

Strengthening the use of Copernicus data and services for flood prediction and monitoring in African countries

The „Sentinels-4-African-DRR“ Project

*UN-SPIDER Bonn International Conference
„Space-based Solutions for Disaster Management in Africa:
Networks and Information Technologies in times of crisis“
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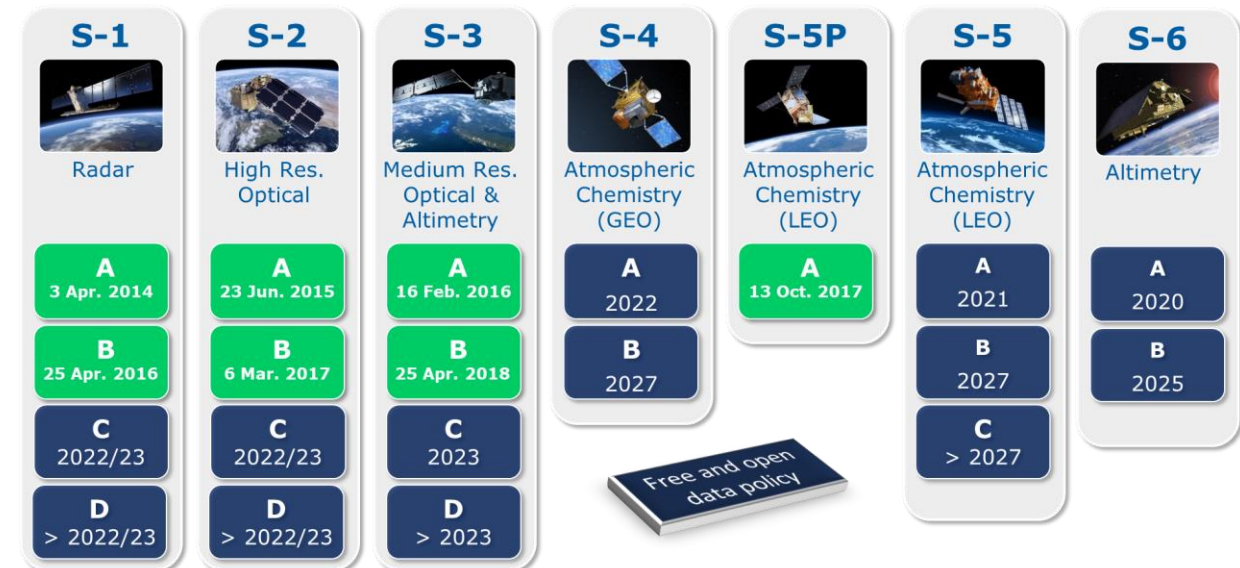
The Copernicus Programme

Core Services



Images: EU/ESA

Sentinel Satellites



How can African users benefit from Copernicus?

- Most Copernicus data and information are available globally, i.e. can be used freely by users outside of Europe.
- Some services are restricted to Europe, others are available as global versions as well, e.g.
 - GloFAS (Global Flood Awareness System, <https://www.globalfloods.eu/>)
 - GDO (Global Drought Observatory, <https://edo.jrc.ec.europa.eu/gdo/>)
- Not always easy to find out what data/information is available, how it is accessible, and how it can best be utilized.

Sentinels-4-African-DRR

Project goal and objectives

- Overall goal:

To strengthen the benefit from Copernicus in African countries, specifically for Disaster Risk Reduction and Management, through...

- Development of tailored training material
- Organization of targeted training events
- Collection and evaluation of user-requirements and user-feedback

- **Related objectives:**

- Work closely with UN-SPIDER and support UN-SPIDER events and the UN-SPIDER community in Africa
- Establish continuous communication with African Copernicus users
- Develop freely available training and guiding material on the use of Copernicus for DRR/DRM, specifically considering the needs and challenges of African users



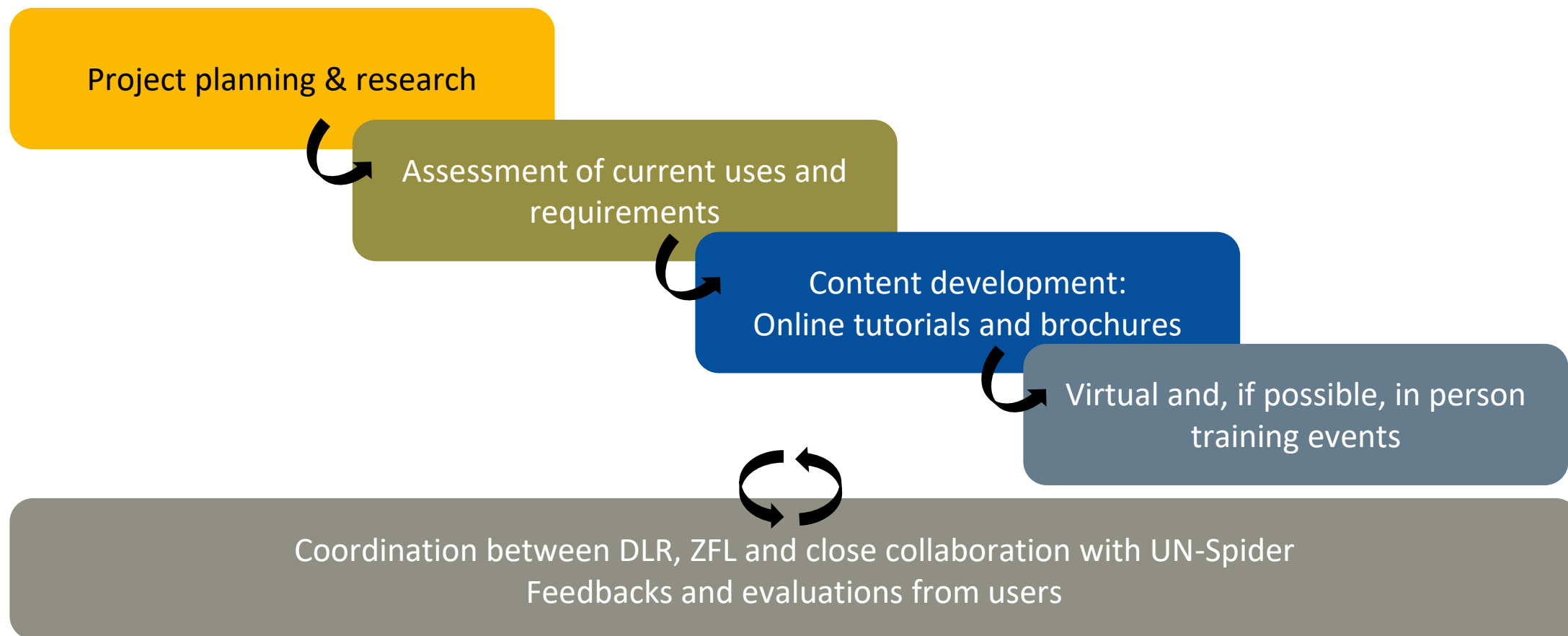
Foreseen Project Outputs

- 2-3 Trainings per year, ideally connected to UN-SPIDER activities and events
- Development of Training materials:
 - Guidelines for the use of Copernicus satellite data and derived information products and services in the context of different disaster types
 - Online material for specific disaster- and user types
 - Tutorials for the use of Copernicus data for disaster management and risk reduction
 - Dissemination of the material through the use of different media

Project context and cooperations

- The Sentinels-4-African-DRR project is closely embedded in ongoing collaborative efforts between DLR, UN-SPIDER and ZFL / Uni Bonn
- The SPEAR project provides the collaborative framework and sets the regional focus (Africa) for Sentinels-4-African-DRR
 - strong synergy between both efforts is expected
- Sentinels-4-African-DRR will add to UN-SPIDER & SPEAR activities
- Sentinels-4-African-DRR will benefit from events and networks organized and established in the SPEAR context and through UN-SPIDER activities in general

The „Sentinels-4-African-DRR“ Project



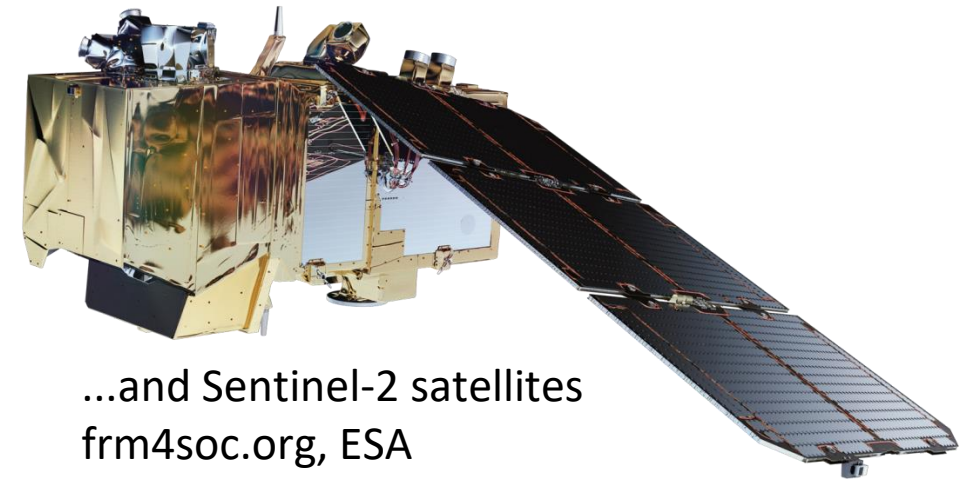
Example: Flood prediction and monitoring in African countries

Flood mapping with Copernicus Products

- Both optical and radar data can be used
- Dependent on conditions, data availability
- Further factors might play a role
 - Cloud cover
 - Capture time

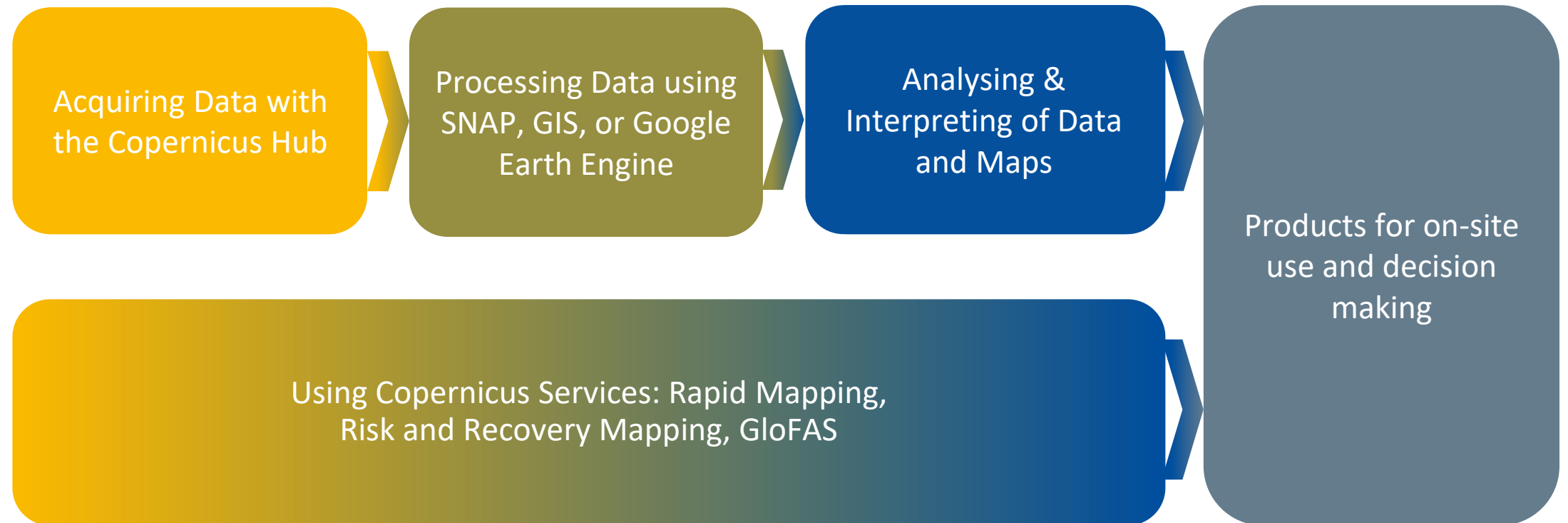


Sentinel-1...



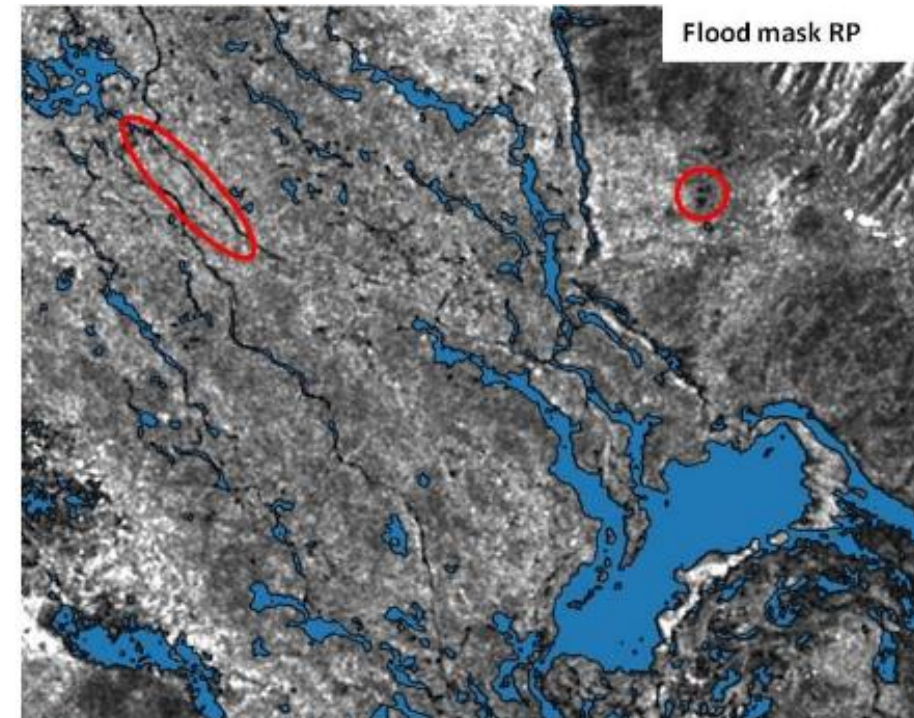
...and Sentinel-2 satellites
frm4soc.org, ESA

Exemplary Workflow



Radar based flood detection - Threshold

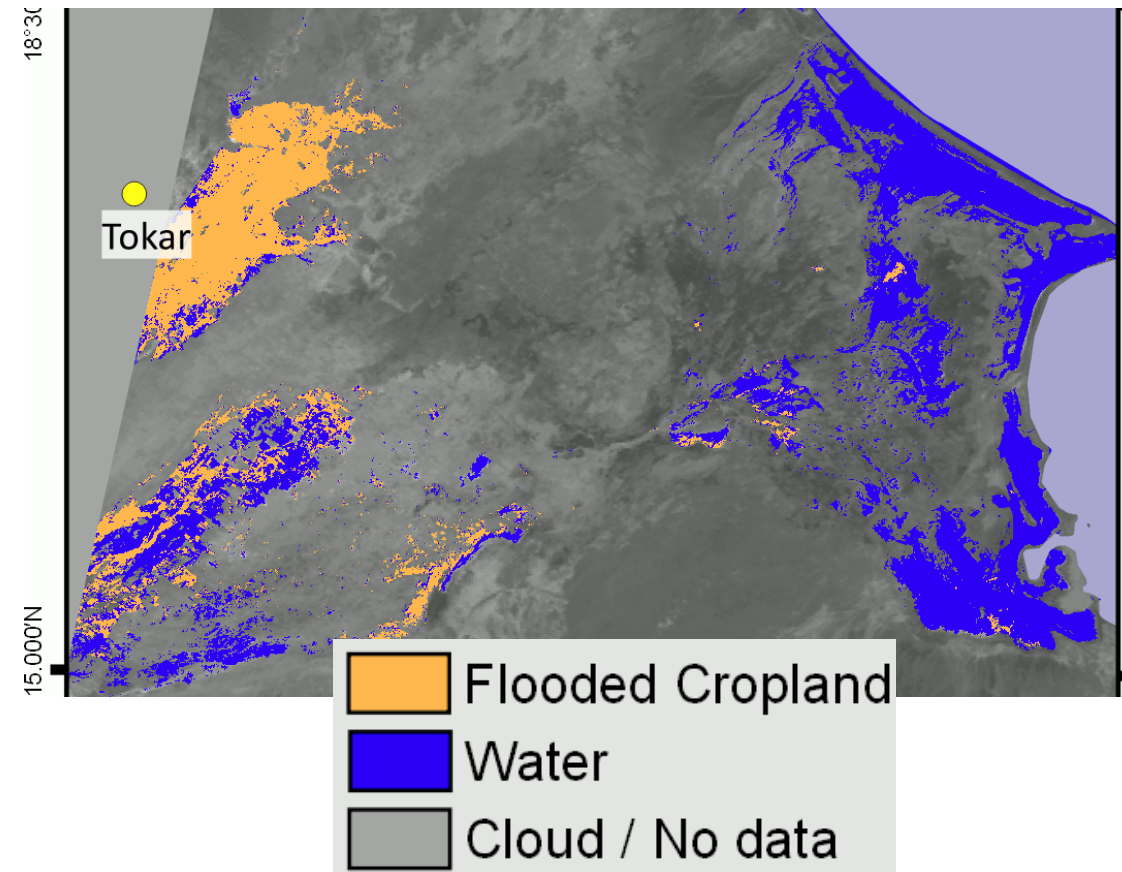
- Simple, effective method for rapid/first assessment
- Sentinel-1 scene during or shortly after event
- VV-Polarization
- Threshold selection
- Result: Binary map water \leftrightarrow no water



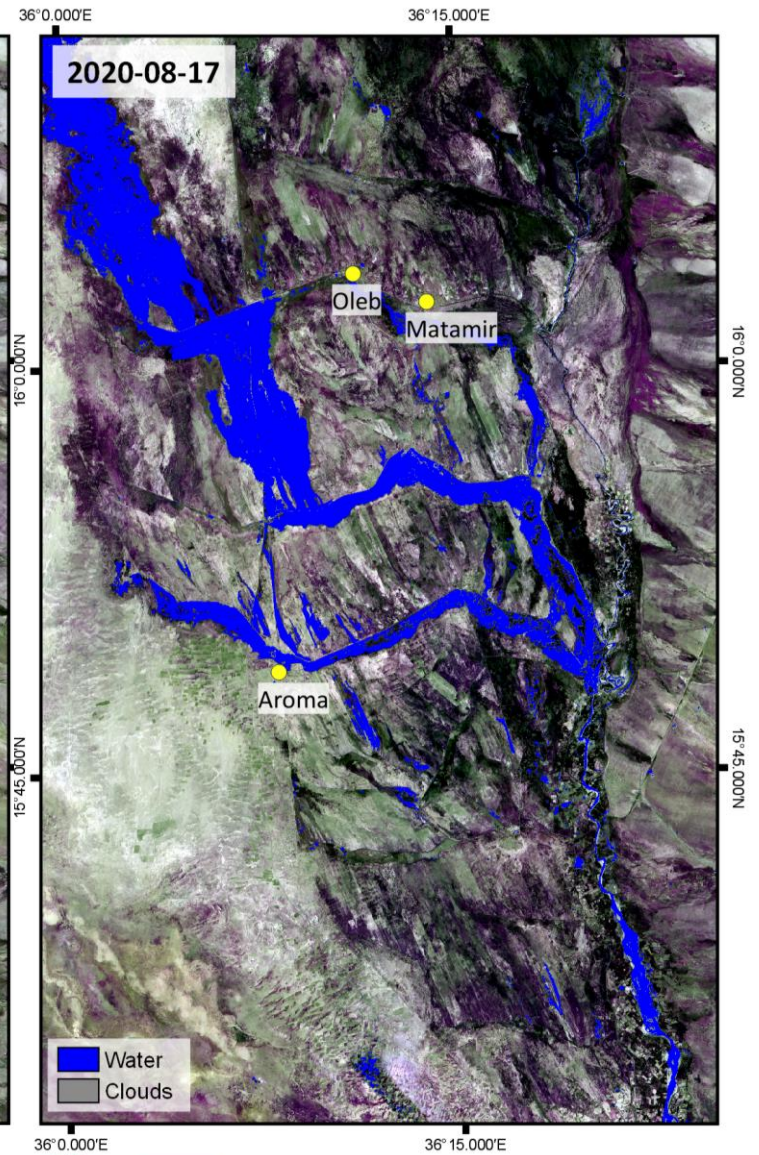
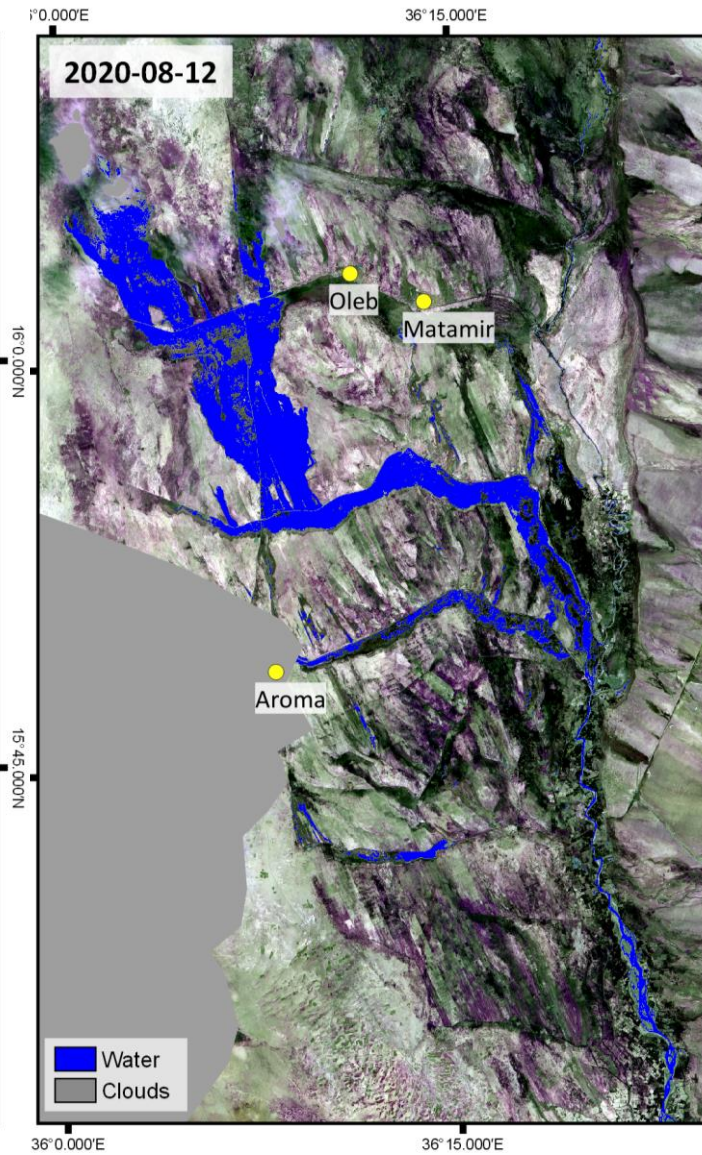
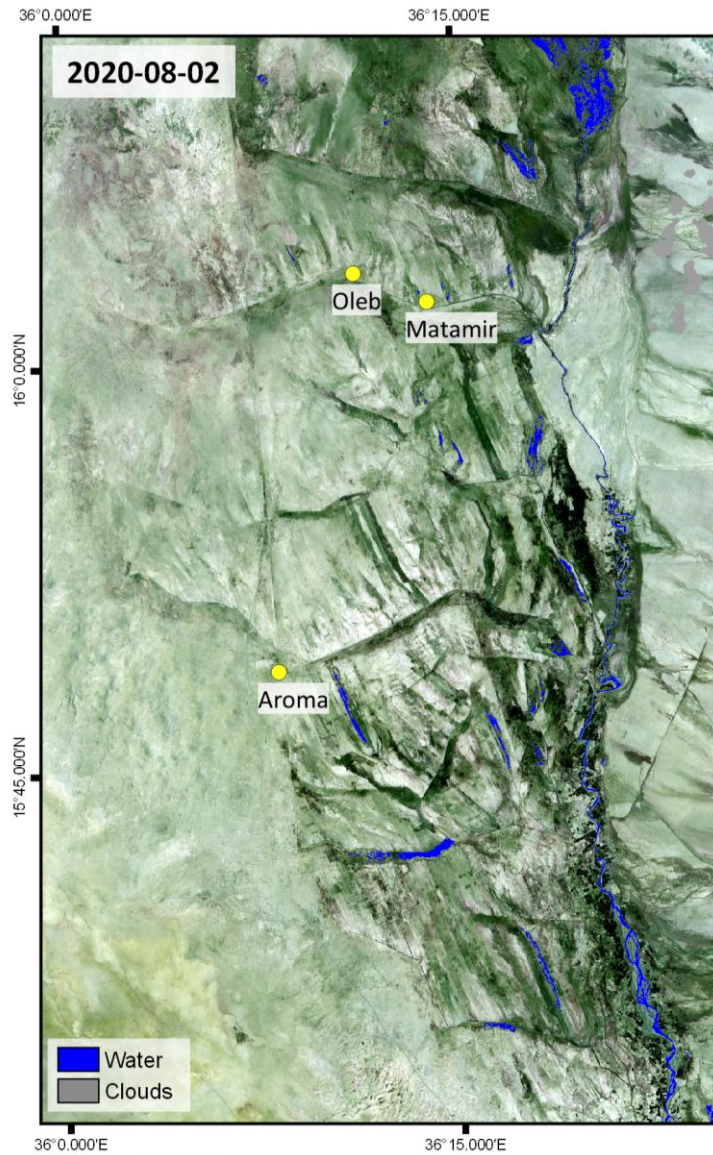
Recommended practice output
UN-SPIDER.org

Sentinel-2 based flood detection

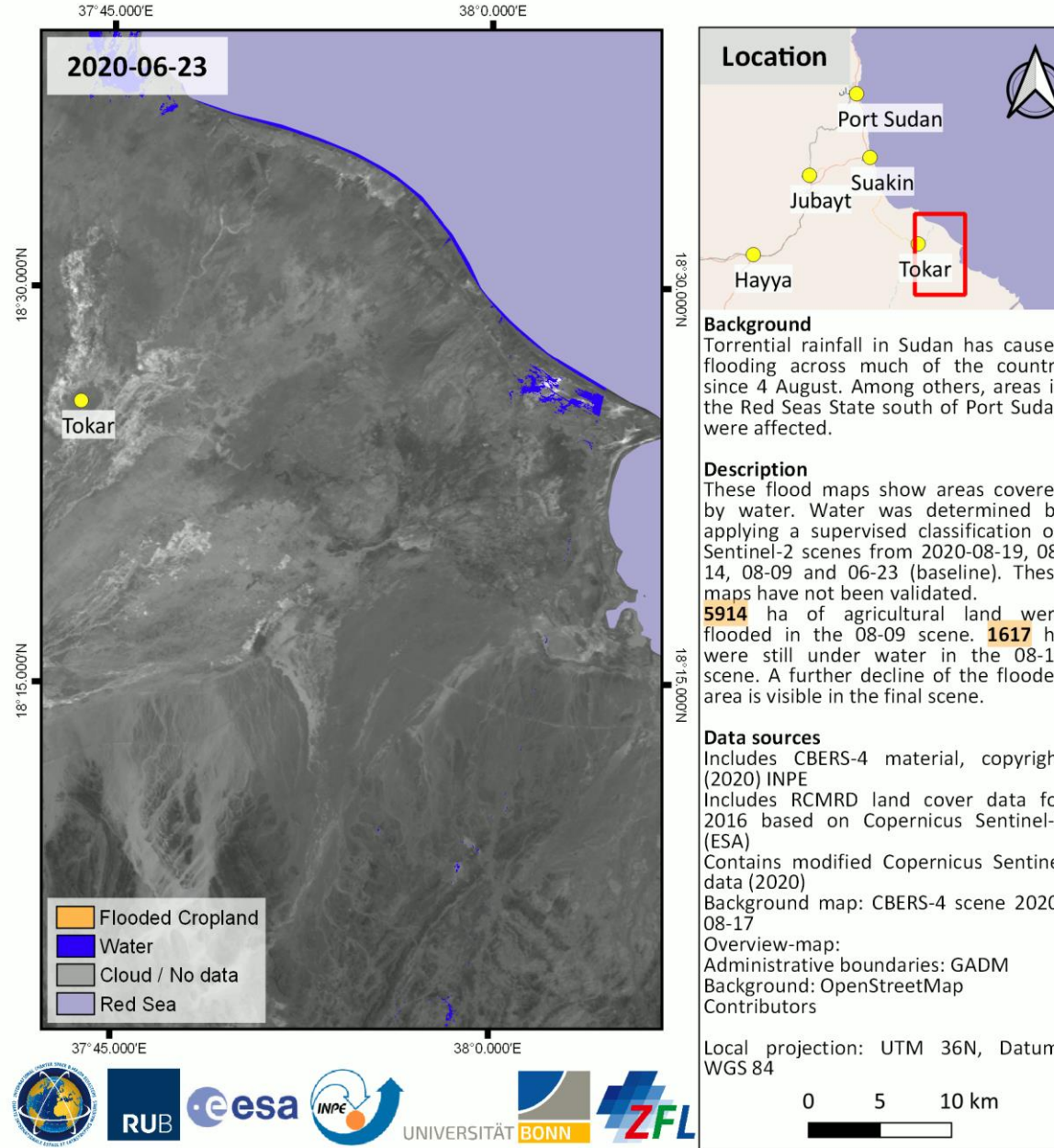
- Change detection approach
- Scene before and scene during flood
- Supervised classification on each scene
- Compare water extend before and after
- Cloud conditions have to be permitting



Example output, Sudanese Flood

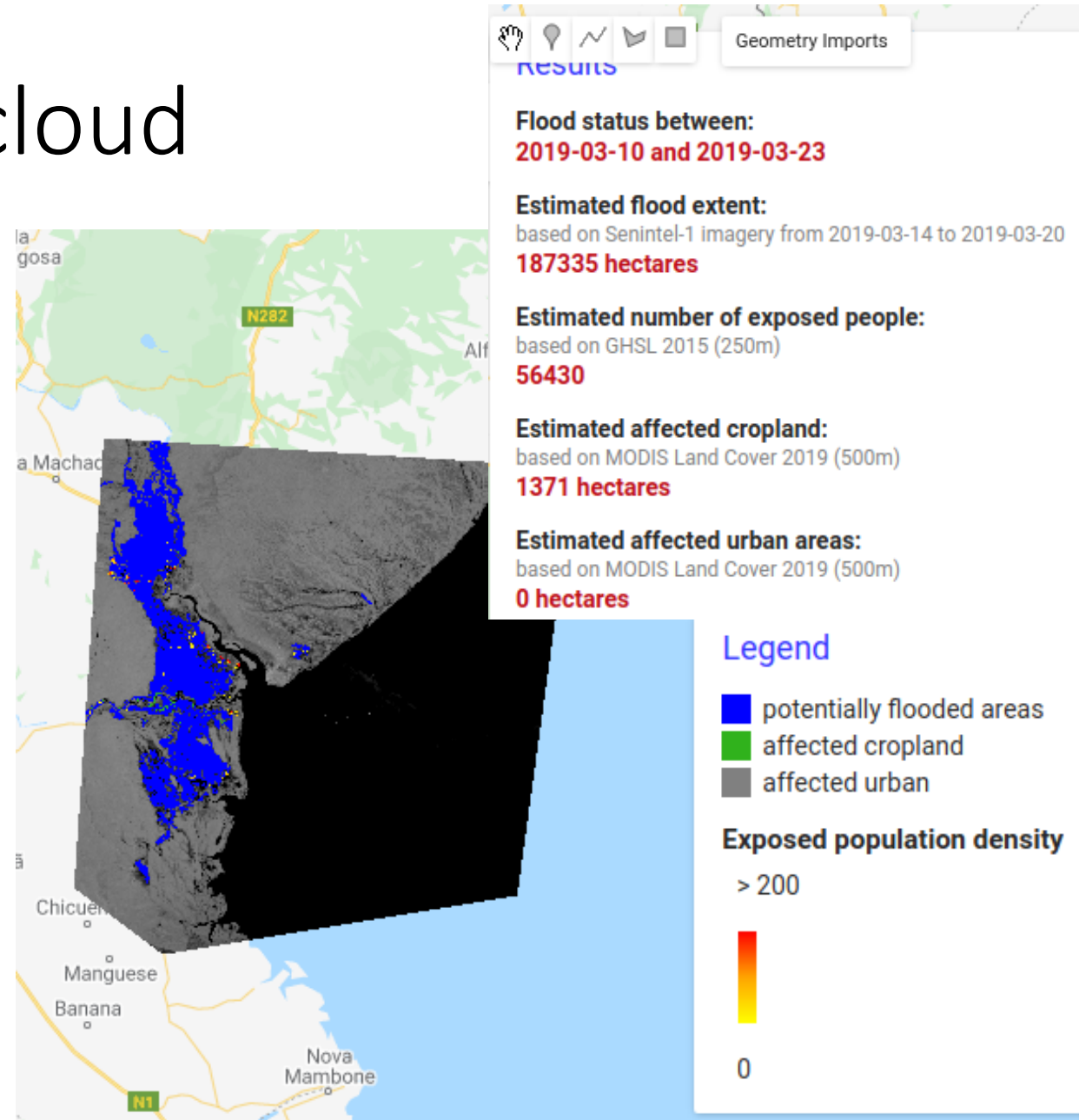


Flood Progression - Red Sea State Near Tokar, Sudan Based on Sentinel-2 (2020-06-23, 08-09, 08-14, 08-19)



Flood mapping on the cloud

- Cloud-based tools
- Low bandwidth/computing power requirements
- Quickly applicable to any study area
 - Size/Memory limitations
- Free to use
- Recommended Practices are available



Find recommended practices on floods and other hazards at UN-SPIDER.org

Browse Recommended Practices

Hazard Type: Flood Software: - Any - Related dataset: - Any -

Title	Software used	Related dataset
Recommended Practice: Disaster Preparedness Using Free Software Extensions	QGIS	MODIS Level 1, Atmosphere and Land data products (NASA), OpenStreetMap (Geofabrik), Global Flood Awareness System (GLOFAS - Copernicus EMS), Database of Global Administrative Areas (GADM), WorldPop
Recommended Practice: Exposure Mapping	QGIS	WorldPop, Land Cover Map (GlobeLand 30 - NGCC)
Recommended Practice: Flood Hazard Assessment	HEC-RAS Hydrologic Engineering Centers River Analysis System (US Army Corps of Engineers)	WorldDEM™ (AIRBUS)
Recommended Practice: Flood Hazard Mapping	ArcGIS Desktop (esri), ArcHydroTools, HEC-GeoHMS - Hydrologic Engineering Center, HEC-GeoRAS - Hydrologic Engineering Center	Cedar Creek DEM and Land Use (USGS), Land Cover Map (GLC2000 - JRC), GlobCover (ESA), Global Map-Global Land Cover (GLCNMO - ISCGM), Land Cover Map (LCI - USGS), Land Cover Map (Corine Land Cover - EEA)
Recommended Practice: Flood Mapping and Damage Assessment Using Sentinel-1 SAR Data in Google Earth Engine	Google Earth Engine (Google)	MODIS Land Cover Products (NASA), Sentinel 1 - SAR Dataset (ESA), Global Human Settlement Layer (GHSL - JRC), Global Surface Water (JRC)
Recommended Practice: Flood Mapping and Damage Assessment using Sentinel-2 (S2) Optical Data	QGIS	Sentinel 2 - Imagery (ESA)
Recommended Practice: Radar-based Flood Mapping	Google Earth Pro, Sentinel Application Platform (SNAP), Python	Sentinel 1 - SAR Dataset (ESA)
Recommended Practice: Use of Digital Elevation Data for Storm Surge Coastal Flood Modelling	QGIS	WorldDEM™ (AIRBUS)

Possibilities for participation

- Contact us and support us by participating in interviews and/or surveys
- Discuss your specific Copernicus experiences with us, including challenges and requirements for increasing your use of the Copernicus portfolio
- Make use of developed material and attend training courses etc. and provide feedback to us!

Thank you for your attention!

The Project „Sentinels-4-African-DRR“ receives EU funding through the Framework Partnership Agreement for Copernicus User Uptake

