

SPACE-SI

Earth Observation @ SPACE-SI

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Slovenian Centre of Excellence for
Space Sciences and Technologies

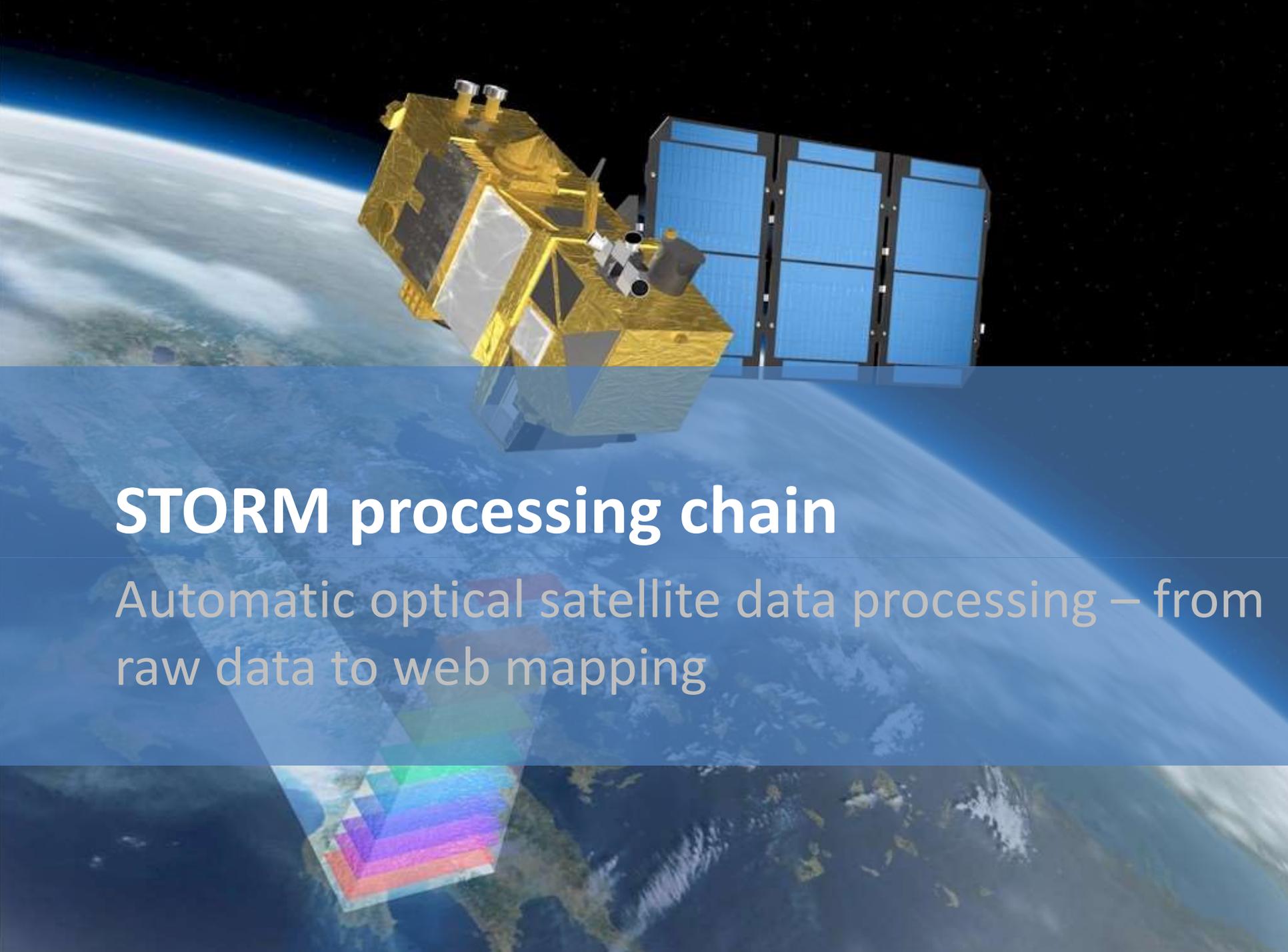
Earth observation @ ESA – Opportunities for Slovenia – Ljubljana, 8 June 2016

- STORM - Automatic image processing chain
- Earth observation applications
- Application of Sentinel-2 Time Series Data for Crop Identification and Crop Stress Monitoring
- Automatic Recognition of Vegetation Parameters from Satellite Data and Ground Measurements for Drought Monitoring
- Where to go

SPACE-SI microsatellite ready for launch

- < 70 kg satellite for Earth observation
- 2.8 m GSD from 600 km
- Four spectral channels (G, B, R, IR)
- High-definition video
- Real-time imaging and video streaming over Slovenia

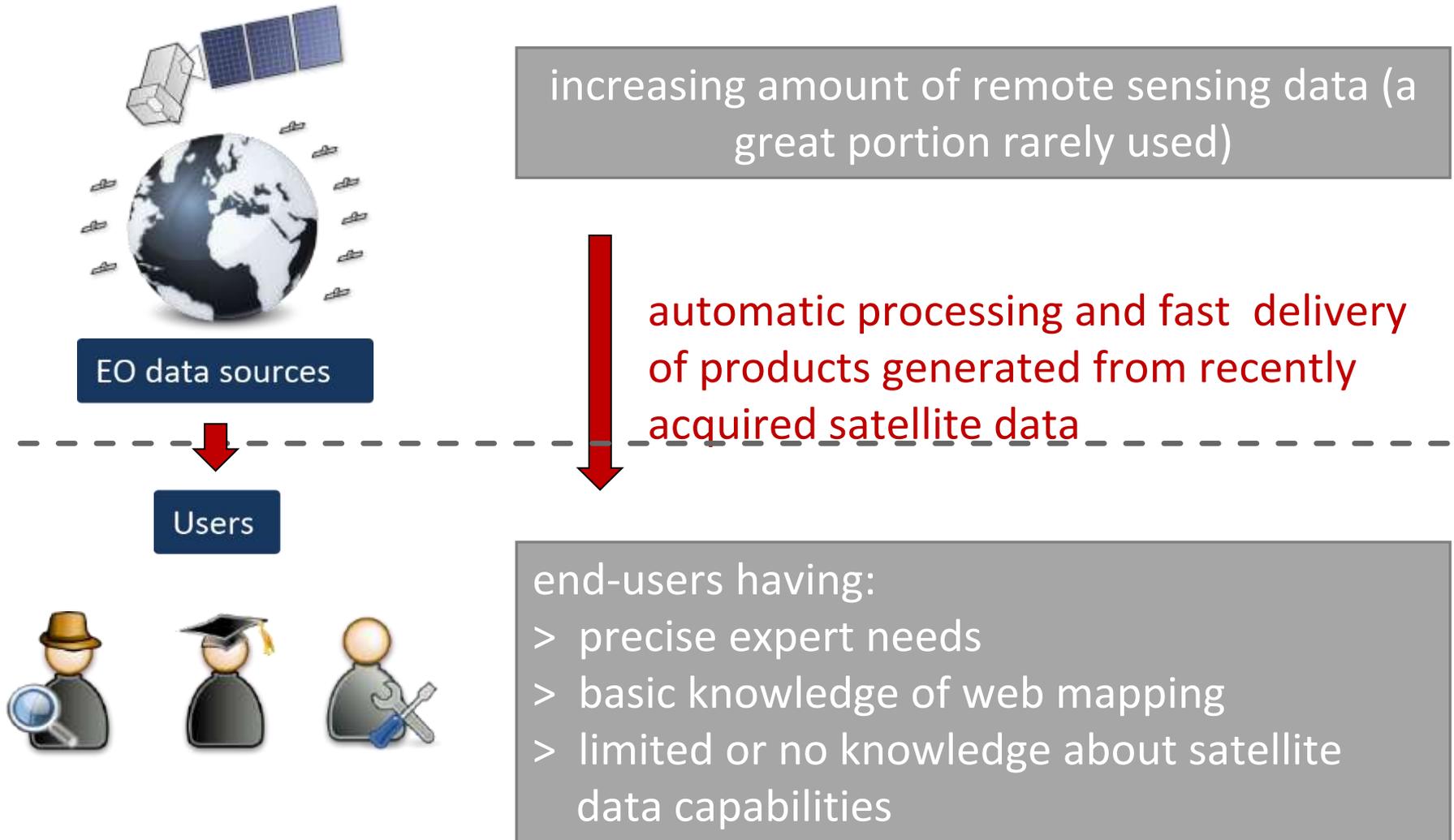




STORM processing chain

Automatic optical satellite data processing – from raw data to web mapping

Automatic preprocessing of satellite imagery

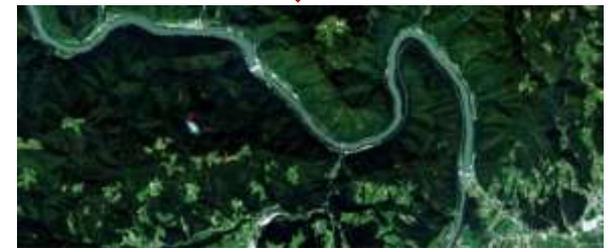


STORM – processing workflow

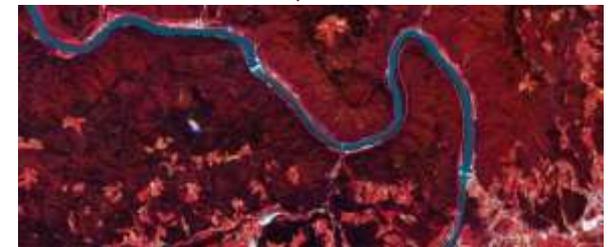
0. Optical satellite image ingestion
(including metadata)



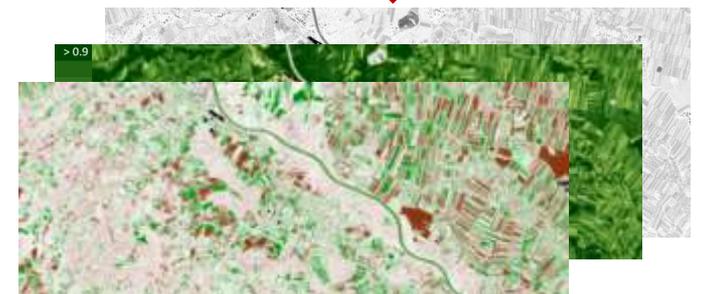
1. Geometric corrections
(production of orthoimage)



2. Atmospheric corrections
Topographic corrections



3. Product generation
(thematic processing)



STORM – Supported sensors

- RapidEye (6.5 m)
- WorldView-2 (2 m)
- THEOS (15 m)
- Pleiades (2 m)
- SPOT 6, 7 (6 m)
- Landsat 4-8 (30 m)
- PROBA-V (100 m)
- Sentinel-2 (10/20/60 m)



STORM geometric corrections

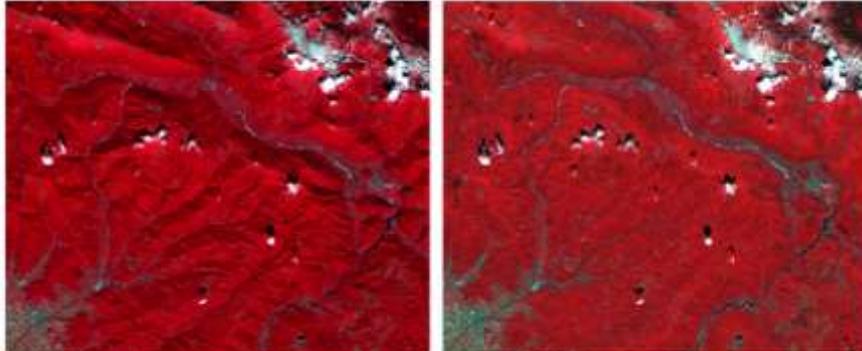


orthorectified
WorldView-2, 2 m



aerial orthophoto, 0.5 m

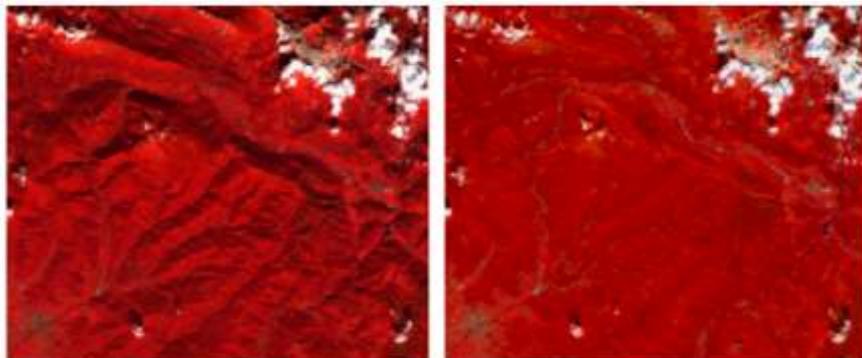
STORM topographic correction



RapidEye



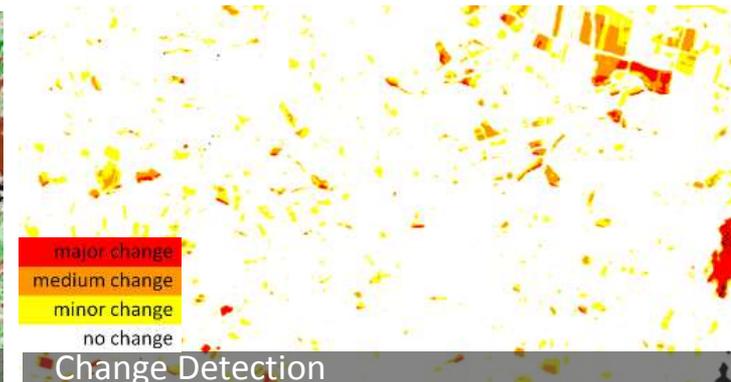
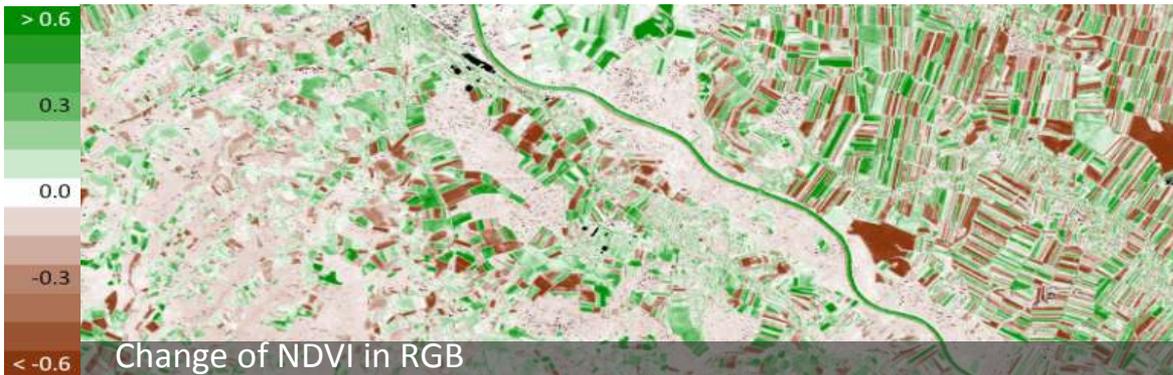
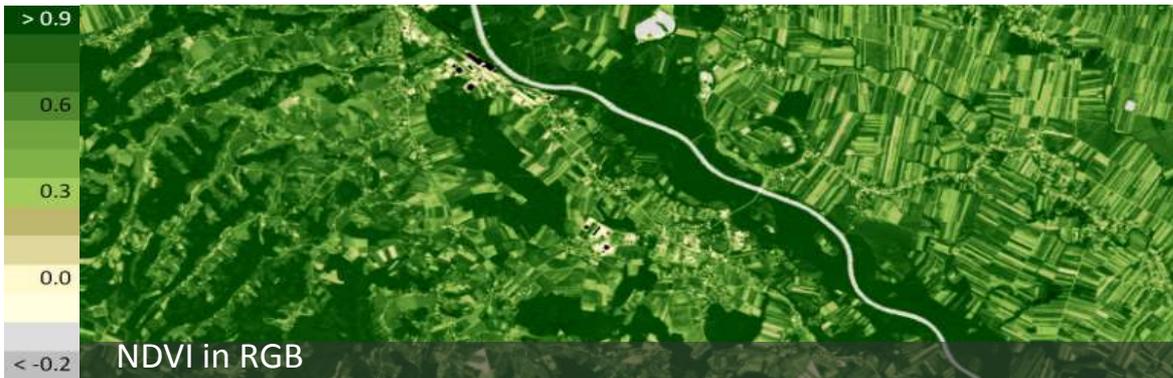
Landsat 8

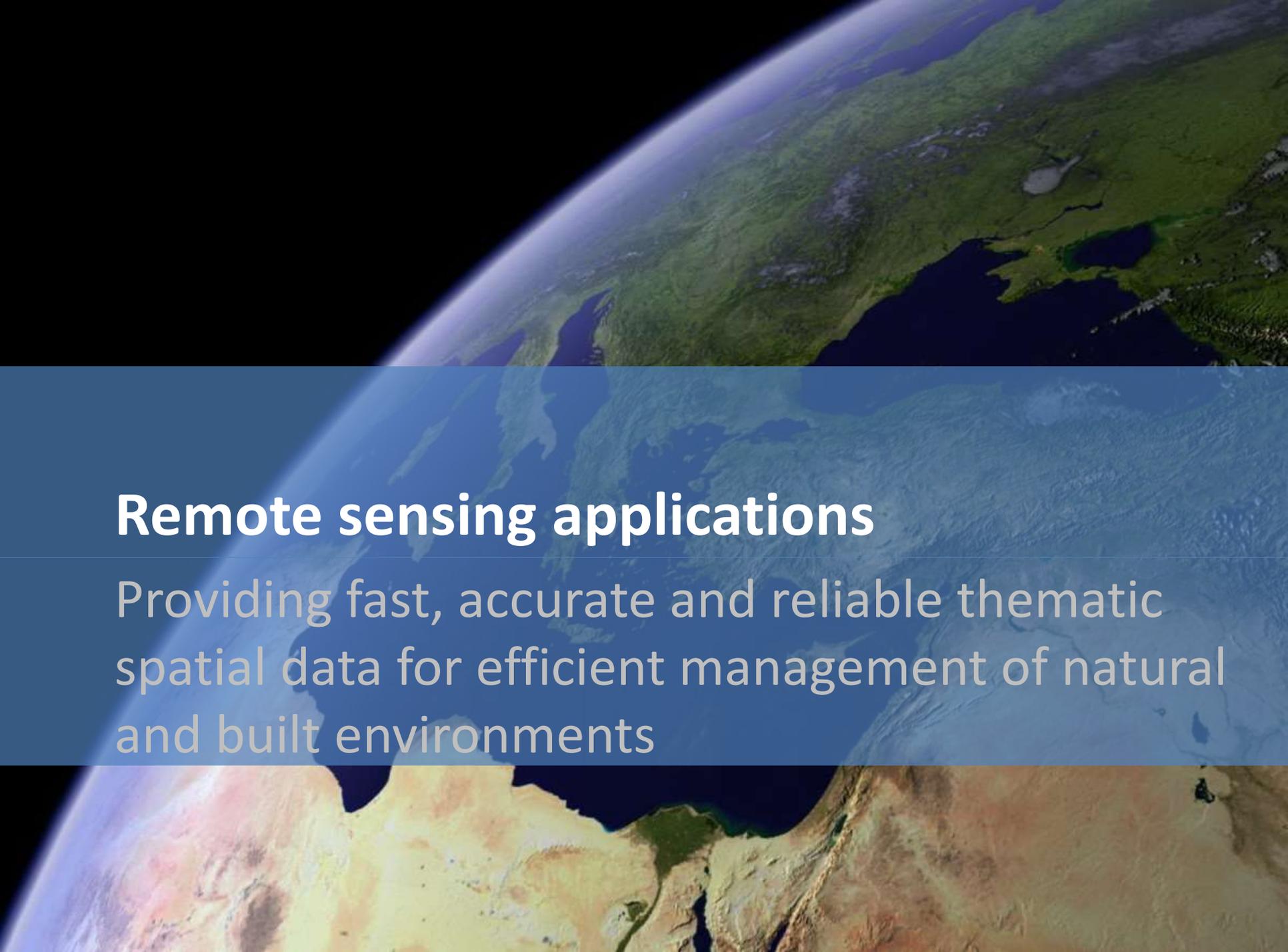


PROBA-V

before after

STORM products



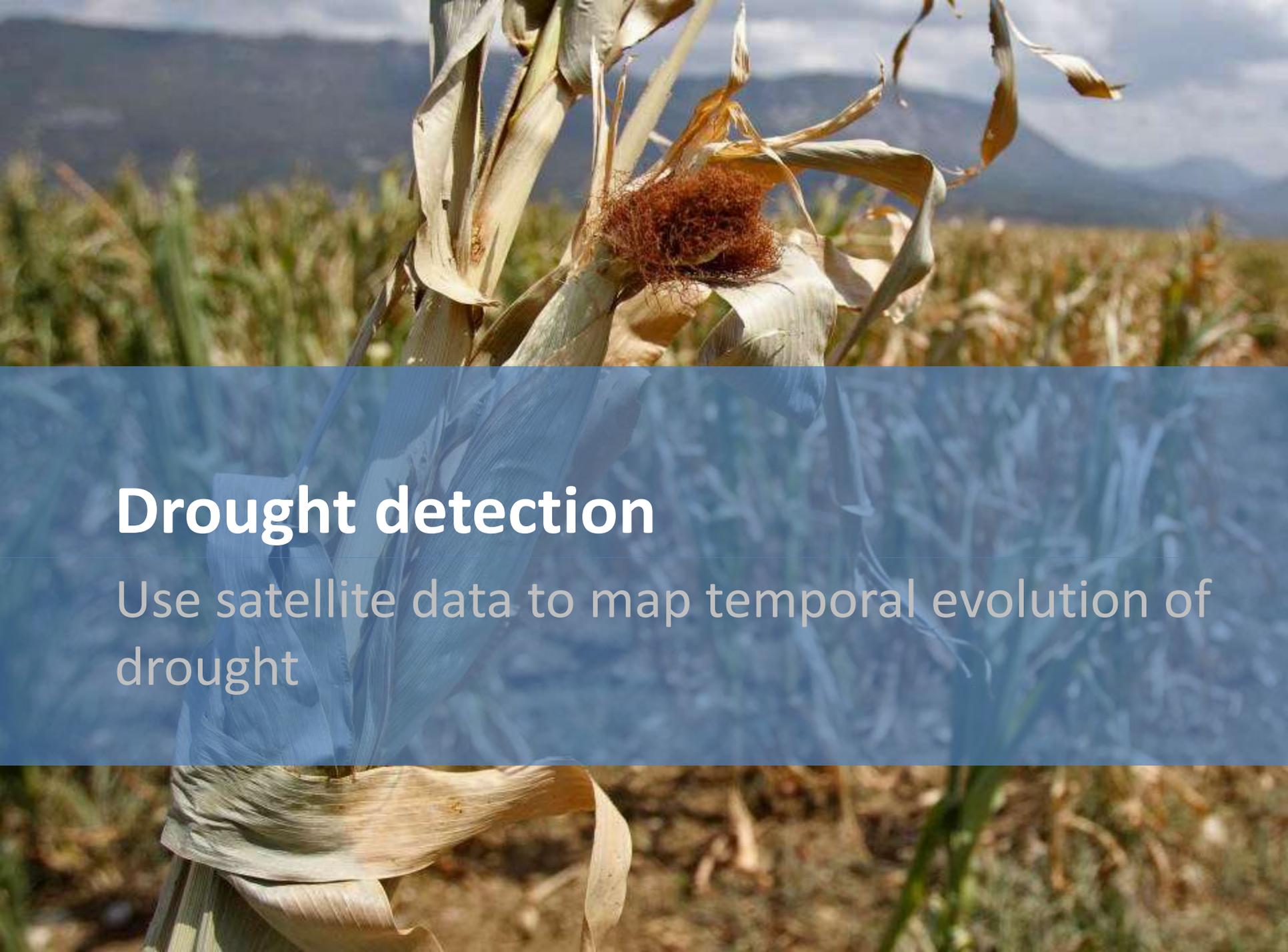
A satellite view of Earth from space, showing the curvature of the planet. The top half shows a lush green landmass, likely North America, with a blue ocean to its west. The bottom half shows a brown and yellow landmass, likely Africa, with a blue ocean to its east. A semi-transparent blue band across the middle contains white text.

Remote sensing applications

Providing fast, accurate and reliable thematic spatial data for efficient management of natural and built environments

Remote sensing applications

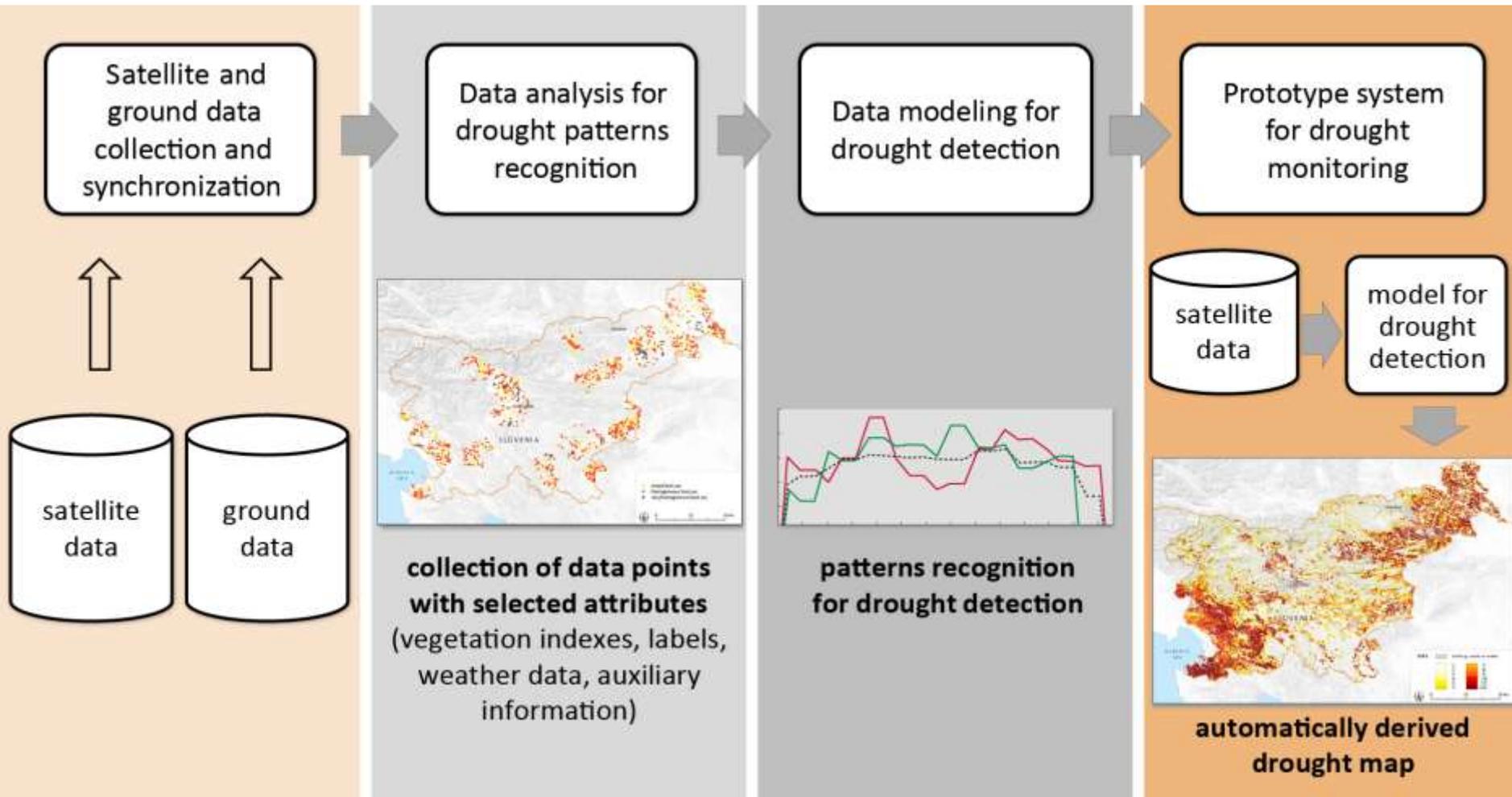
- land use classification and change detection
- disaster monitoring
- drought monitoring
- vegetation development cycle monitoring
- agricultural subsidies
- forest monitoring
- high precision relief and digital elevation modelling
- natural disasters
- urbanization
- topographic and thematic mapping
- archaeological site observations



Drought detection

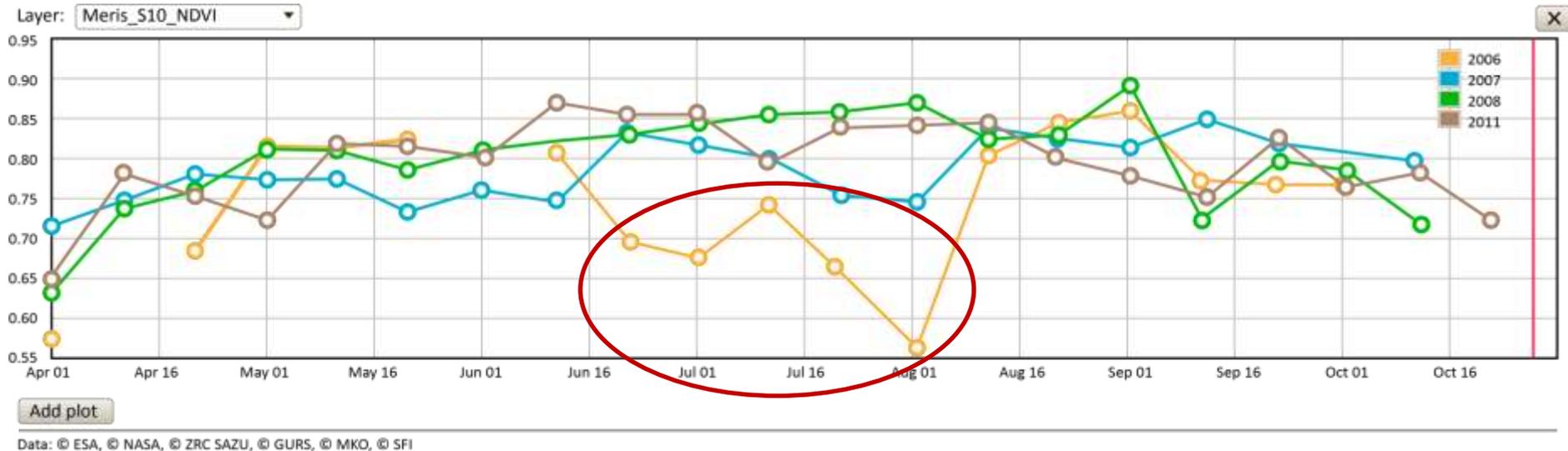
Use satellite data to map temporal evolution of drought

Drought detection

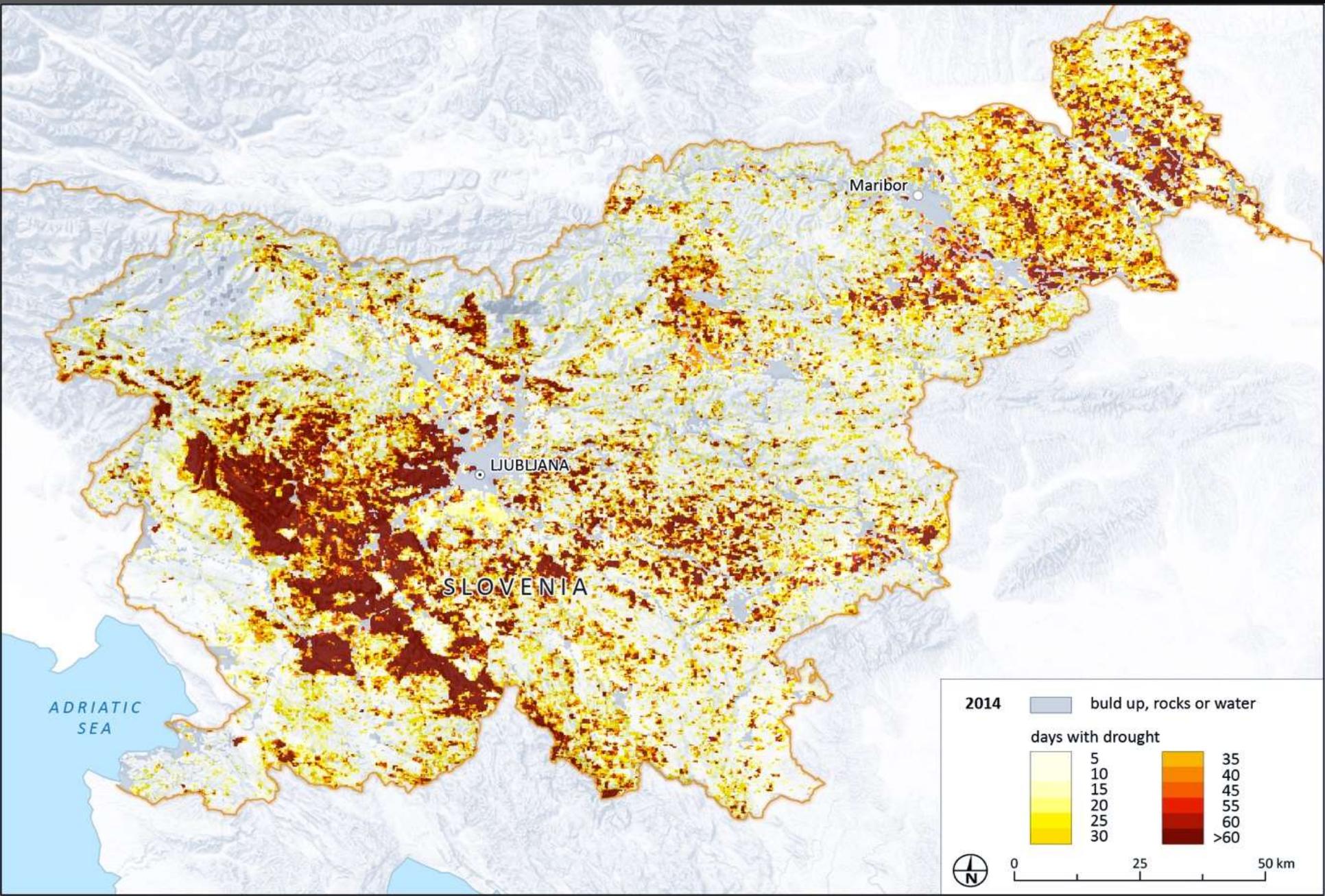


Vegetation anomalies

- Nova Gorica, MERIS 10 days NDVI composites



Drought 2006-2014





Real time monitoring of agricultural areas

Using high temporal and spatial resolution data for agriculture



Time series – RapidEye 2011

Feb

Mar

Apr

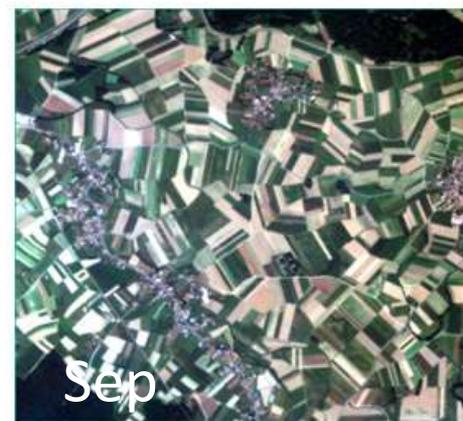
May

Jun

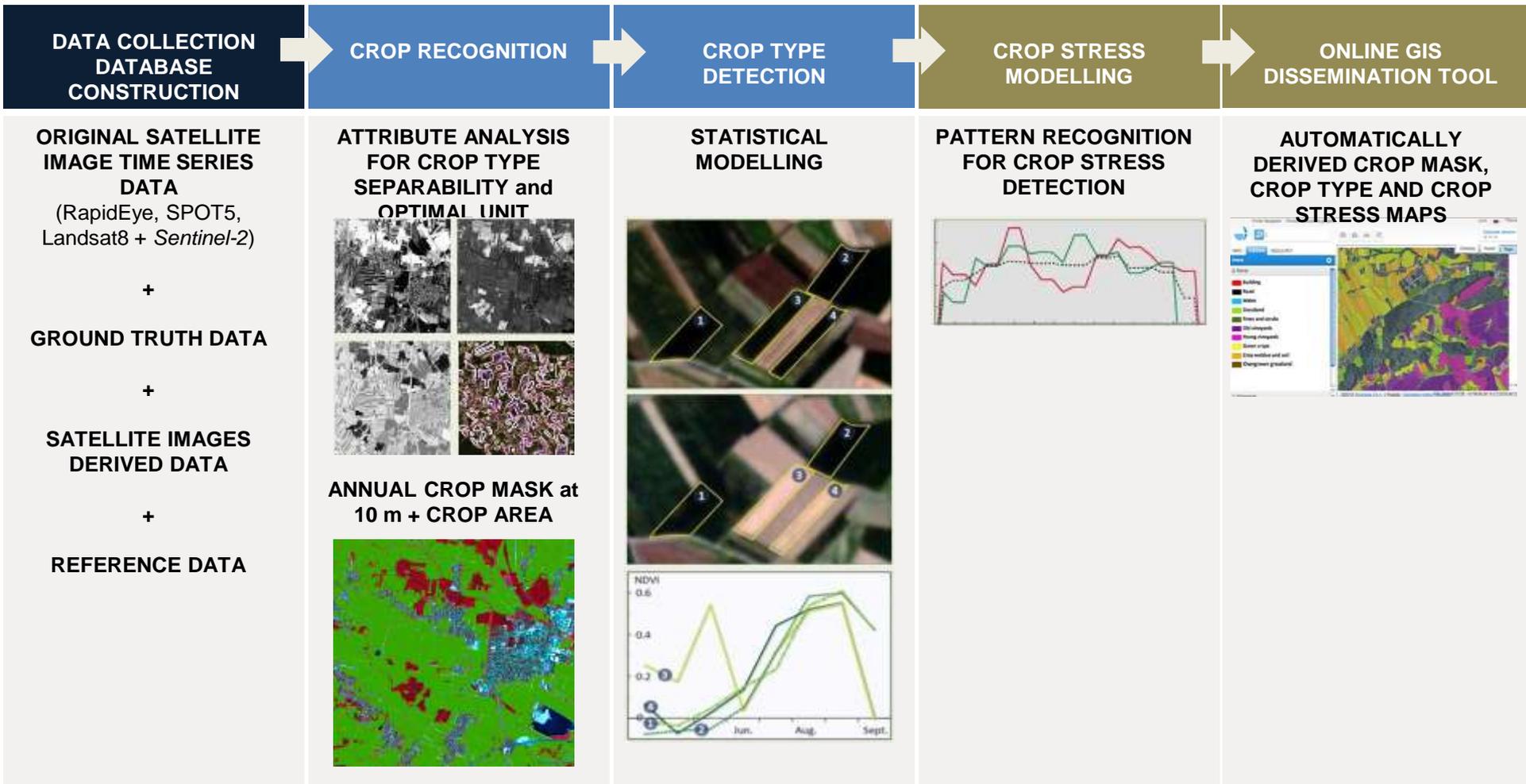
Jul

Aug

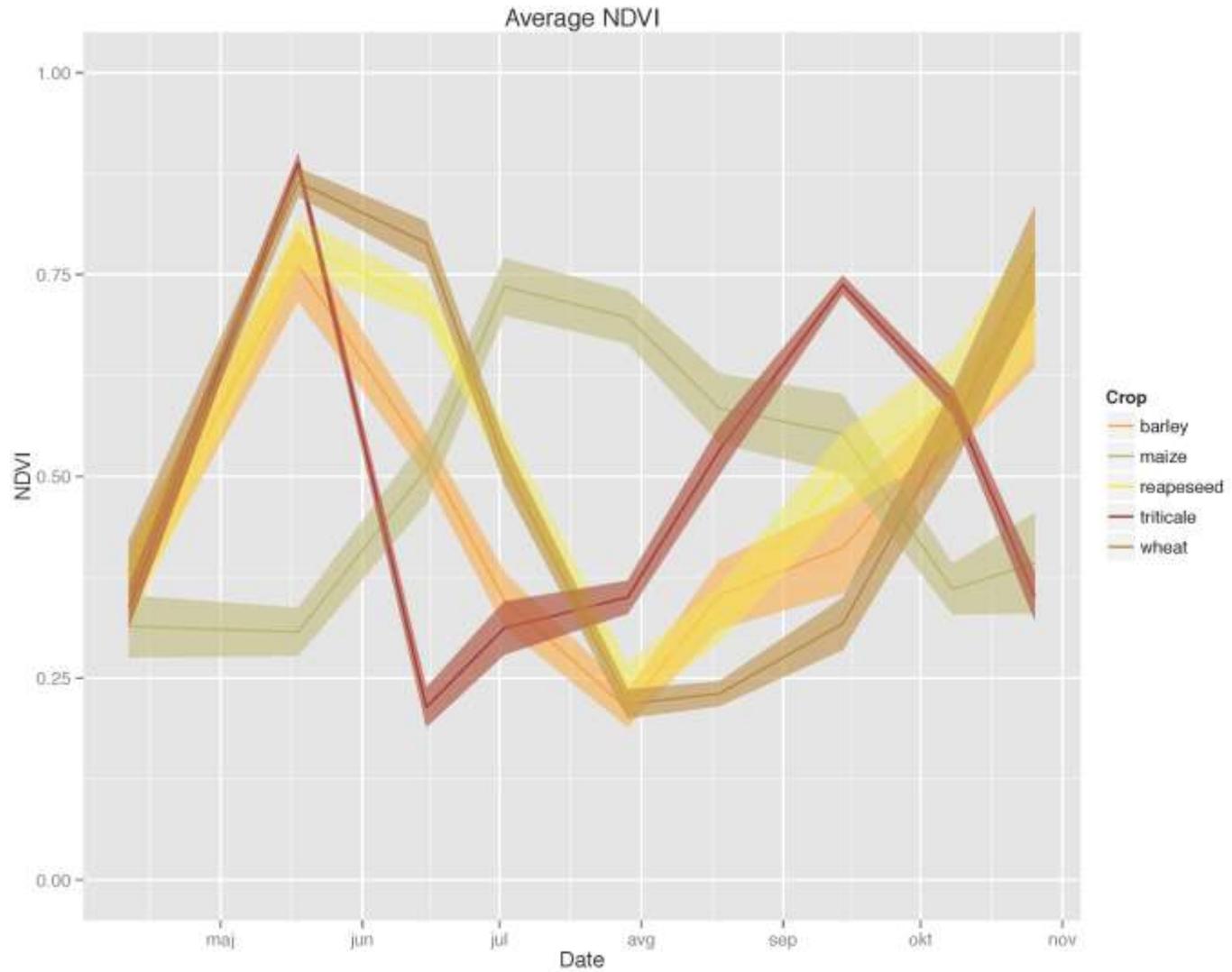
Sep



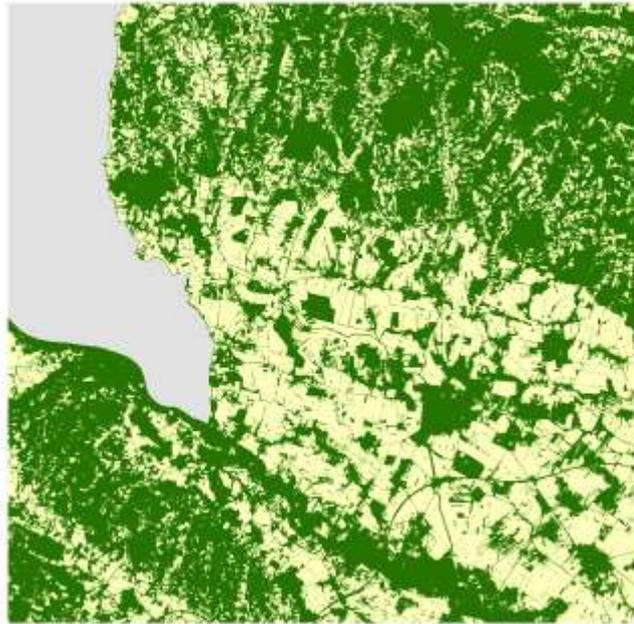
Data processing for agriculture



All crops



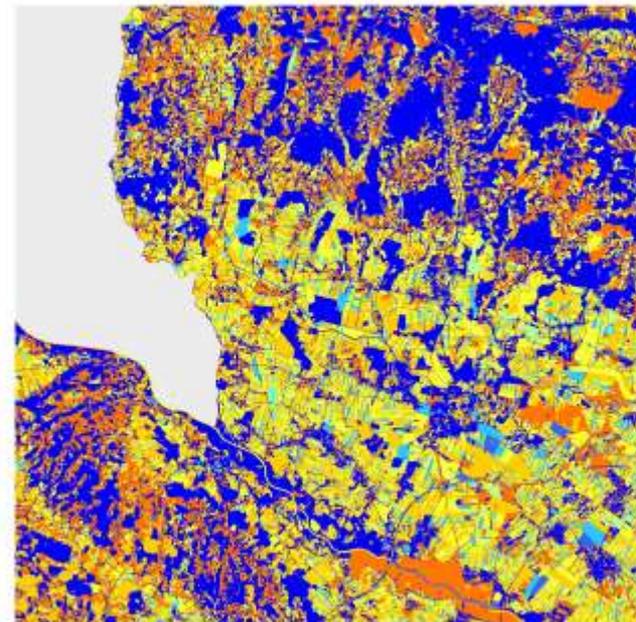
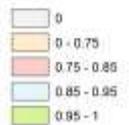
Crop classification



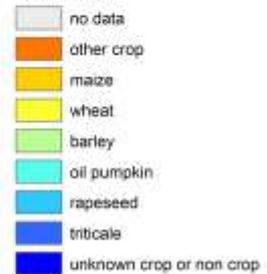
Crop mask



Crop mask confidence



Crop type



A close-up photograph of a person splashing water over their head. The water is captured in mid-air, creating a dynamic, textured pattern of droplets and ripples. The person's skin is wet and glistening. A semi-transparent blue horizontal band is overlaid across the middle of the image, containing white text. The background is a bright, clear blue sky with some green foliage visible in the upper right corner.

Urban Heat Island monitoring

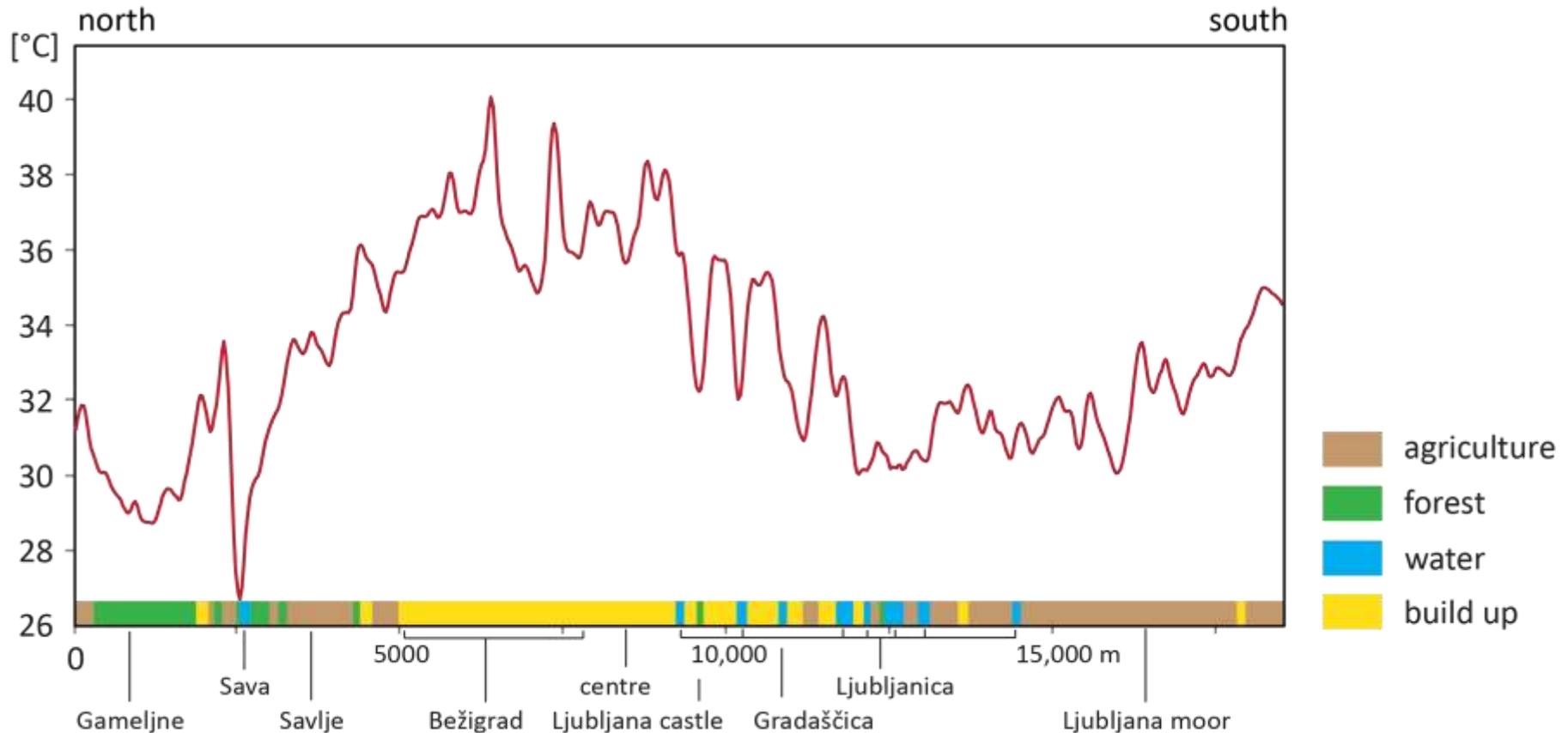
Ljubljana

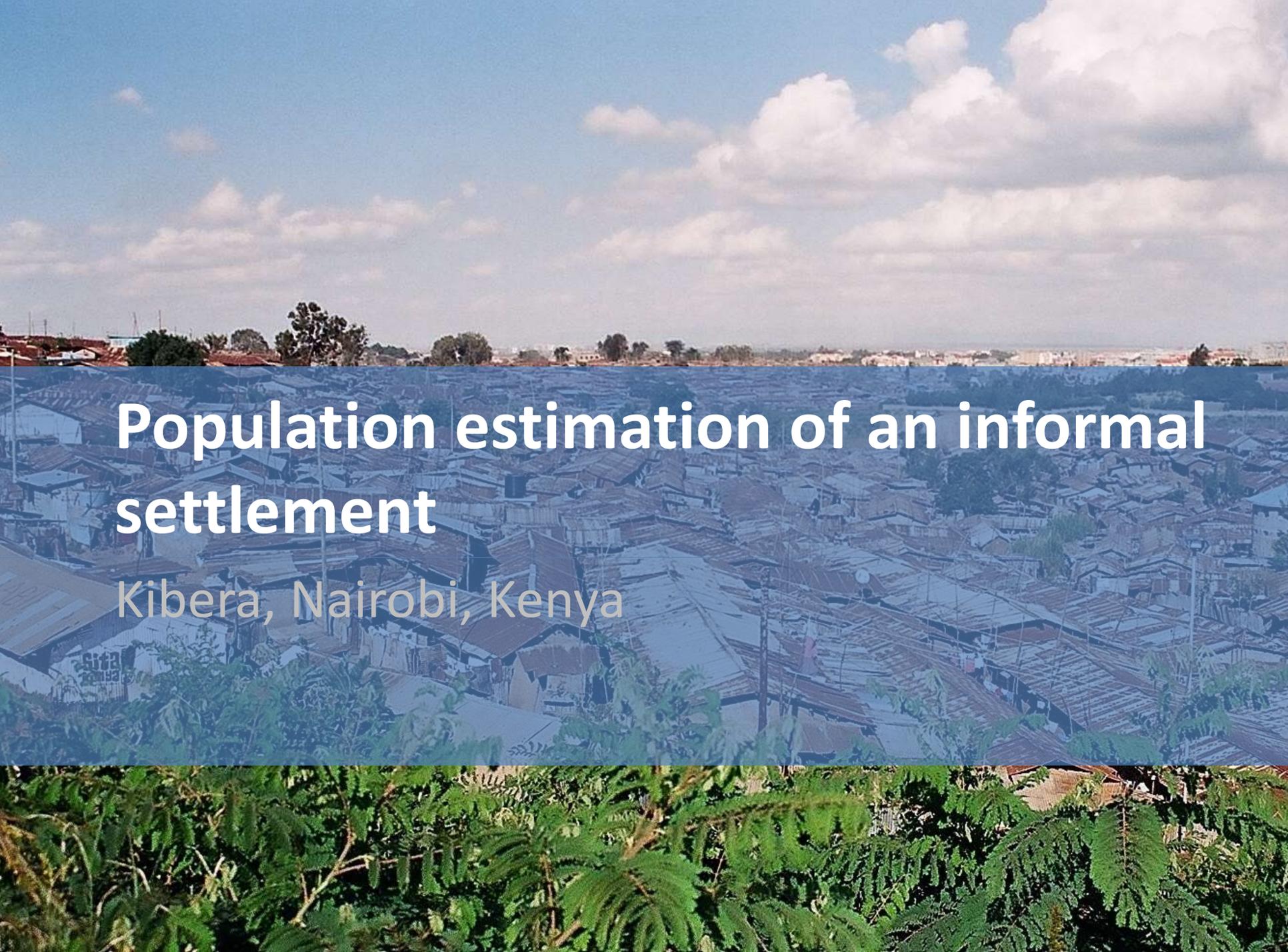
Heat island hot spots



Urban Heat Island monitoring

- from April 2013 for Ljubljana



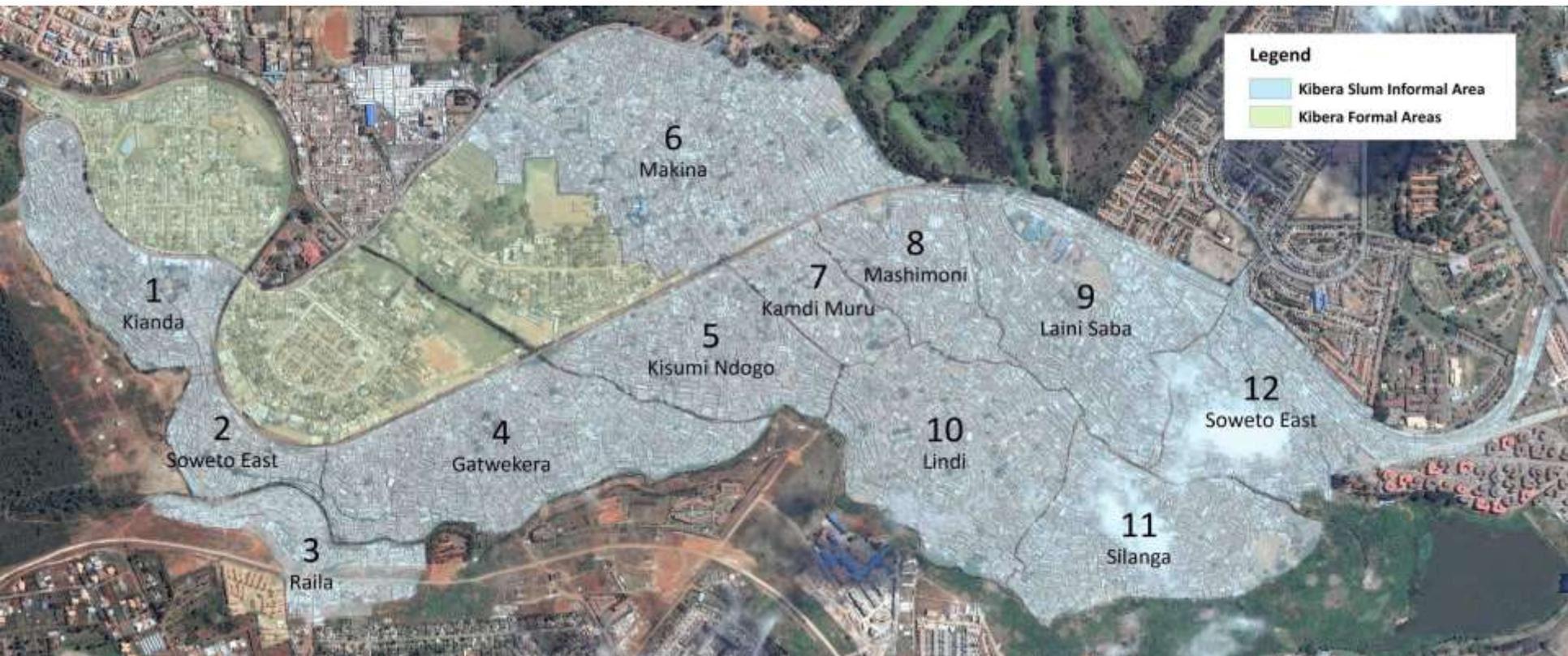
An aerial photograph of a vast, densely packed informal settlement, likely Kibera in Nairobi, Kenya. The settlement is characterized by a sea of corrugated metal roofs in various shades of brown and grey. The buildings are tightly clustered together, with narrow, winding paths visible between them. In the background, a clear blue sky with scattered white clouds is visible above the horizon. A semi-transparent blue horizontal band is overlaid across the middle of the image, containing white text. The foreground is partially obscured by lush green foliage, including what appears to be a large tree with feathery leaves.

Population estimation of an informal settlement

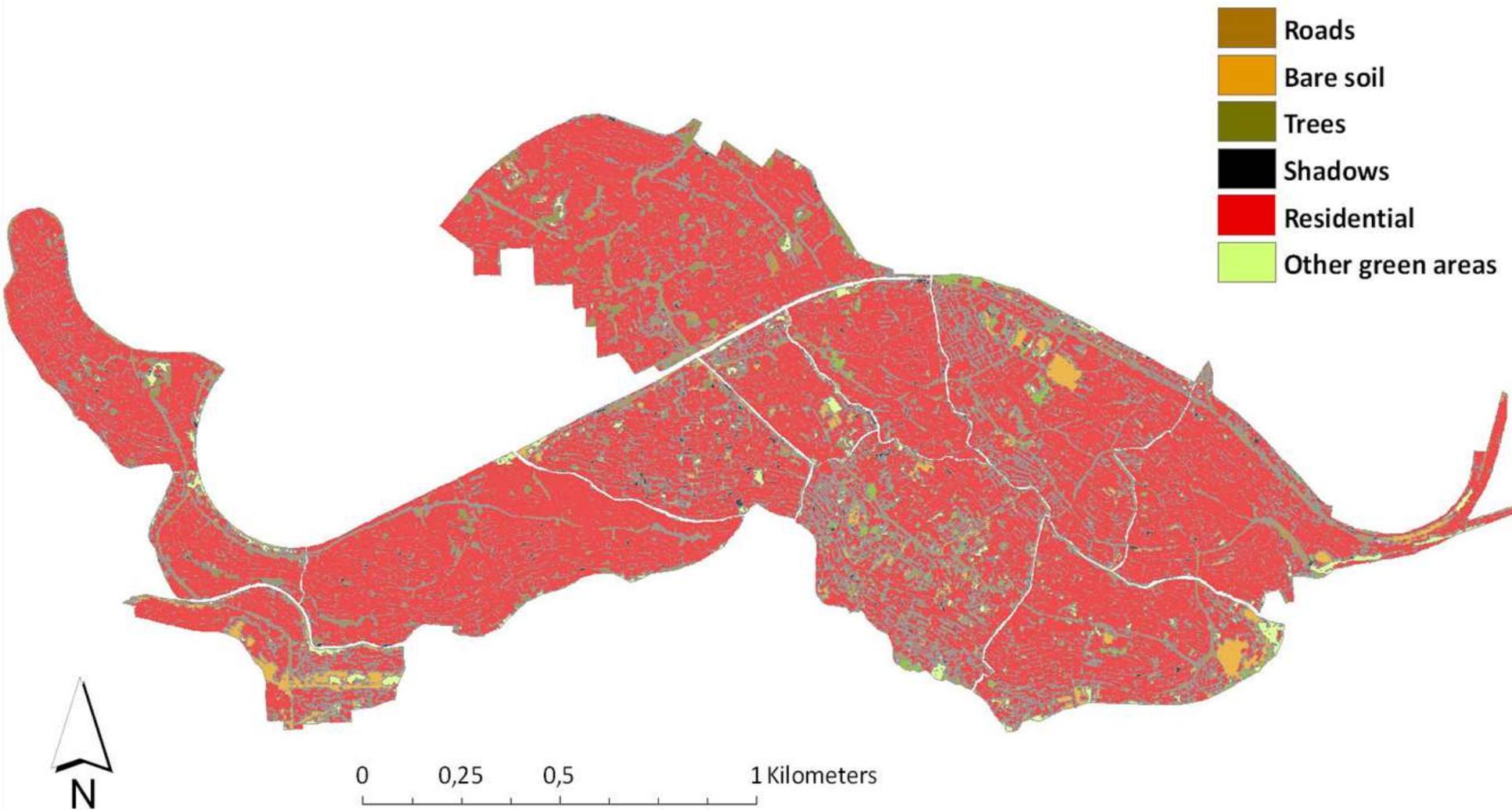
Kibera, Nairobi, Kenya

Land cover mapping

- 2.5 km², 1% area, 25% population



Land cover



Changes



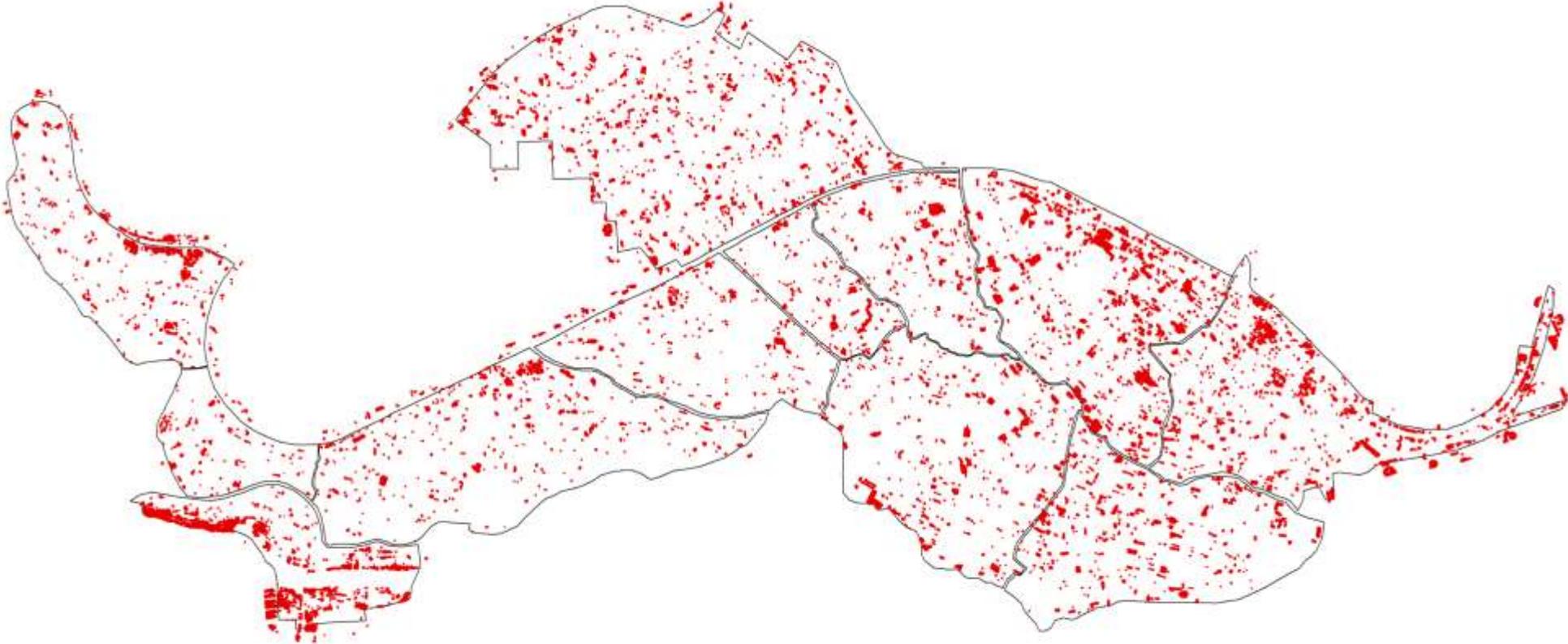
QB 2006-03-27



QB 2008-08-10



GE 2009-07-25



Conclusions

- Experience in satellite based Earth observation
- Ready to process high volume of data
- Working with medium, high and very high resolution data
- Worked in Europe, Africa, Asia and America
- Products and services are operational or preoperational
- Development of new processing algorithms and tools

Future plans

- Providing Sentinel-1, 2 and 3 services and data
 - Develop demonstrated services based on Sentinel data
- Providing data processing and services for users
 - Earth observation data processing support to end users
- Participation in ESA programs and ITTs
 - Earth Observation Envelope Programme (EOEP)
 - Data User Element (DUE)
 - Value Adding Element (VAE)
 - Scientific Exploitation of Operational Missions (SEOM)
- Earth observation missions beside Sentinels
 - Proba-V and its continuation
 - Earth Explorers, e.g. EarthCARE, Biomass, Florescence Explorer

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