

Earth Observation @ SPACE-SI

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Space Sciences and Technologies

- 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

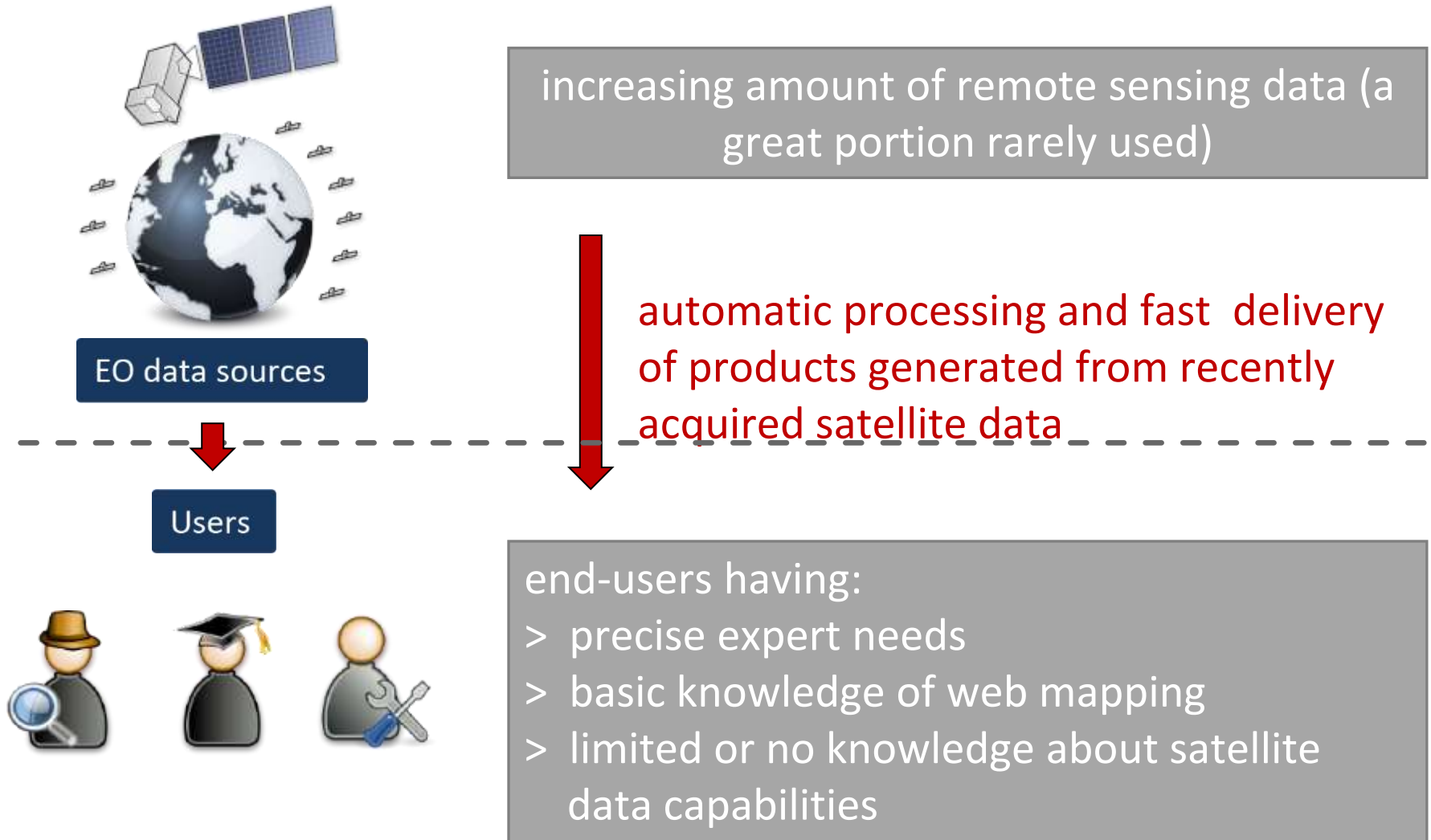


A satellite with gold-colored thermal blankets and blue solar panels is shown in orbit above the Earth's cloud-covered surface. A semi-transparent blue rectangular area is overlaid on the lower half of the image, containing white text. In the bottom-left corner of this blue area, there is a small, colorful, 3D geometric visualization consisting of stacked, translucent planes in shades of red, orange, yellow, green, and blue, resembling a data stack or a spectral analysis visualization.

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)



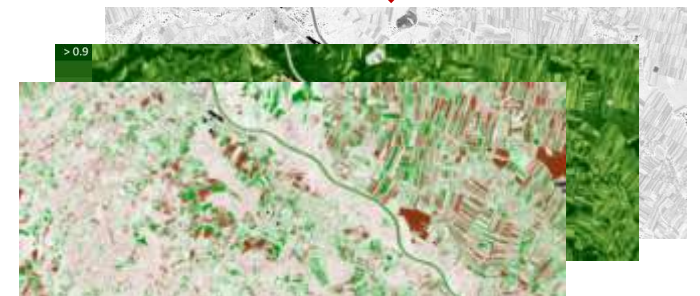
1. Geometric corrections
(production of orthoimage)



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)



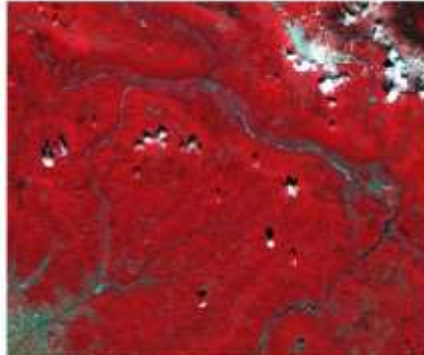
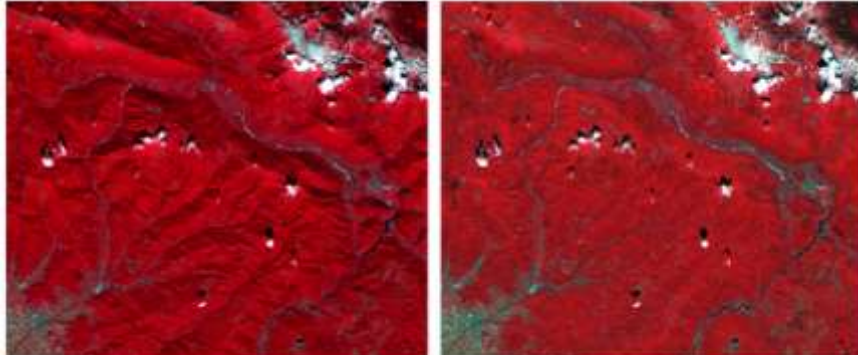
STORM geometric corrections



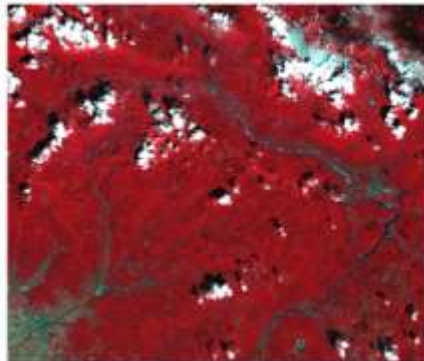
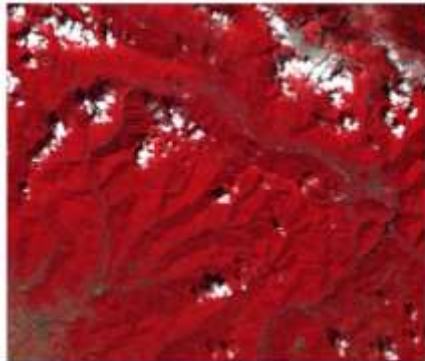
orthorectified
WorldView-2, 2 m

aerial orthophoto, 0.5 m

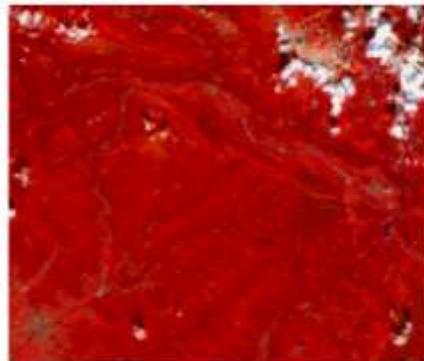
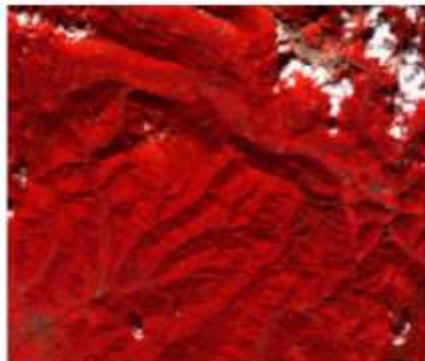
STORM topographic correction



RapidEye



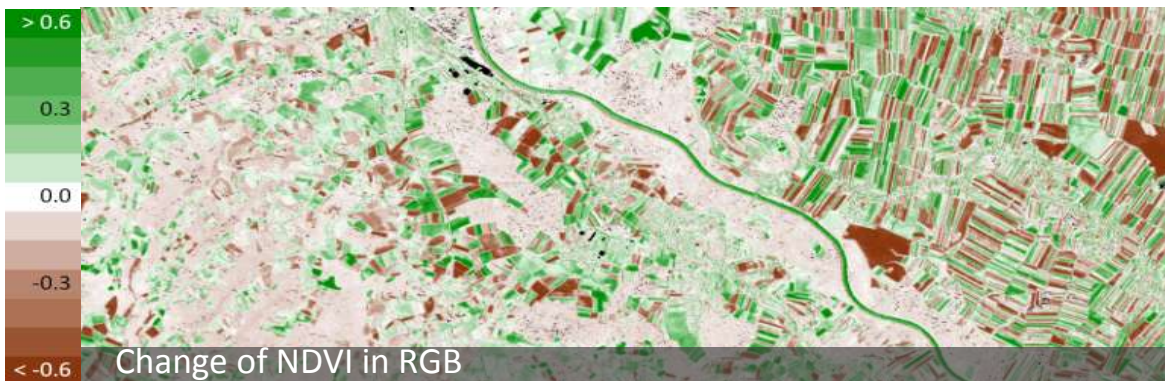
Landsat 8



PROBA-V

before after

STORM products



A satellite image of Earth showing the continent of Europe in the upper half and the northern part of Africa in the lower half. The image is taken from space, showing the curvature of the planet and the thin blue atmosphere. A semi-transparent blue rectangular box is overlaid on the image, containing white text.

Remote sensing applications

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

Remote sensing applications

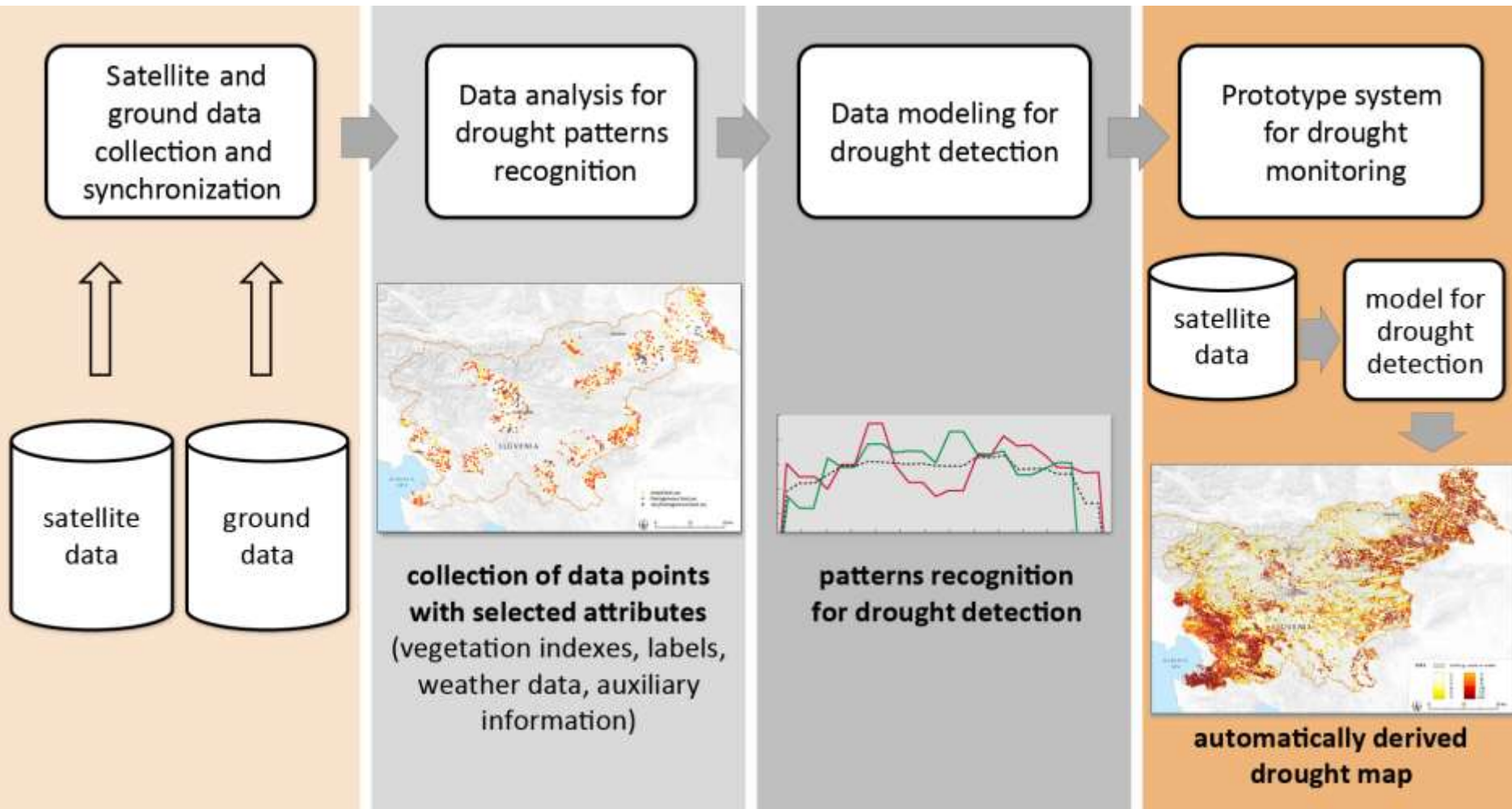
- land use classification and change detection
- disaster monitoring
- drought monitoring
- vegetation development cycle monitoring
- agricultural subsidies
- forest monitoring
- high precision relief and digital elevation modelling
- natural disasters
- urbanization
- topographic and thematic mapping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



Drought detection

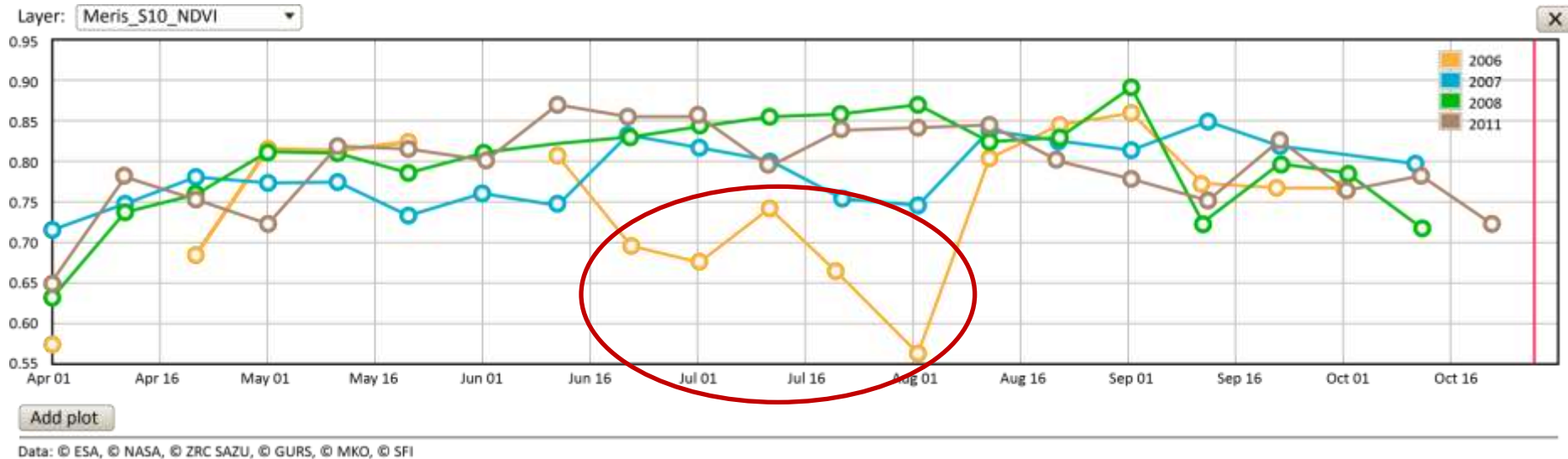
Use satellite data to map temporal evolution of drought

Drought detection

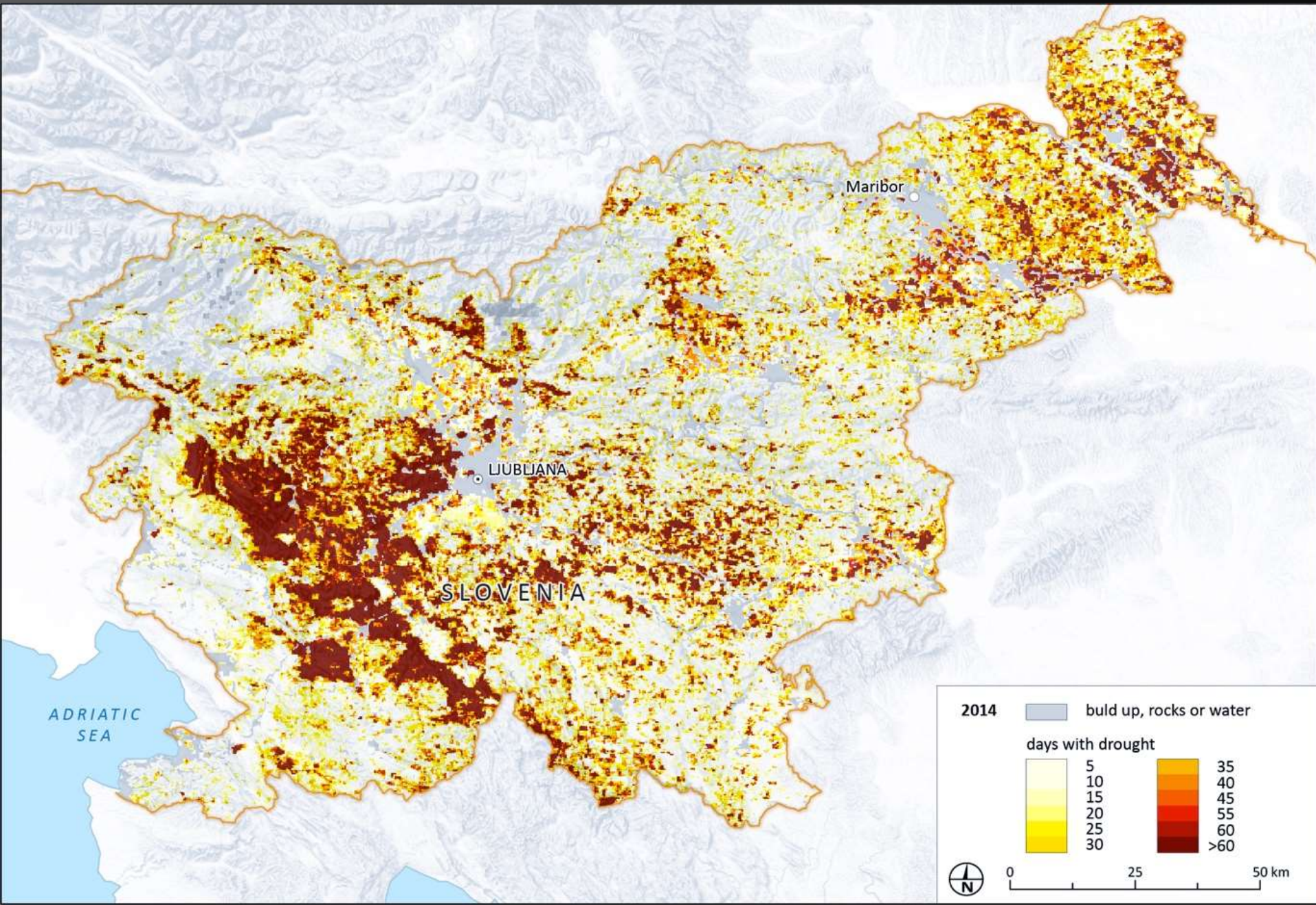


Vegetation anomalies

- 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

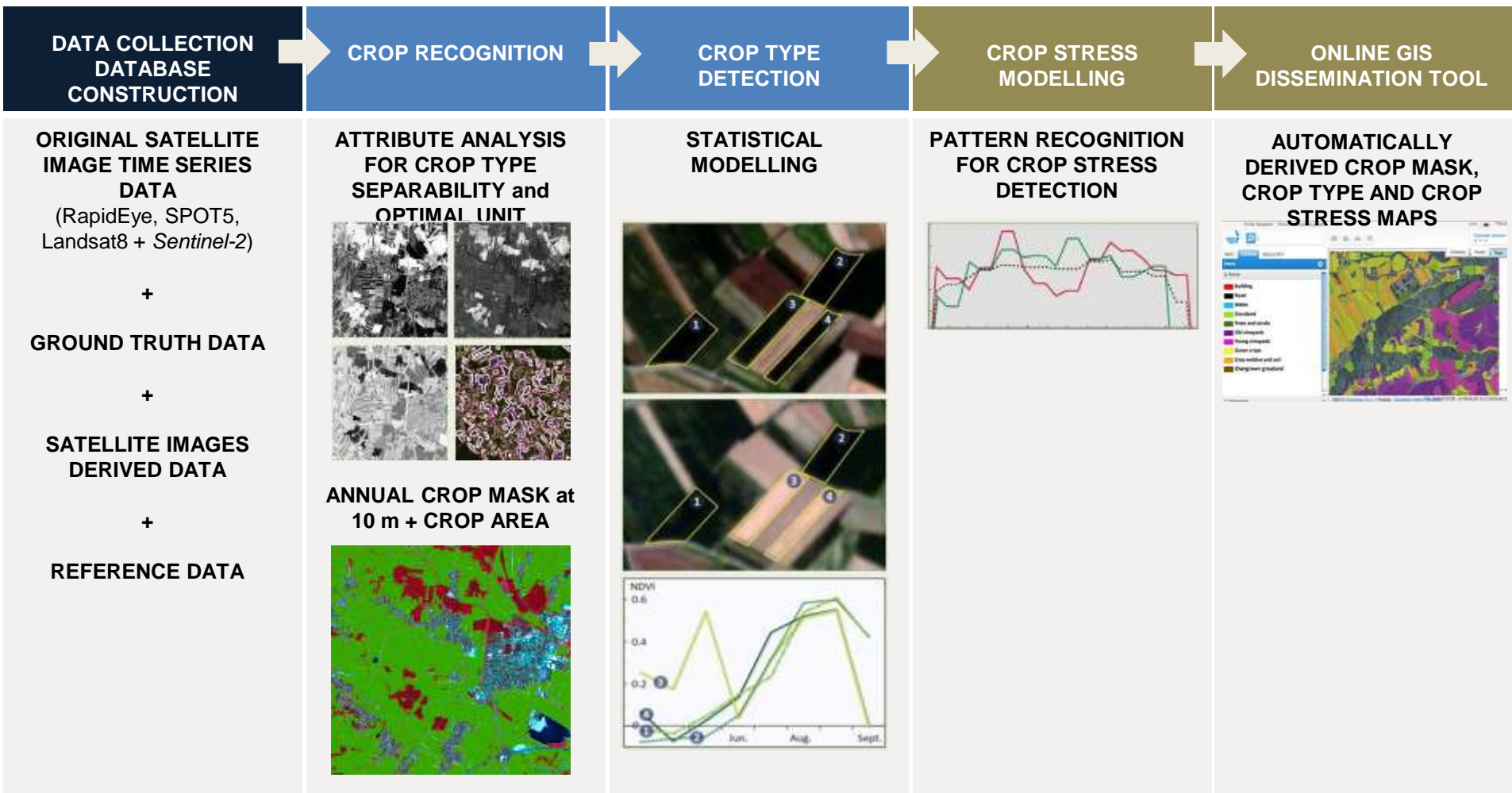
Jul

Aug

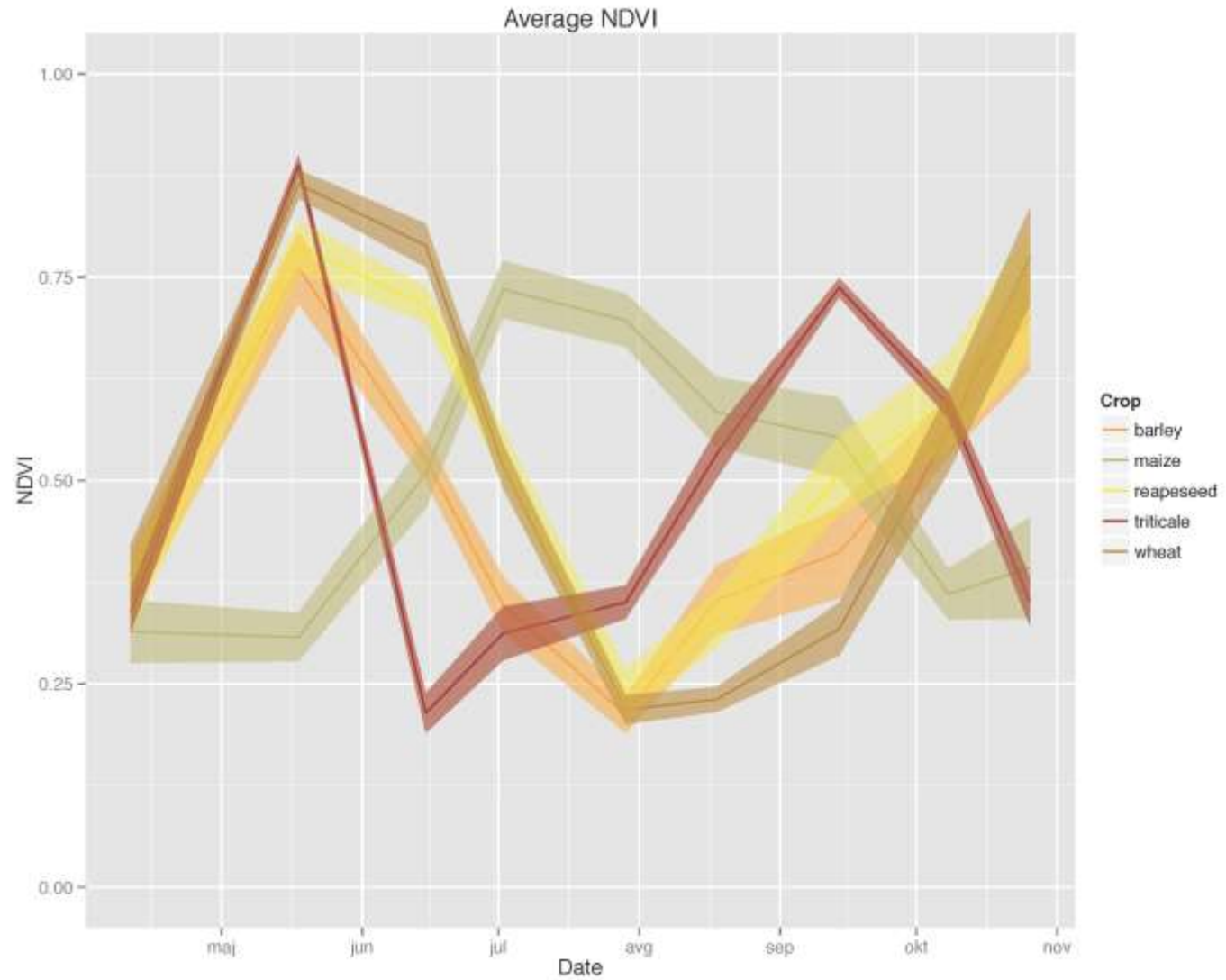
Sep



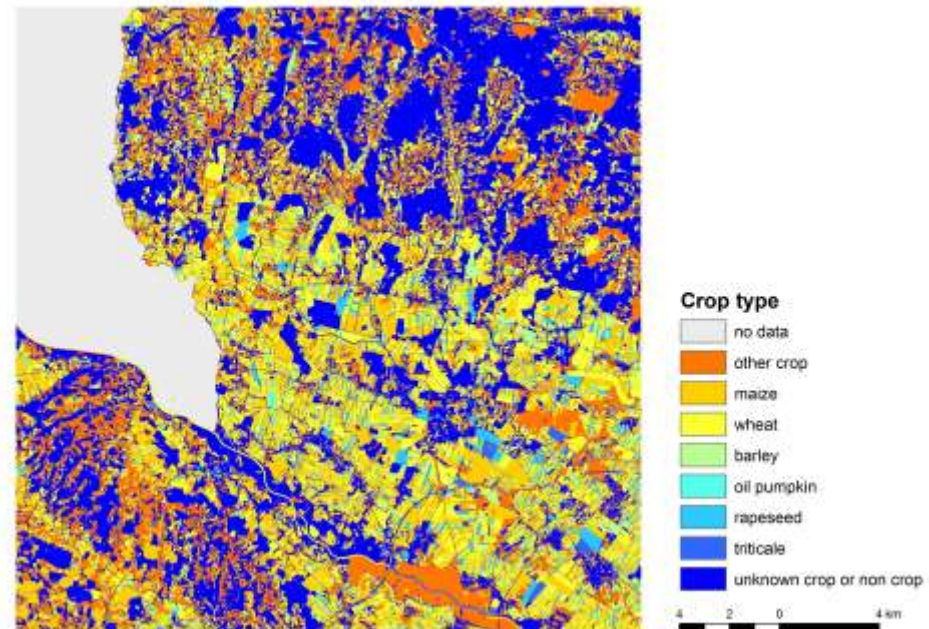
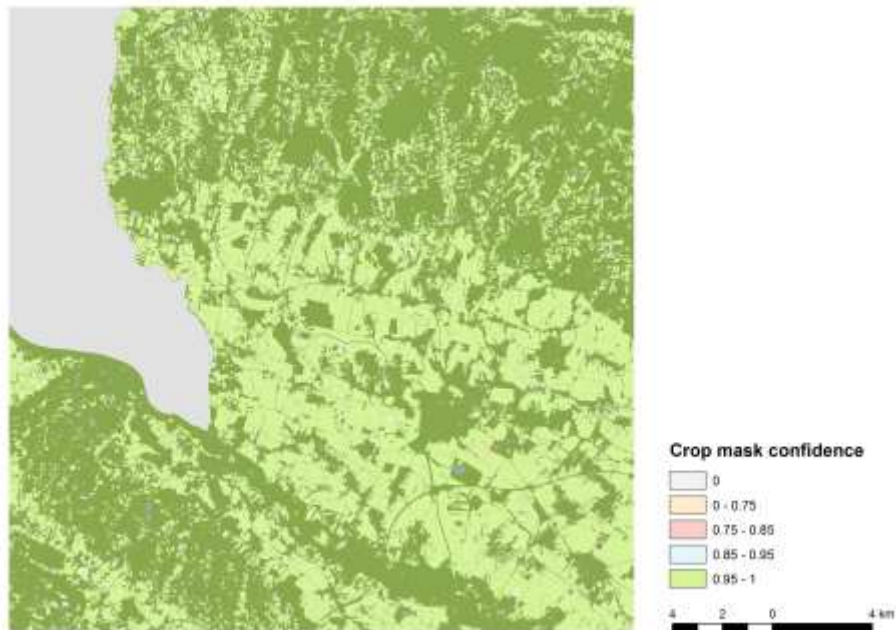
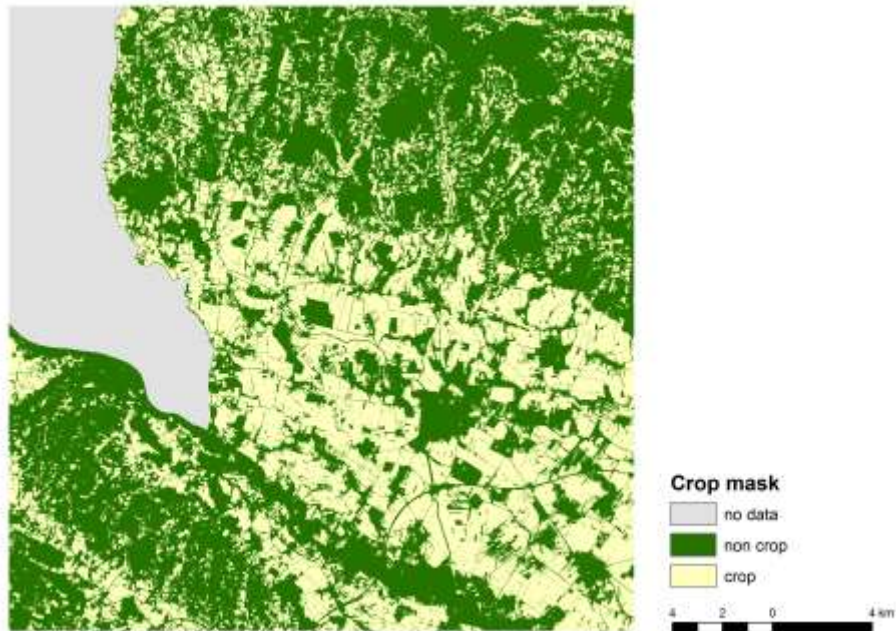
Data processing for agriculture



All crops



Crop classification

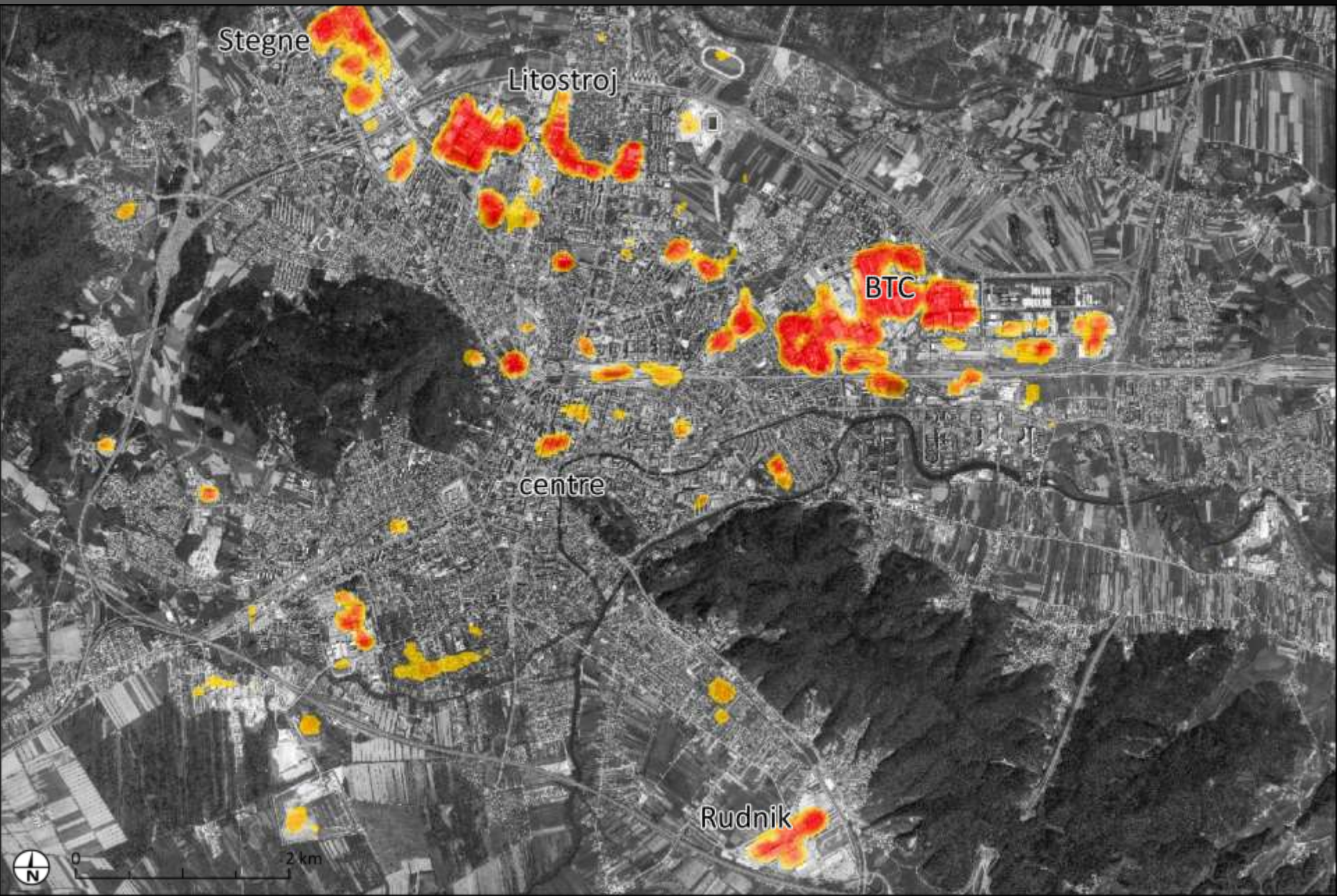


A close-up photograph of a person's head and shoulders being splashed with water. The water is captured in mid-air, creating a dynamic, bubbly effect. The person's skin is wet and glistening. A semi-transparent blue rectangular overlay is positioned across the middle of the image, containing white text. The background is a bright, clear blue sky with some green foliage visible in the upper right corner.

Urban Heat Island monitoring

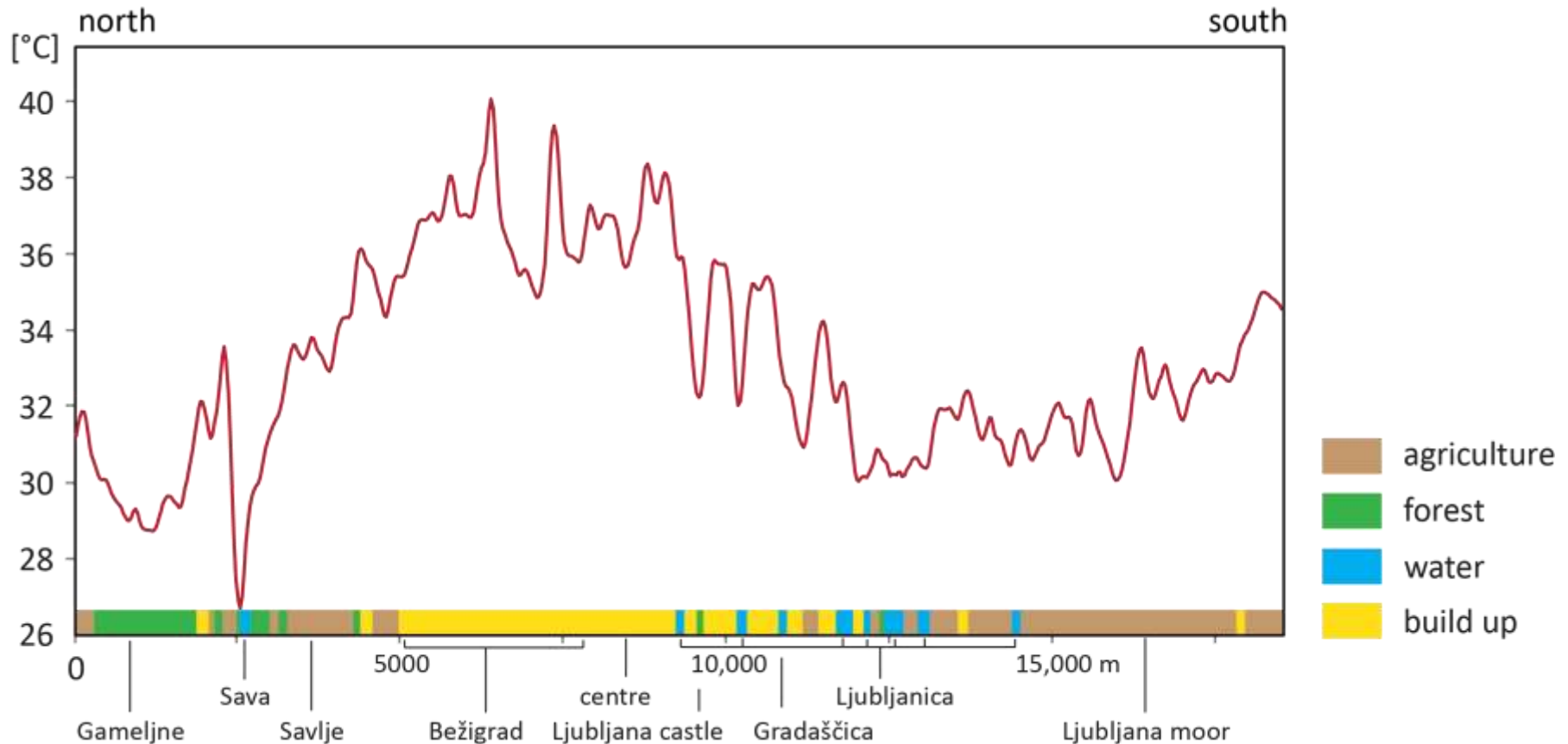
Ljubljana

Heat island hot spots



Urban Heat Island monitoring

- from April 2013 for Ljubljana



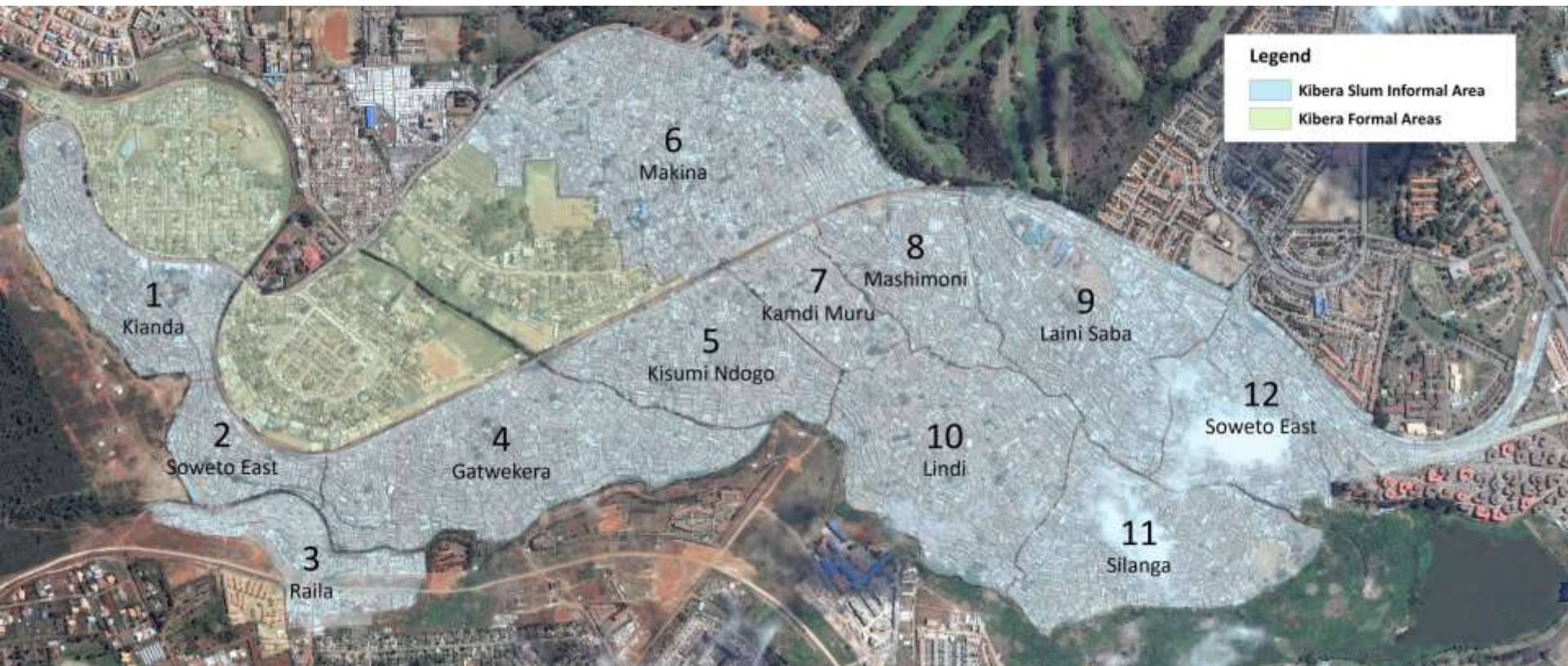
An aerial photograph of a vast, densely packed informal settlement, likely Kibera in Nairobi, Kenya. The settlement is characterized by a sea of closely packed, low-rise buildings with corrugated metal roofs. The image is partially obscured by a semi-transparent blue rectangular overlay that serves as a background for the title text. The sky above is a clear blue with scattered white clouds. In the foreground, the tops of green trees are visible, framing the bottom of the scene.

Population estimation of an informal settlement

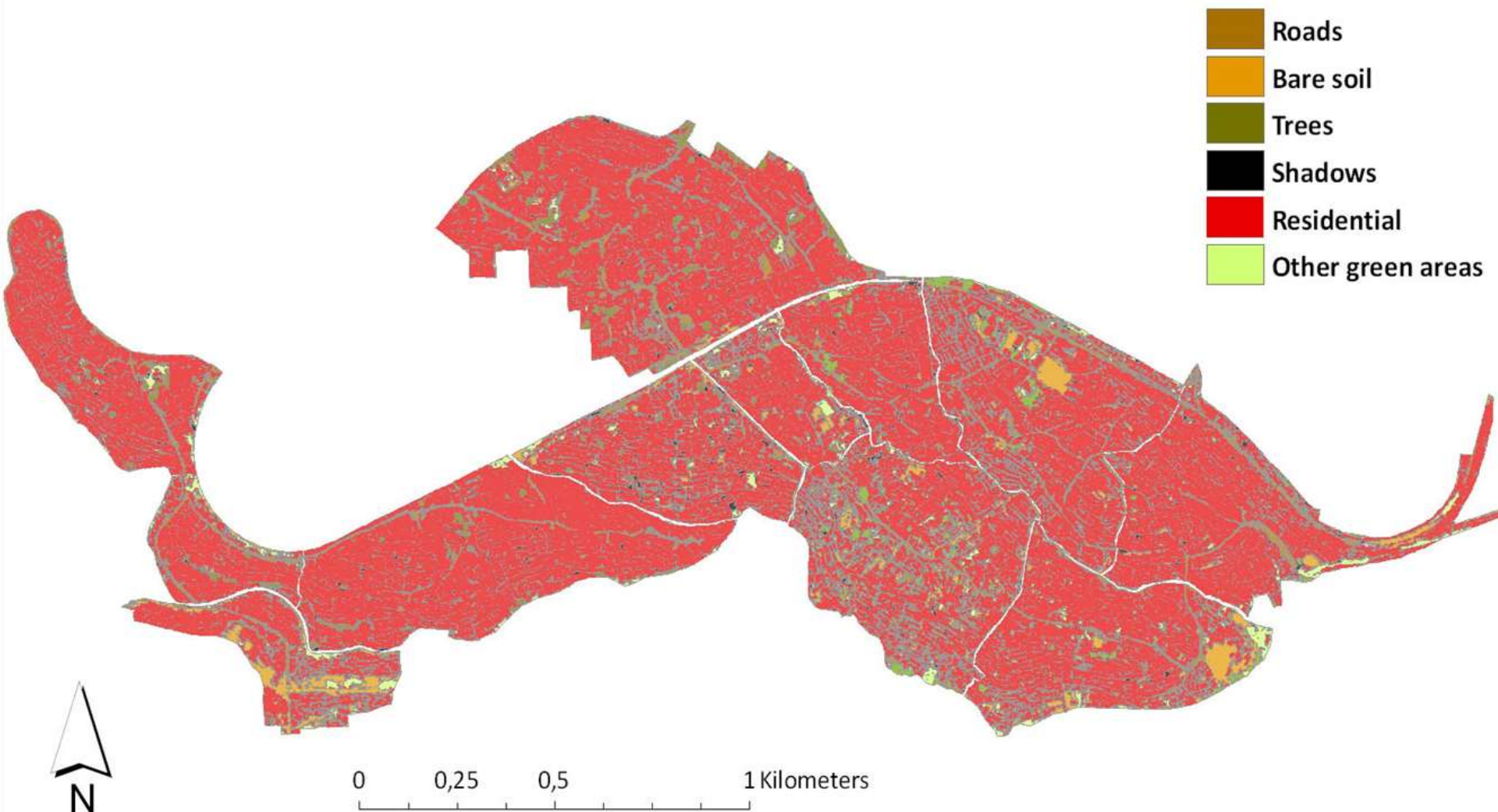
Kibera, Nairobi, Kenya

Land cover mapping

- 2.5 km², 1% area, 25% population



Land cover



Changes



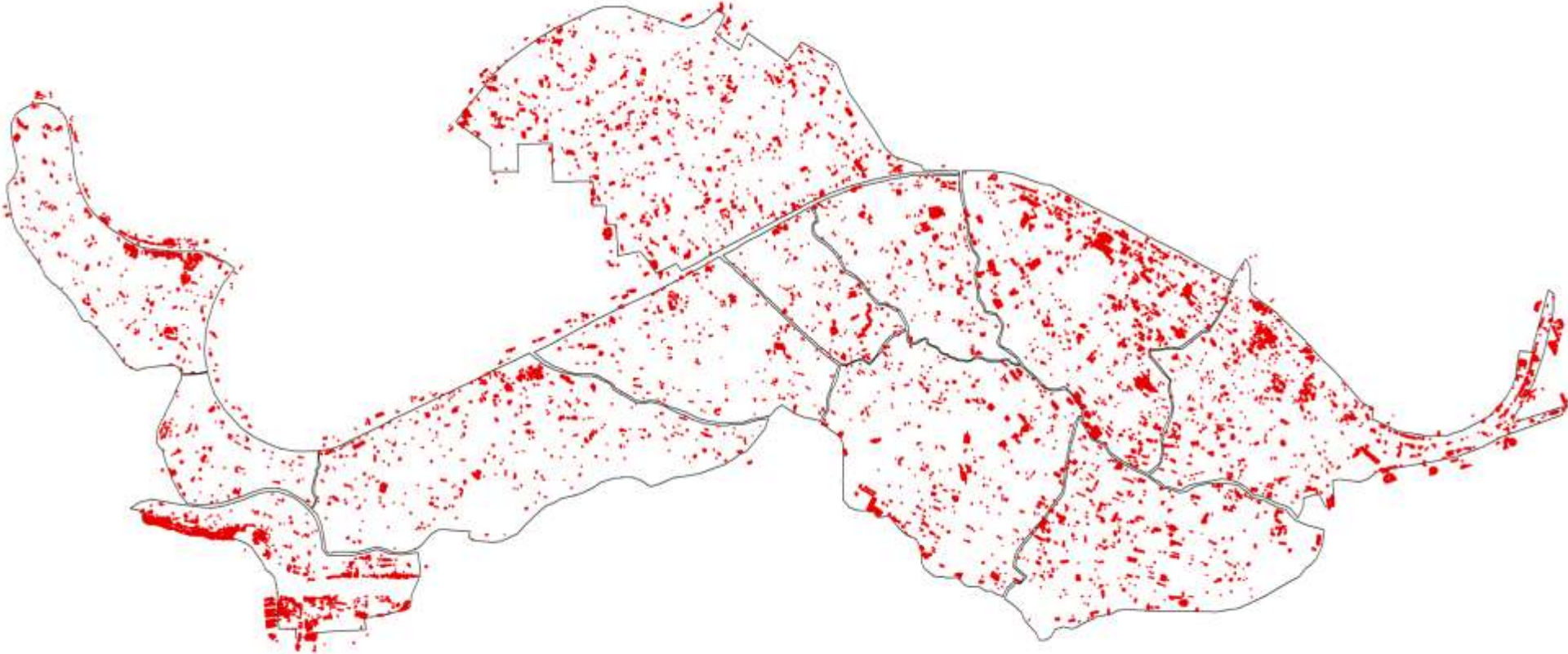
QB 2006-03-27



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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