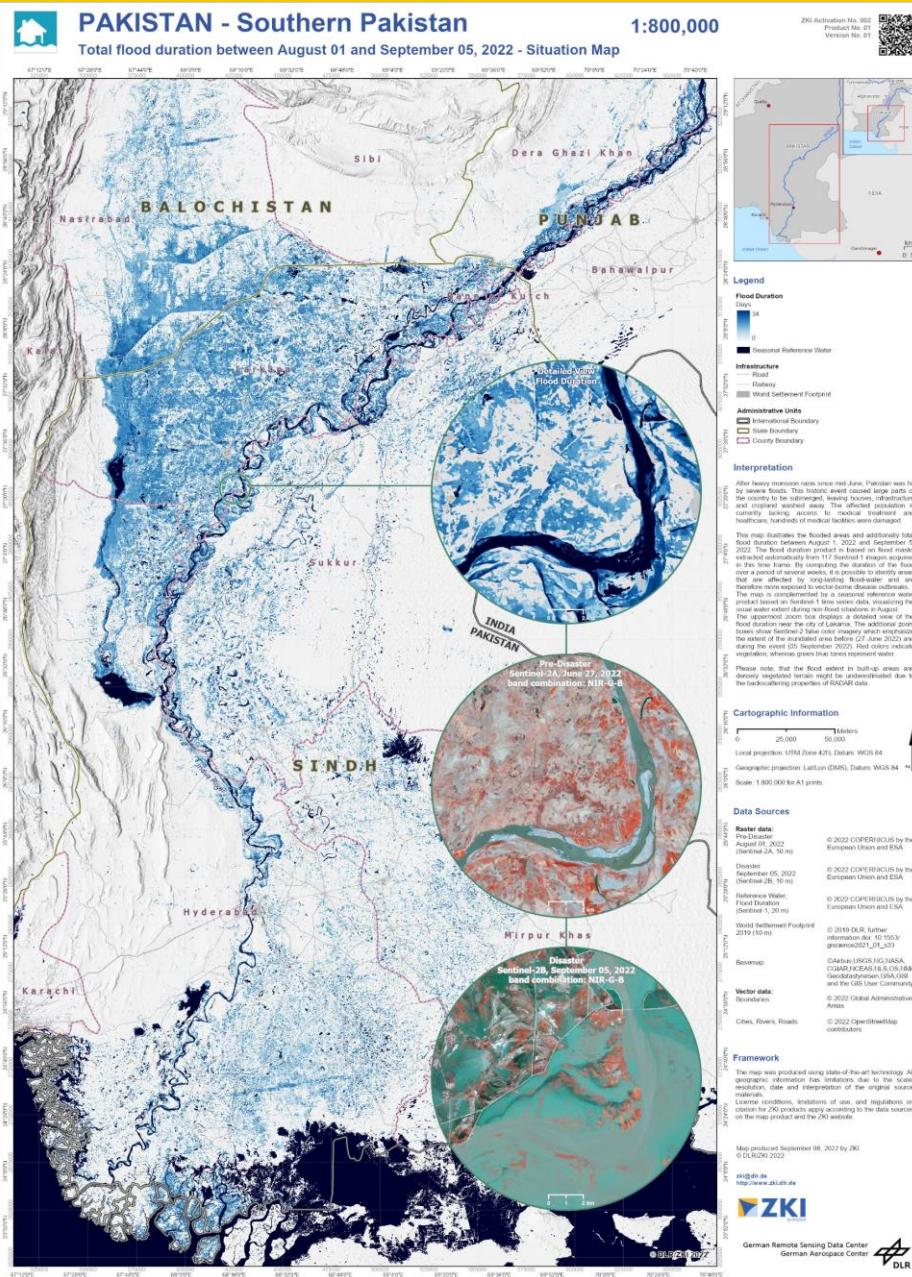
www.freepick.com



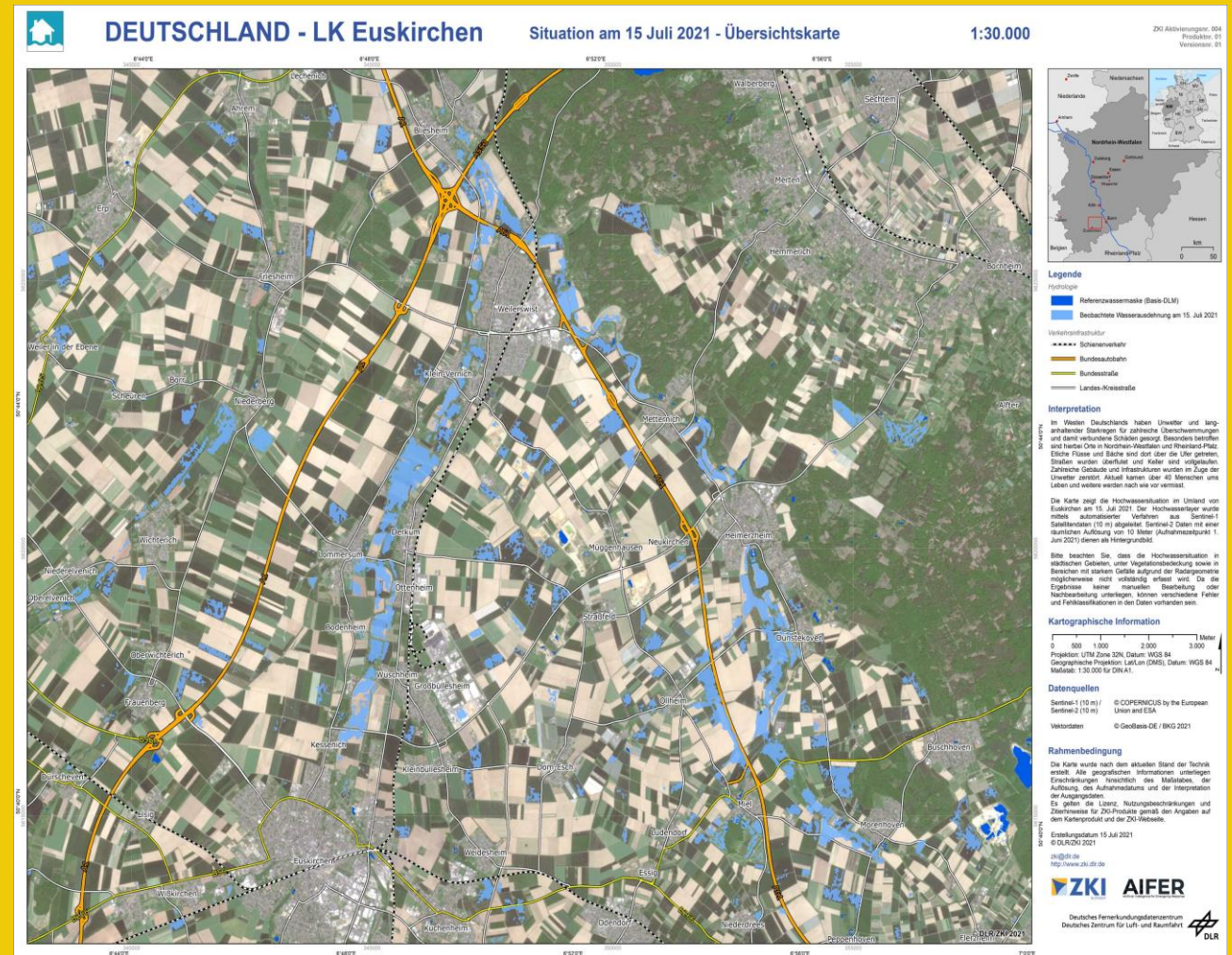
30 Minutes

Workflow for floods detection





Create your map



Large floods-and tsunami detection workshop



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