

BeGeo 2026
24/03/2026 - Brussels Expo

La géo-intelligence au service de la résilience
Geo-intelligentie voor een veerkrachtige toekomst

Remote sensing in support of flood crisis response: the FLOWS project

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VITO

begeo.be

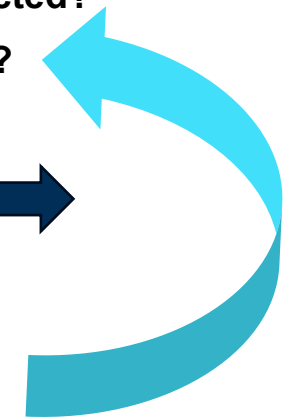
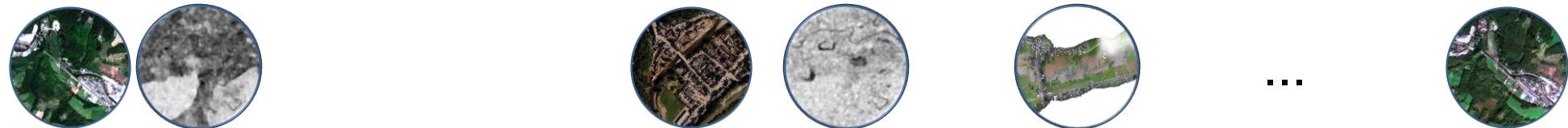


Diamond sponsor of BeGeo 2026

Flood crisis response



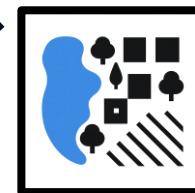
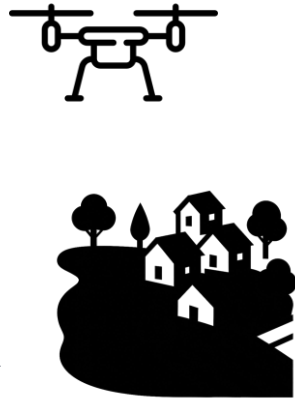
Which routes are still available?
Which areas are flooded?
Where are victims?
Is there pollution?
Which houses need reconstruction?
How is vegetation impacted?
Are there agricultural losses?



- UAV
- Aerial
- Satellite
- Optical
- Multispectral
- Radar



UAV-supported situational awareness





UAV-supported situational awareness

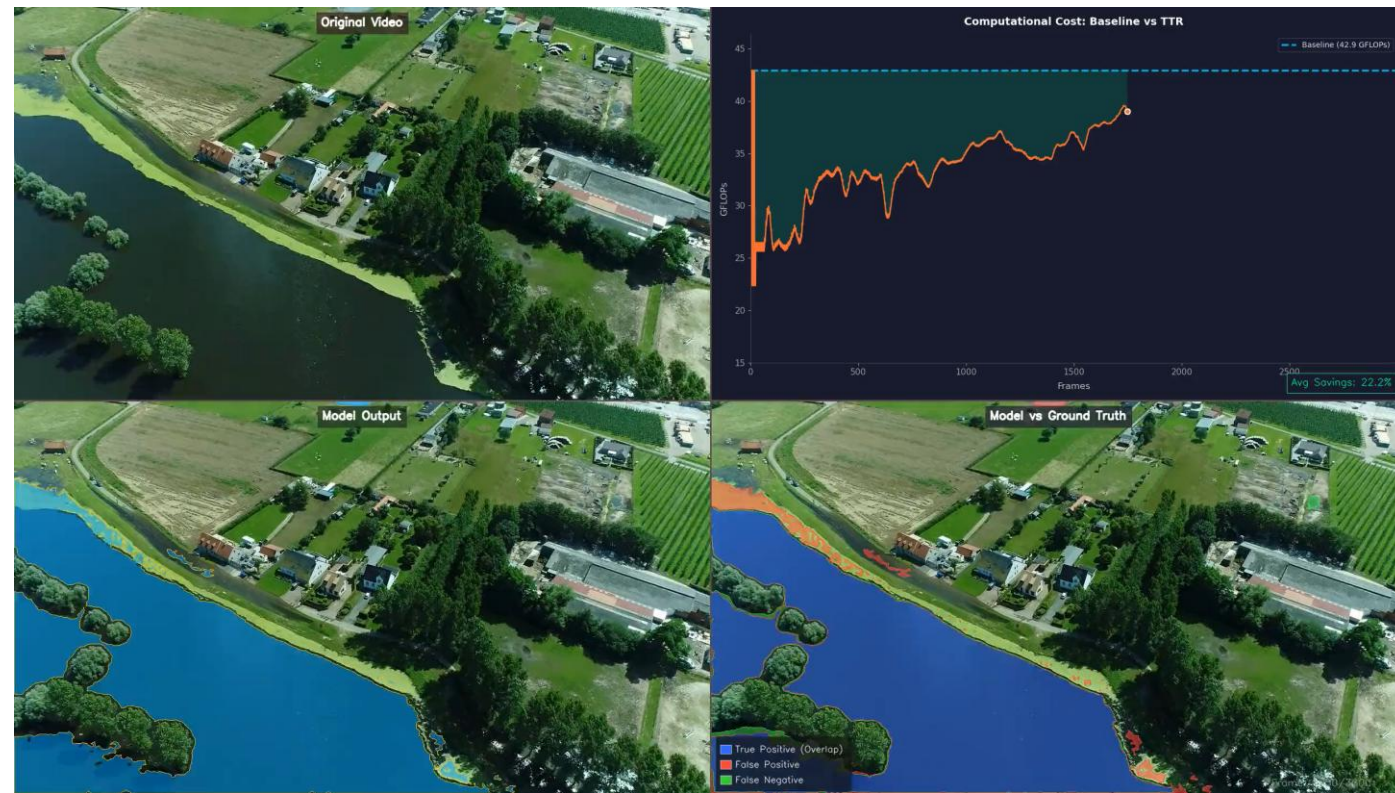
On-board analytics from oblique UAV video

- Goal: Support pilot in image interpretation
- Challenge: limited resources

→ adaptive AI technology:
only dynamic parts of image analyzed

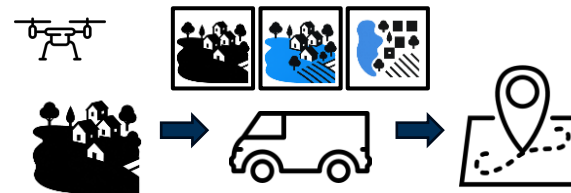
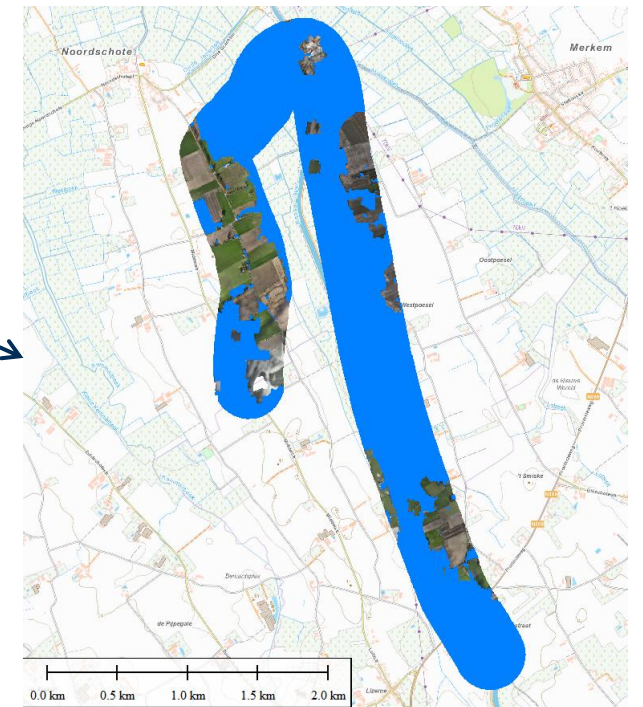
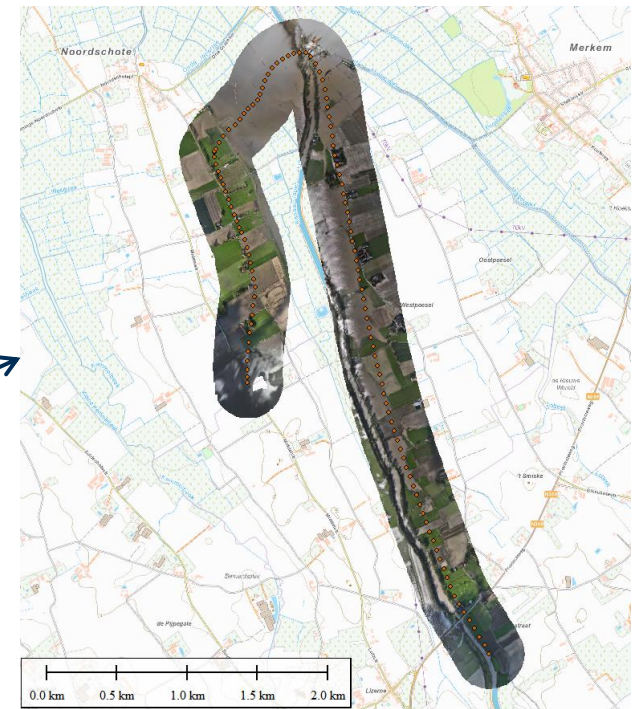
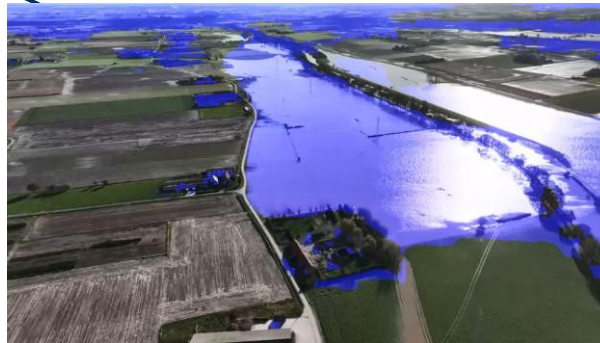
Future:

- Victim detection
- VLMs for flexible tasks



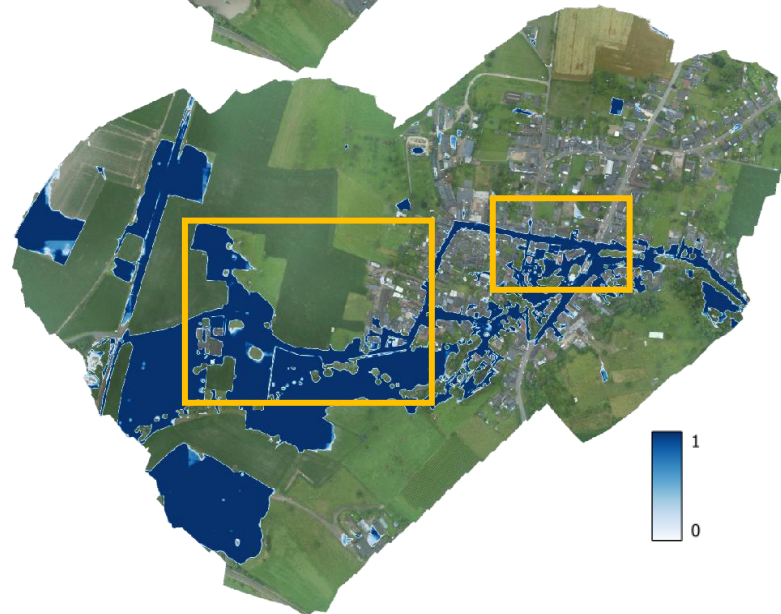
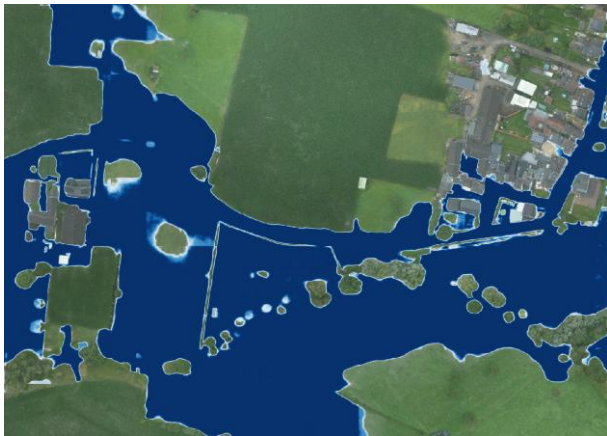
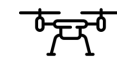
UAV-based flood extent

Oblique UAV video to georeferenced maps



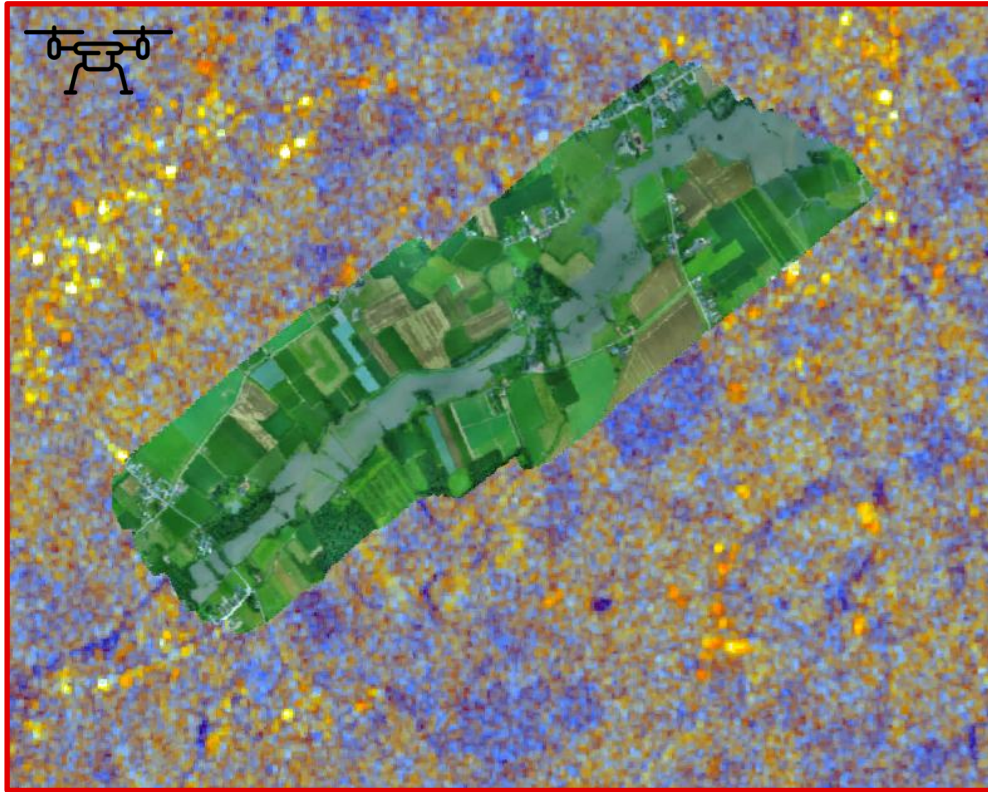
UAV-based flood extent

Orthogonal UAV mosaics to flood maps

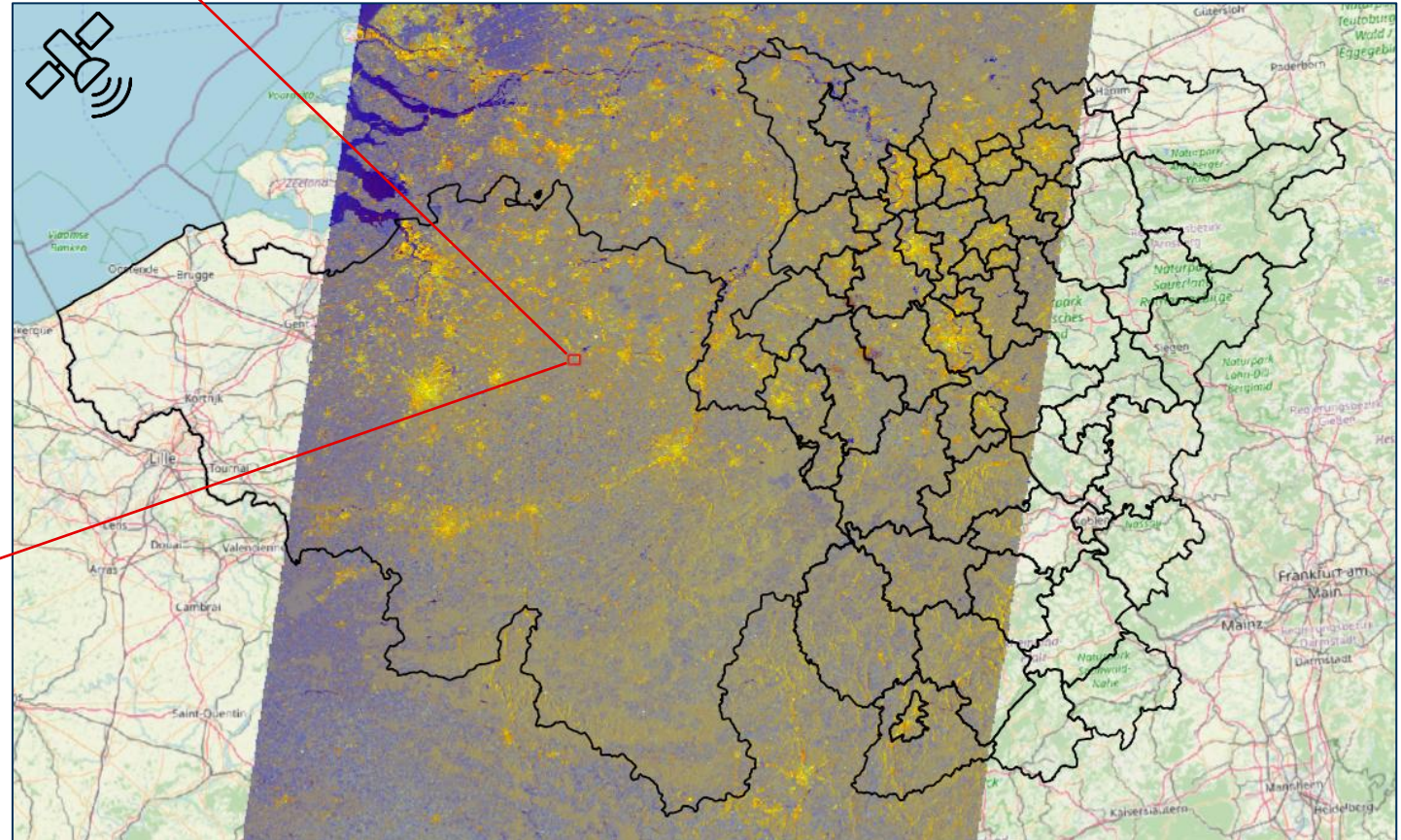


Satellite-based flood products: SAR

Sentinel-1 SAR imagery



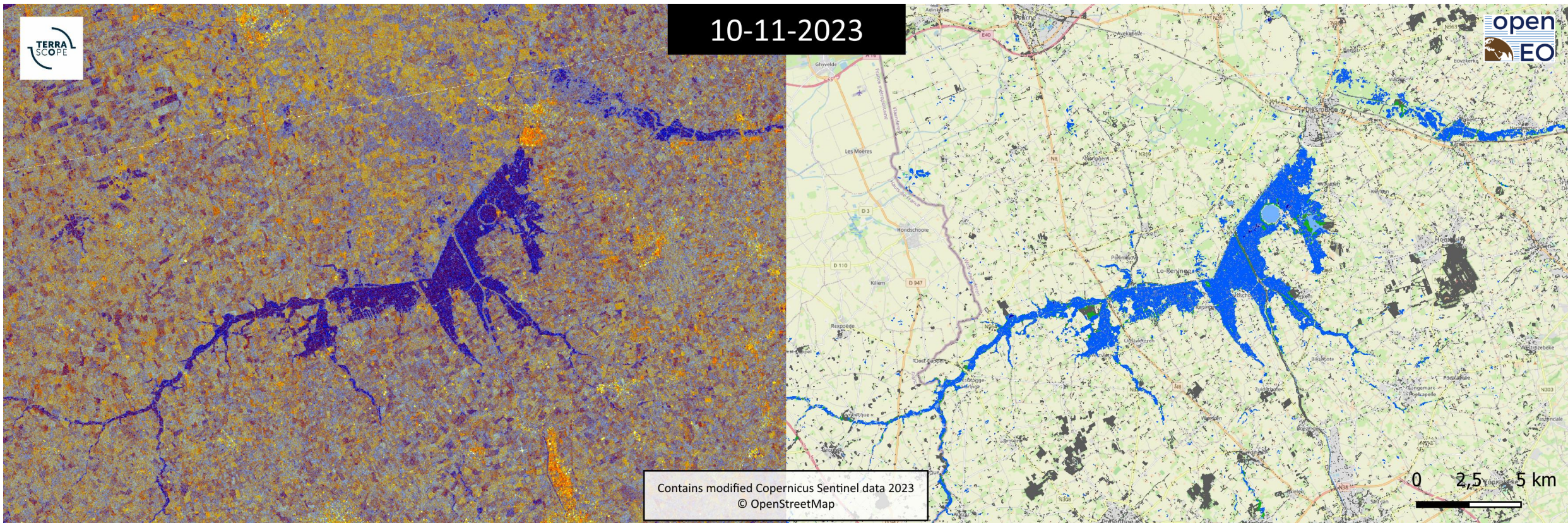
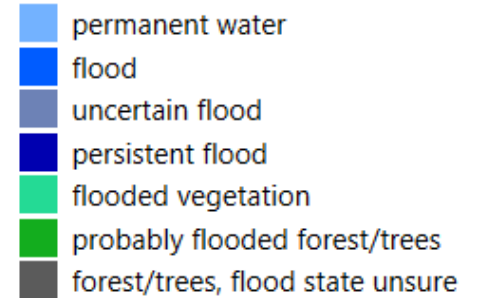
- + Large scale
- + Automated acquisition
- + All-weather
- + Free, open data
- Limited resolution
- Fixed acquisition
- Limited applicability in urban areas



Satellite-based flood products: SAR

Sentinel-1 flood extent maps

- 10m resolution, 2-6 daily over Belgium
- Automated, near-real time production

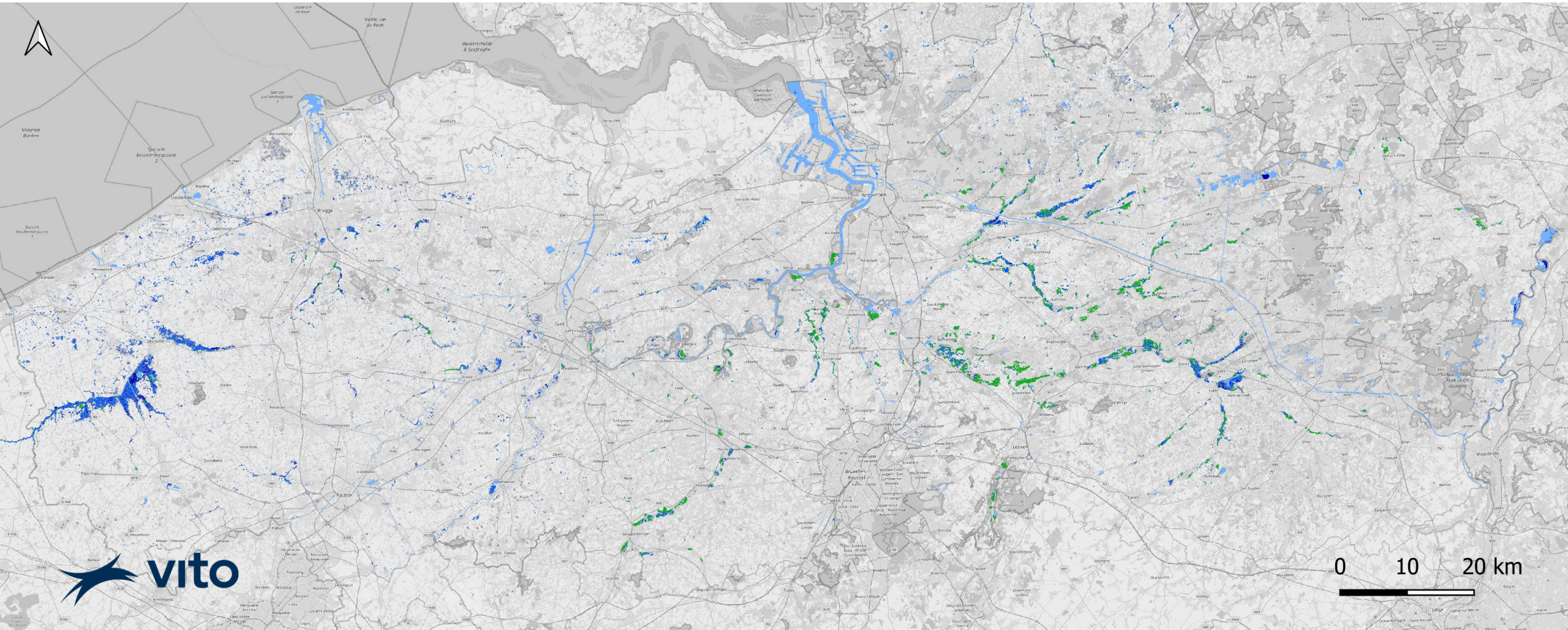


Satellite-based flood products: SAR

Sentinel-1 derived flood products: maximal flood contour

01-01-2024 to 08-01-2024: floods across Flanders

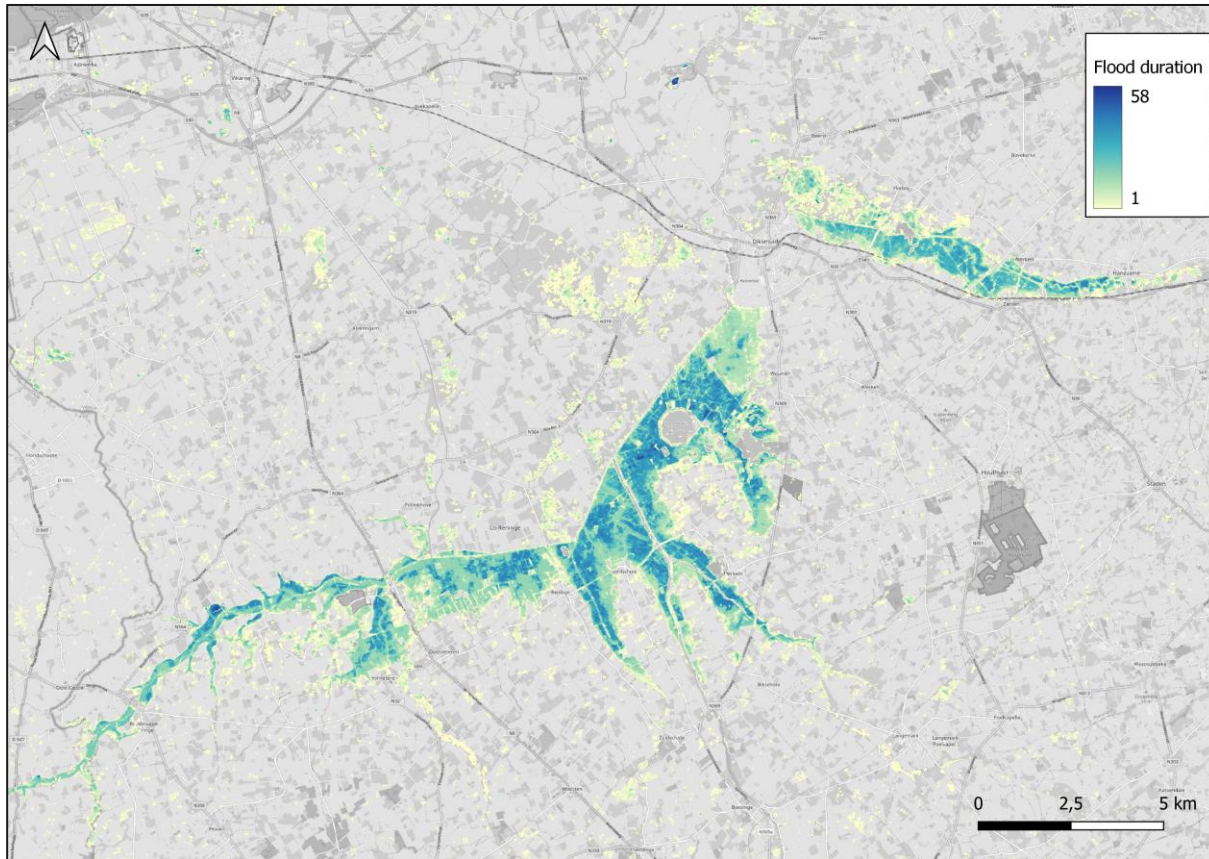
- permanent water
- flood
- uncertain flood
- persistent flood
- flooded vegetation
- probably flooded forest/trees
- forest/trees, flood state unsure



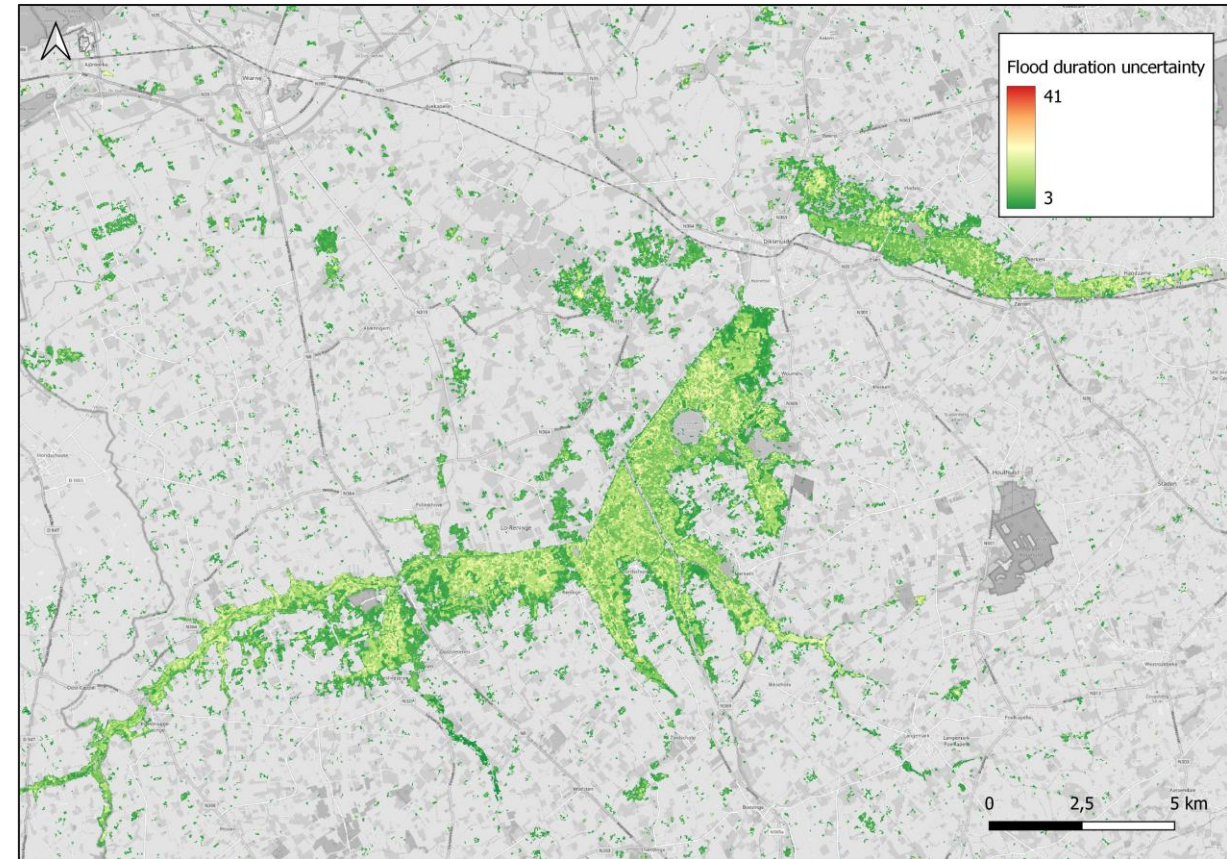
Satellite-based flood products: SAR

Sentinel-1 derived flood products: flood duration

Observed flood duration
20-10-2023 – 20-12-2023



Flood duration uncertainty
20-10-2023 – 20-12-2023



Satellite-based flood products: SAR

Commercial SAR imagery

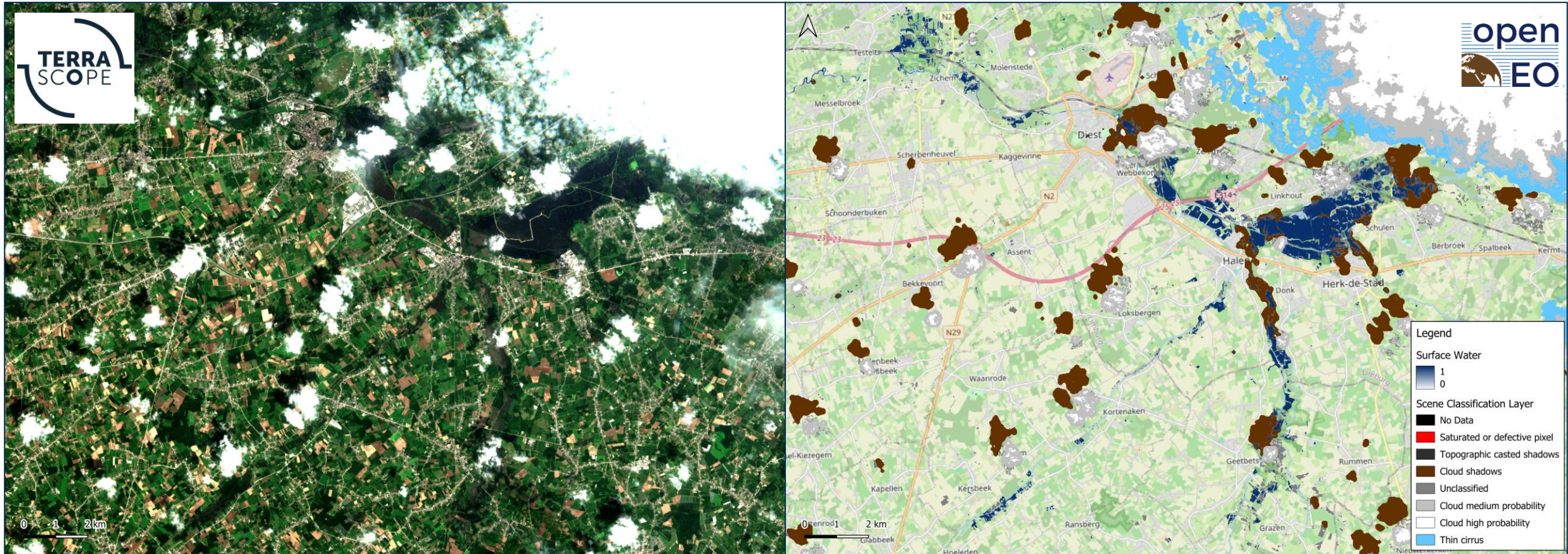
- < 1m resolution
- On-demand acquisition



Satellite-based flood products: multispectral

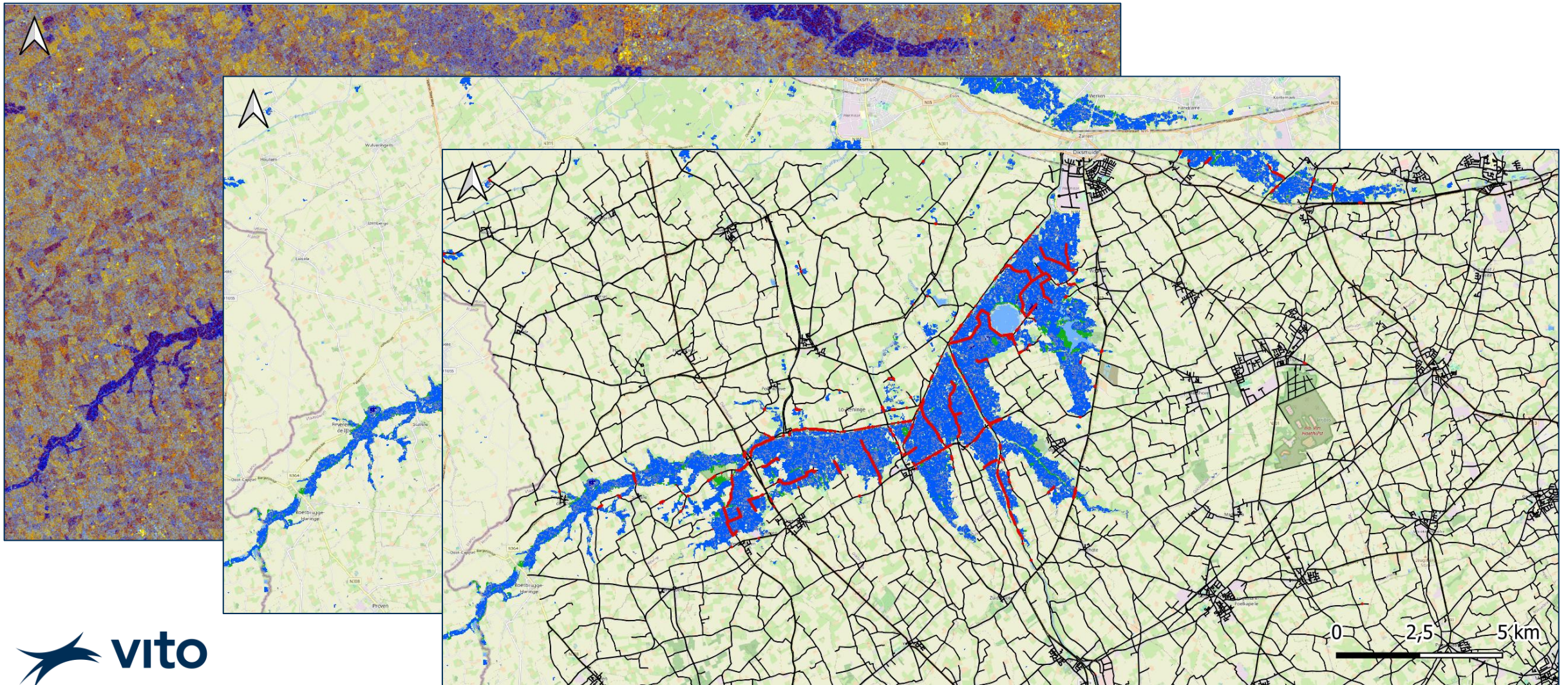
Sentinel-2 water extent maps

2021-07-19 – Demer basin



Flood impact: infrastructure

GIS-based infrastructure impact

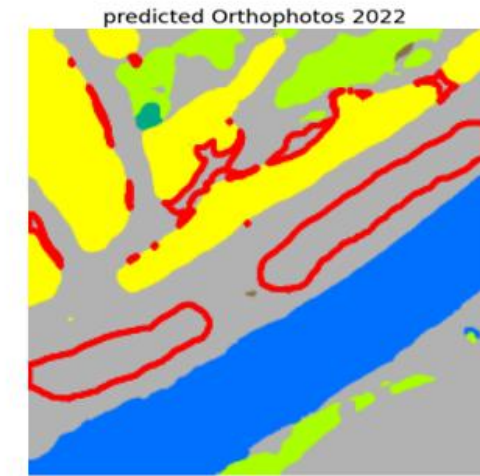
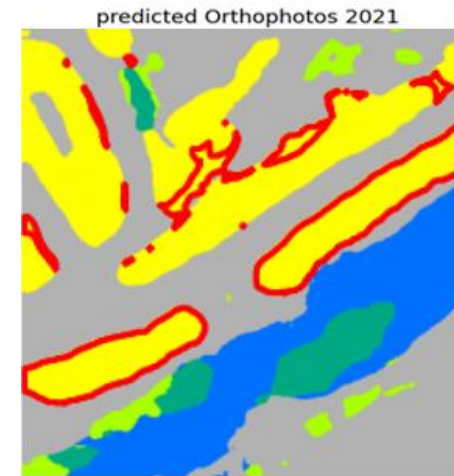
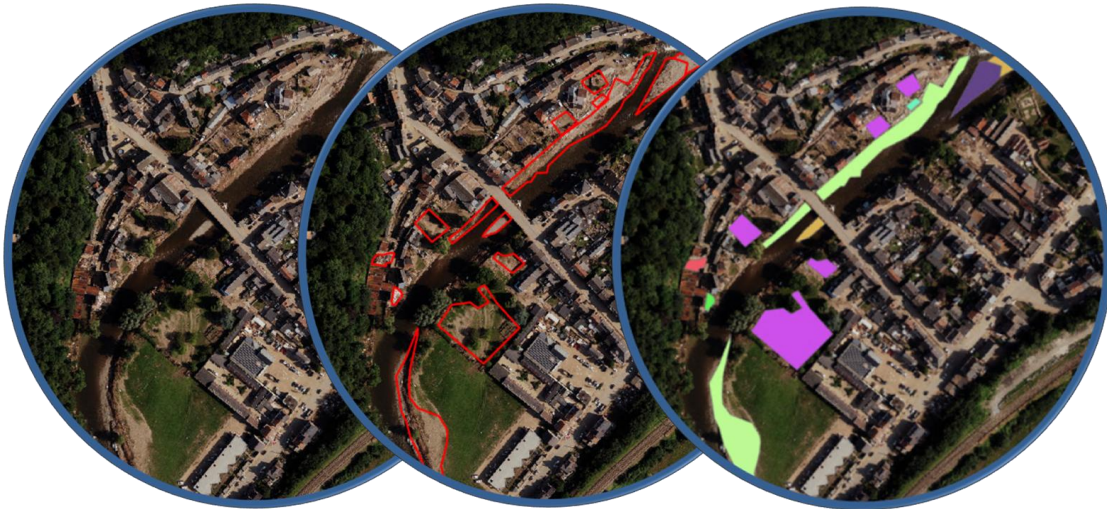


Flood impact: infrastructure

Image-based infrastructure impact

On very high-resolution airborne images :

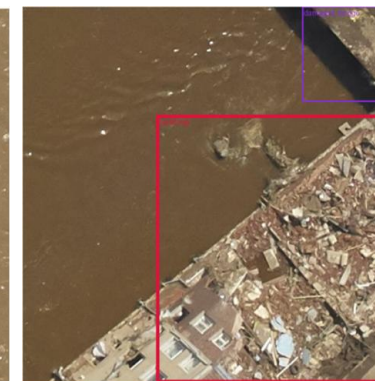
- Change detection with semantic segmentation
- Damage detection



Debris



Sediments



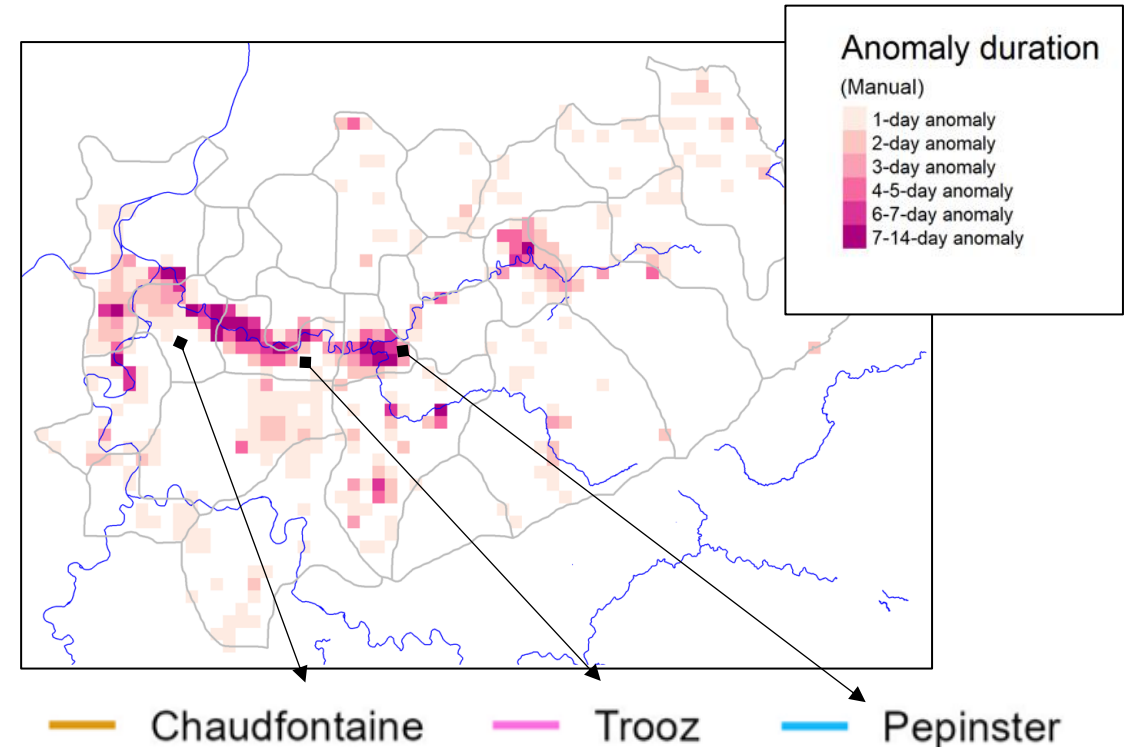
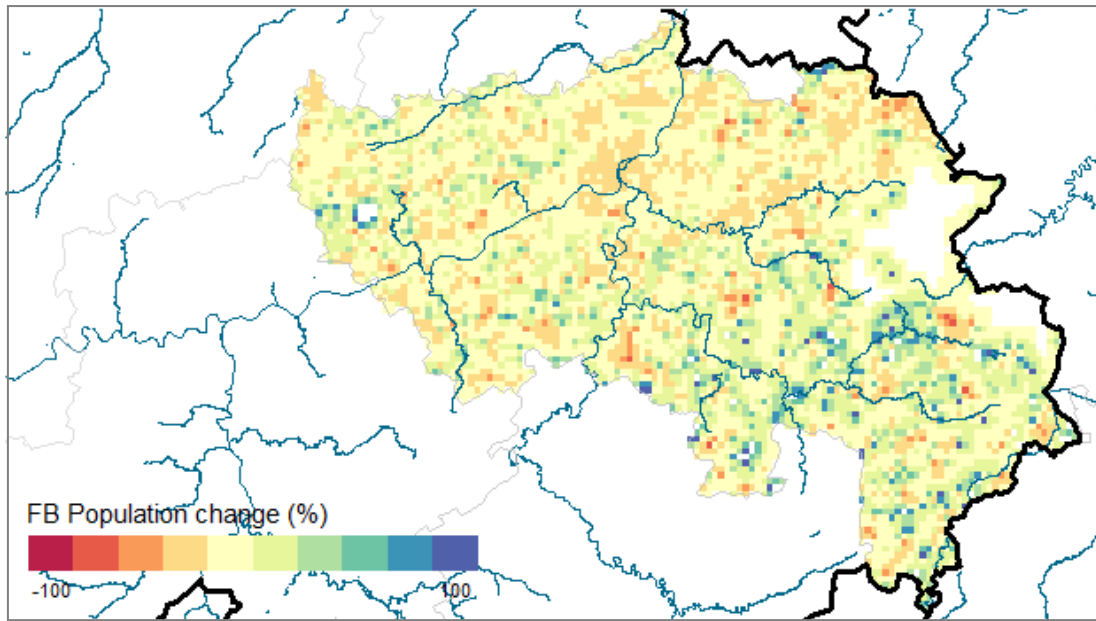
Destroyed buildings

Flood impact: population

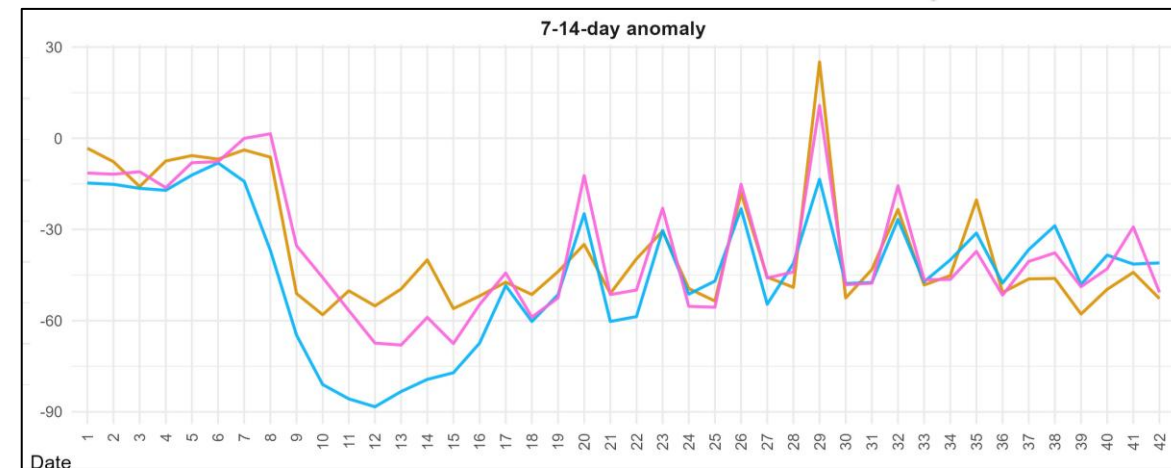
Dynamic population impact using social media

- Facebook Population (Tile) Dataset
 - Hot and cold spots of user activity de/increase
 - Strong activity drop followed by a slow recovery
 - Gap between night-time and daytime activity

14/07/21 00:00:00

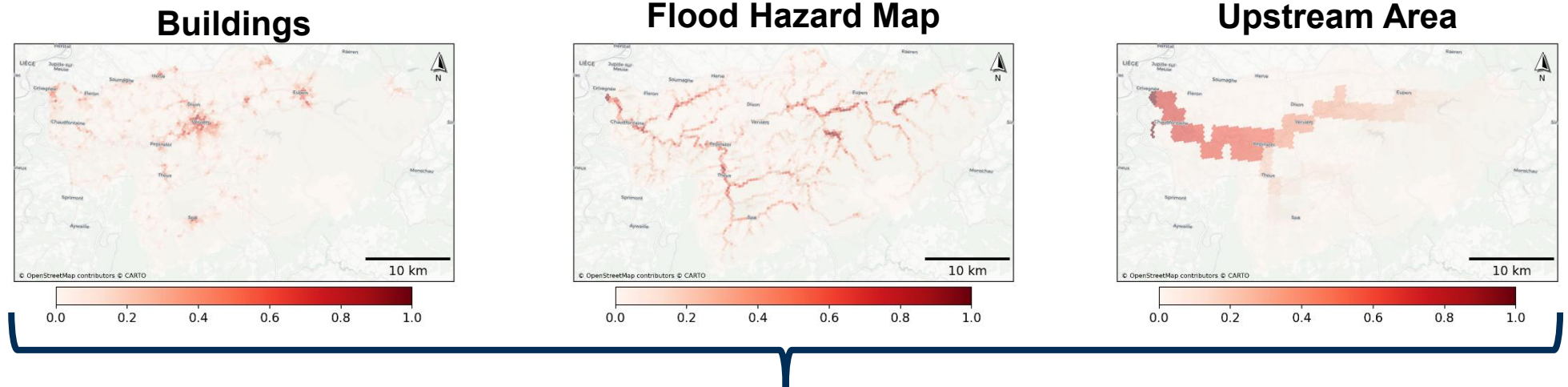


Chaufontaine Trooz Pepinster

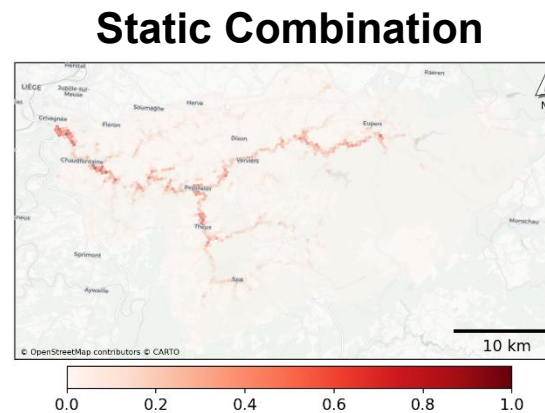


Progressive flood hot spots

Combining the different data



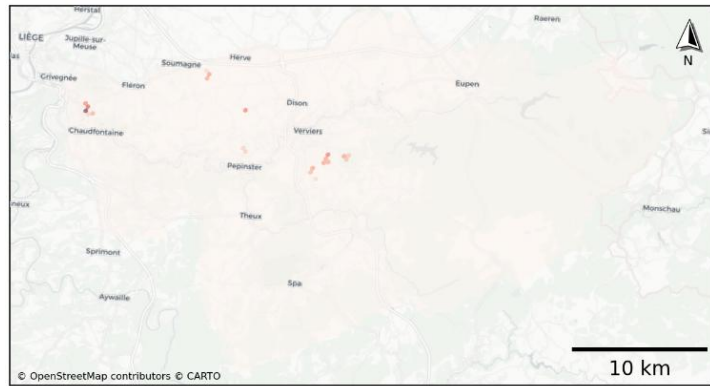
- Combine different static & dynamic data layers
- Add new data as it becomes available
- Maps can be used for dispatching & observation planning



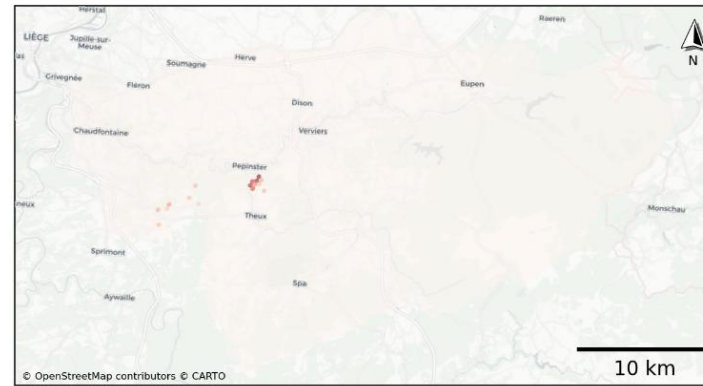
Progressive flood hot spots

Exemplary Temporal Hotspot Maps

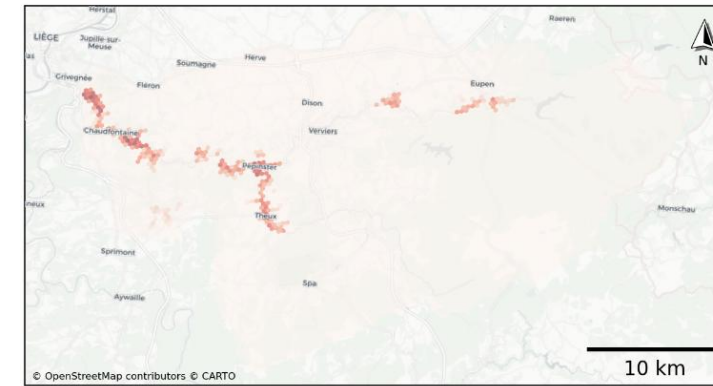
13/07/-14/07 6pm-2am



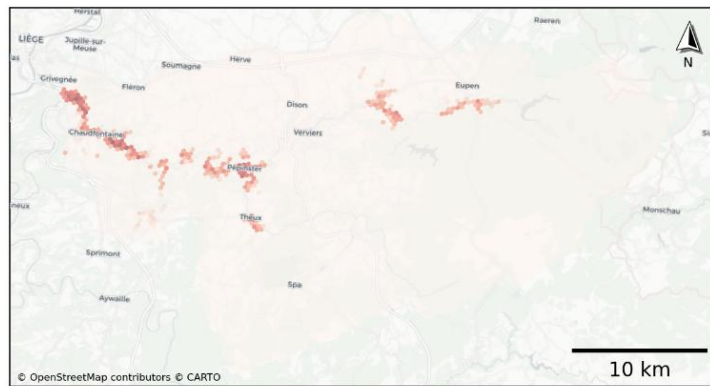
14/07 2am-10am



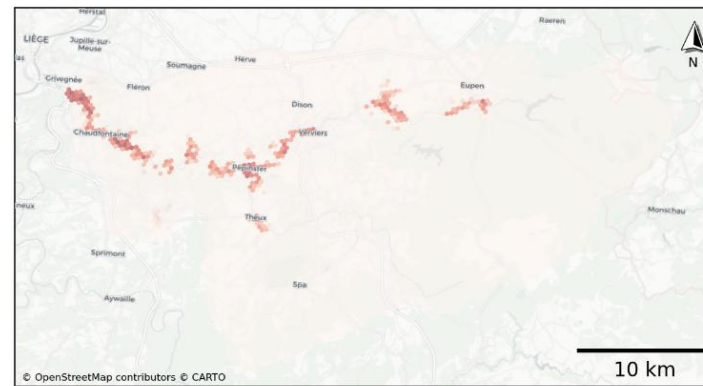
14/07 10am-6pm



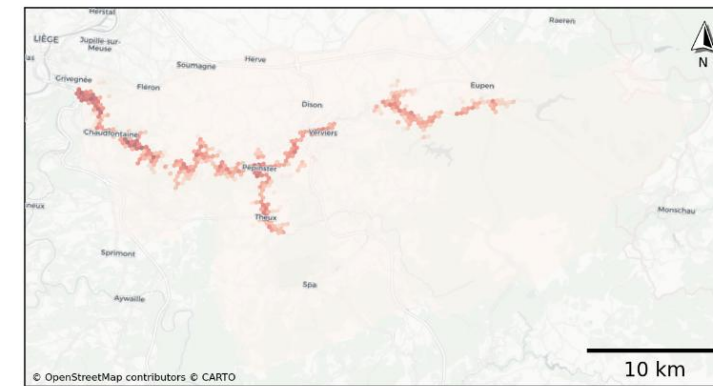
14/07/-15/07 6pm-2am



15/07 2am-10am



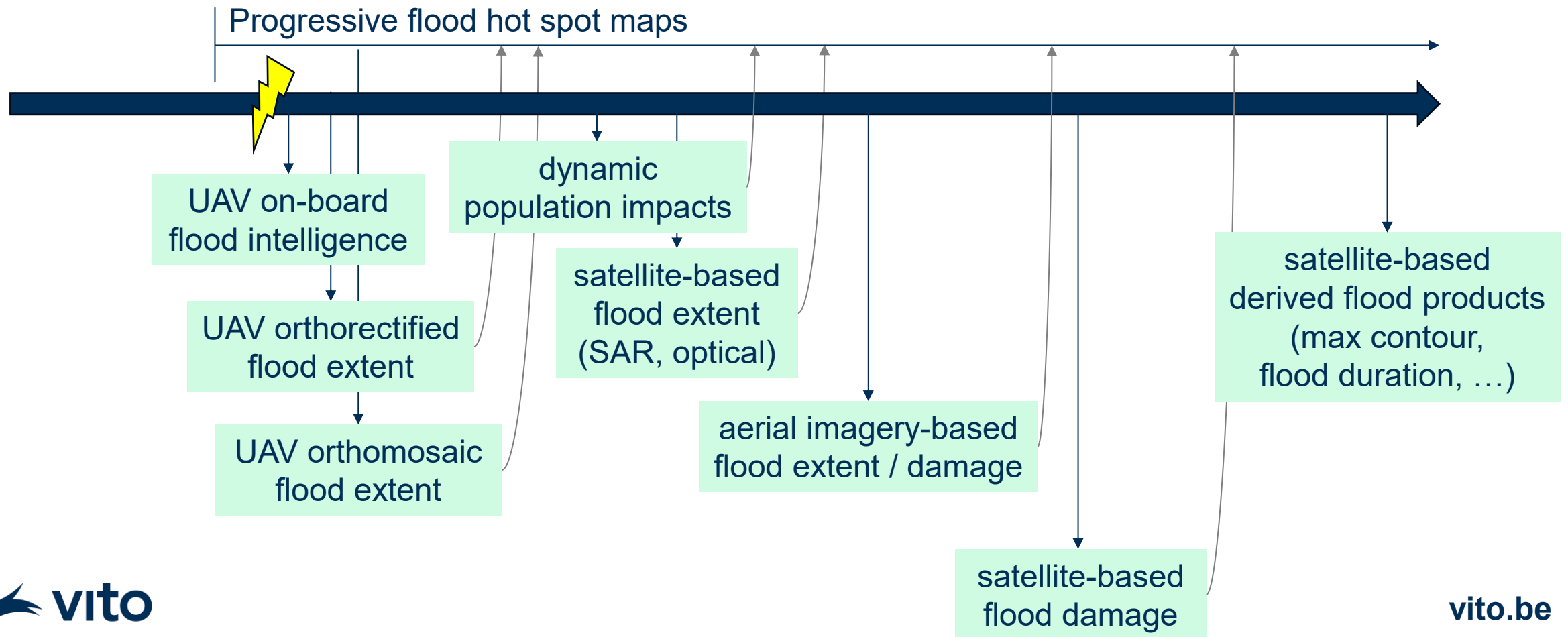
15/07 10am-6pm



DLR

Summary & outlook

Exploitation of all information pieces to build situational awareness



Thank you!
Find us at booth S08.

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