Assessment of Impact of Natural Hazards:
Challenge & Security Bootstrapping Services

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Reinforcing the AI4EU Platform by Advancing
Earth Observation Intelligence, Innovation & Adoption

Challenge

- Quick assessment of area affected by flooding using Sentinel imagery -> Flooding mask

- Exploitation of resources from AI4Copernicus project to facilitate further analysis

Flooding in Australia 2021

- Extreme rainfall on the east coast of Australia beginning on 18 March 2021 led to widespread flooding in New South Wales

- Suburbs of Sydney experienced the worst flooding in 60 years

- 18,000 people to evacuate, in addition to over 1,000 flood rescues
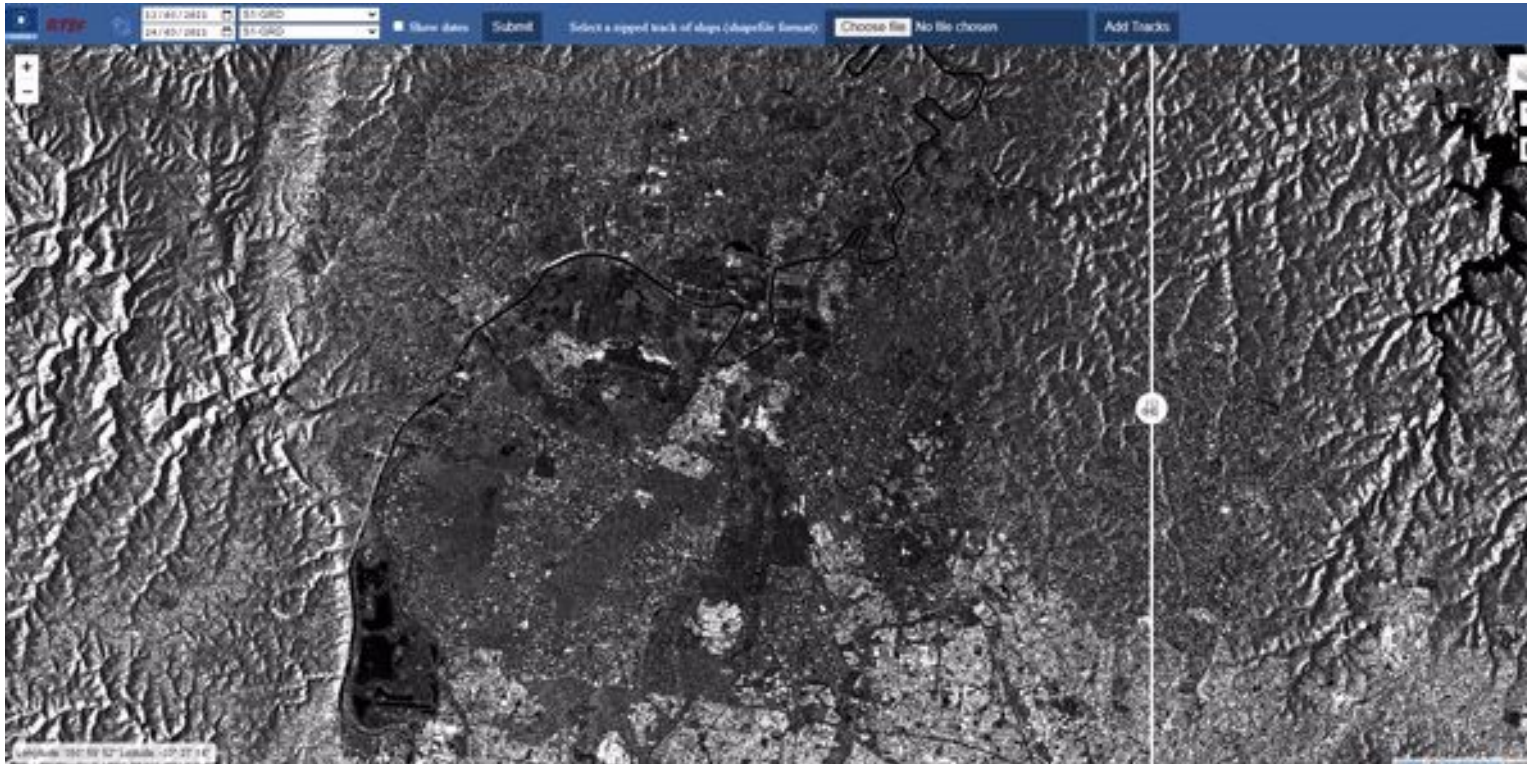
Flooding in Australia 2021
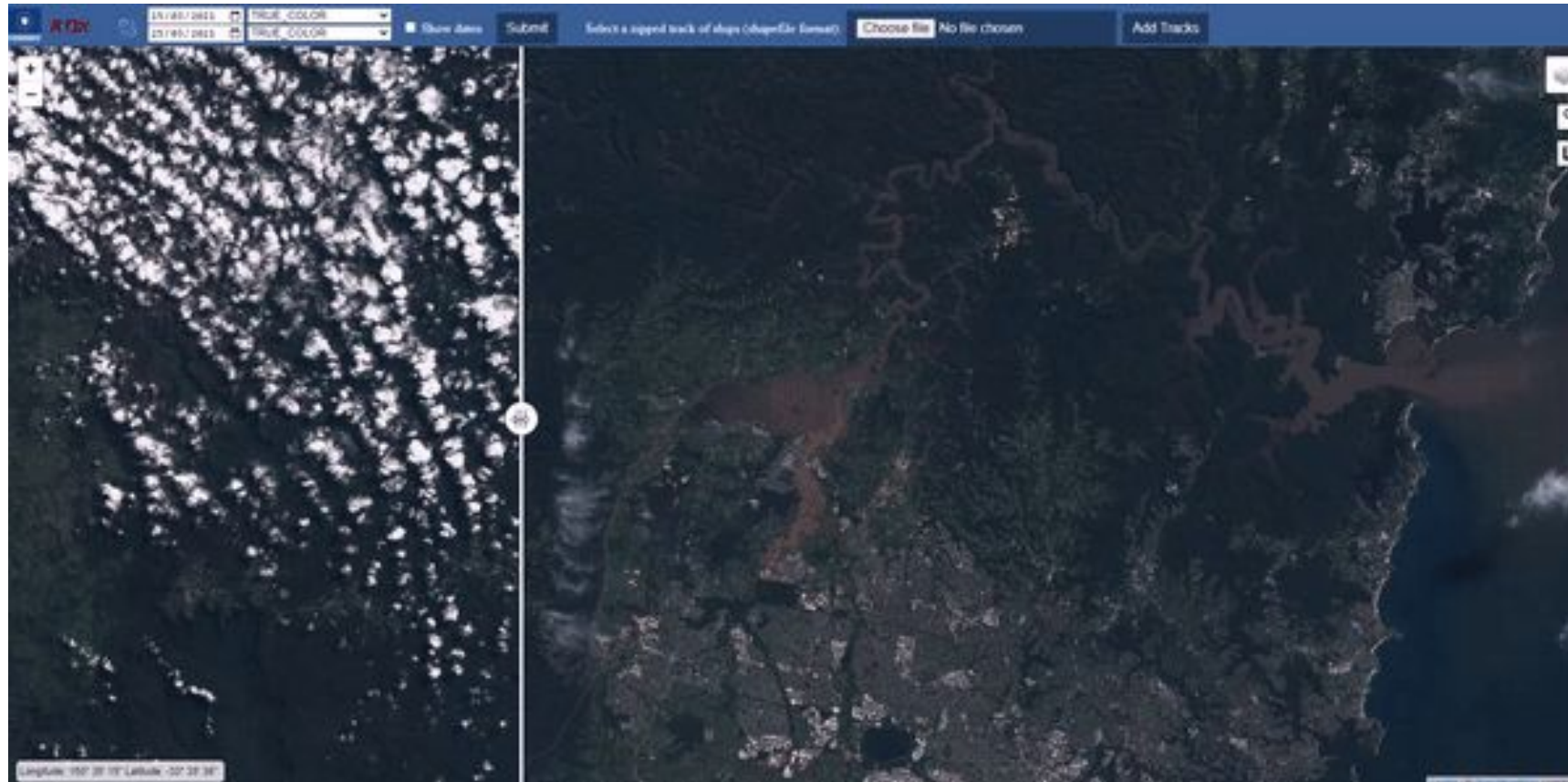
Flooding in Australia 2021

- Water: Regions of calm water and other smooth surfaces appear black (the radar reflects away from the spacecraft)

- Surfaces: Rough surfaces appear brighter, as they reflect the radar in all directions, and more of the energy is scattered back to the antenna

- Slopes: Hills and other large-scale surface variations tend to appear bright on one side and dim on the other. (The side that appears bright was facing the SAR.) Where slopes are very steep, the dim side may be completely dark because no radar signal is returned at all. This is called shadow. Slope-influenced brightness is corrected by doing radiometric correction.

- Man-Made Structures: Due to the reflectivity and angular structure of buildings, bridges, and other human-made objects, these targets tend to behave as corner reflectors and show up as bright spots in a synthetic aperture radar (SAR) image.

Amplitude Change Detection

- Compares backscatter of two images acquired using the same imaging parameters
  - R: Backscatter day 1
  - G: Backscatter day 2
  - B: Backscatter day 2

- Sensitive to significant changes that affect the backscatter:
  - new building: before low backscatter, after high backscatter
  - Flooding: decrease of backscatter because of very low backscatter of water bodies
  - Burned Area: depending of the vegetation characteristics, it could be are increase or decrease of backscatter

Piura March 2017


27/02/17->23/03/17
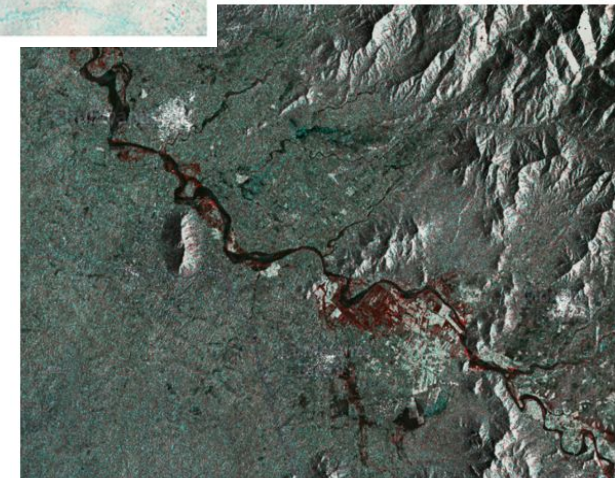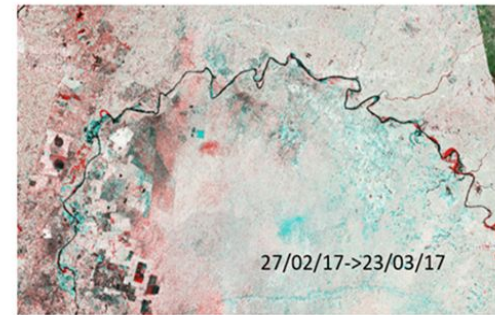
Multi-Temporal Coherence

- Coherence is the amplitude of the complex correlation coefficient between two images. A low coherence represents changes between the two acquisitions

- Exploit coherence of two SAR images acquired using the same imaging parameters
  - R: Backscatter day 1
  - G: Backscatter day 2
  - B: Coherence

- Can detect subtle changes
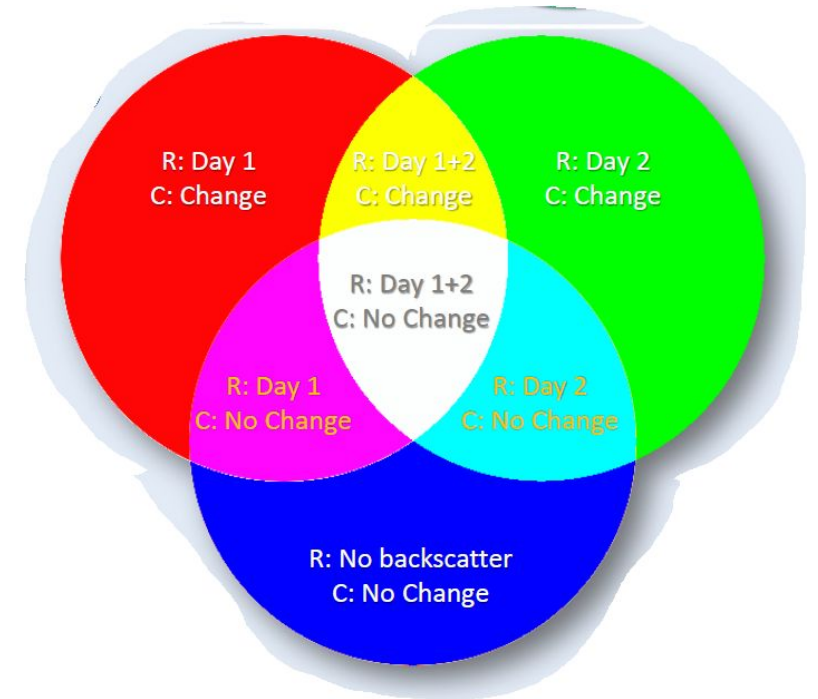
Change Vector Analysis
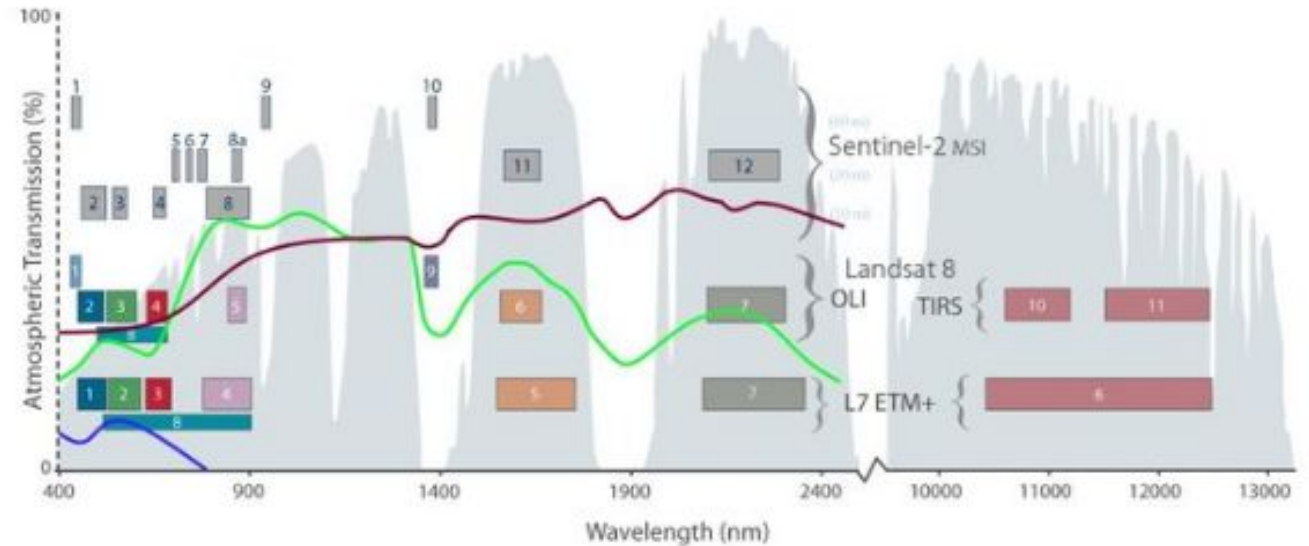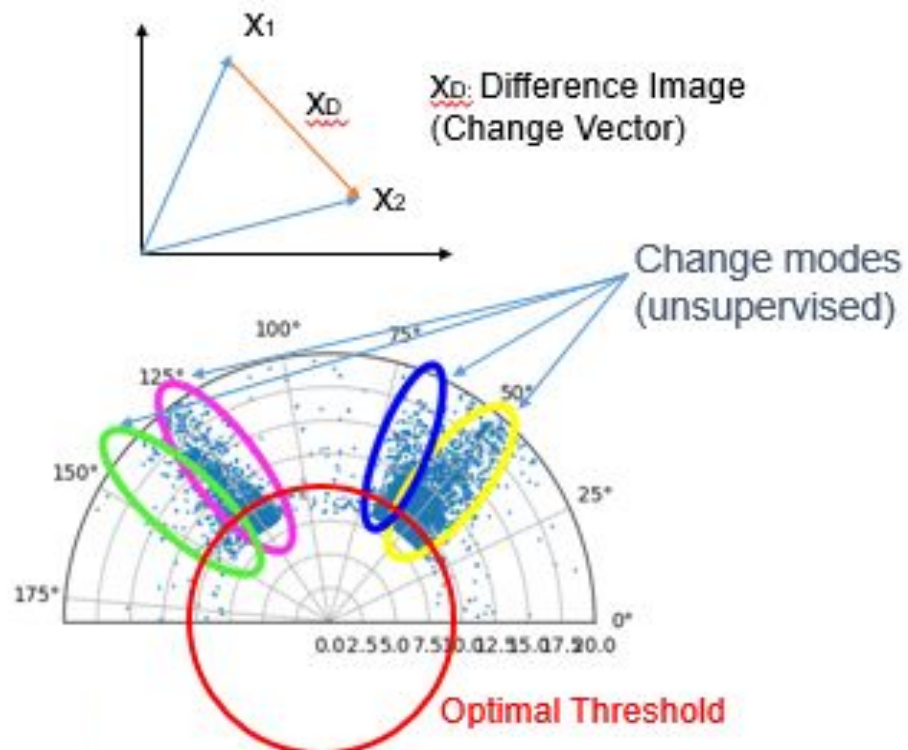
Spectral bands of Sentinel-2 and Landsat 7 & 8. Spectral signatures of vegetation, soil, and water are depicted in green, brown and blue respectively. Modified from (USGS, 2017).

Security Bootstrapping Services

- Docker image containing some scripts for pre-processing and change detection
  - S1 and S2 preprocessing
  - S1 and S2 change detection

- Based in SNAP and GDAL tools
- <u>Technical documentation</u>

Thank You!

Any Questions?