



• • • • • **SPACE-SI**



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OPERATION PART FINANCED BY THE EUROPEAN UNION  
European Regional Development Fund

# Opazovanje Zemlje

## Earth observation

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**Slovenian Centre of Excellence for Space Sciences  
and Technologies**

**Research Centre of the Slovenian Academy of  
Sciences and Arts**

Strokovni posvet o vesoljskih tehnologijah, njihovi uporabi pri spremljanju okolja ter o evropskih okoljskih vesoljskih programih in možnostih sodelovanja za slovenske ustanove, 9.12.2013



## Remote sensing activities at Space-SI

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- **15+ years of experience**
- **Leading Slovenian group**
- **From satellite to the end user**
- **Development of algorithms and methods**
- **Applications in various fields**
- **Automatic image processing chain**
- **Crowd sourcing**



## Remote sensing applications

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- Land use classification and change detection
- Disaster monitoring
- Flood detection
- Crop type mapping
- Drought monitoring
- Vegetation development cycle monitoring
- Invasive plant mapping
- High precision relief and digital elevation modeling
- Topographic and thematic mapping
- Archaeological site observations
- Forest monitoring
- Laser scanning
- Ship detection
- Informal settlements mapping

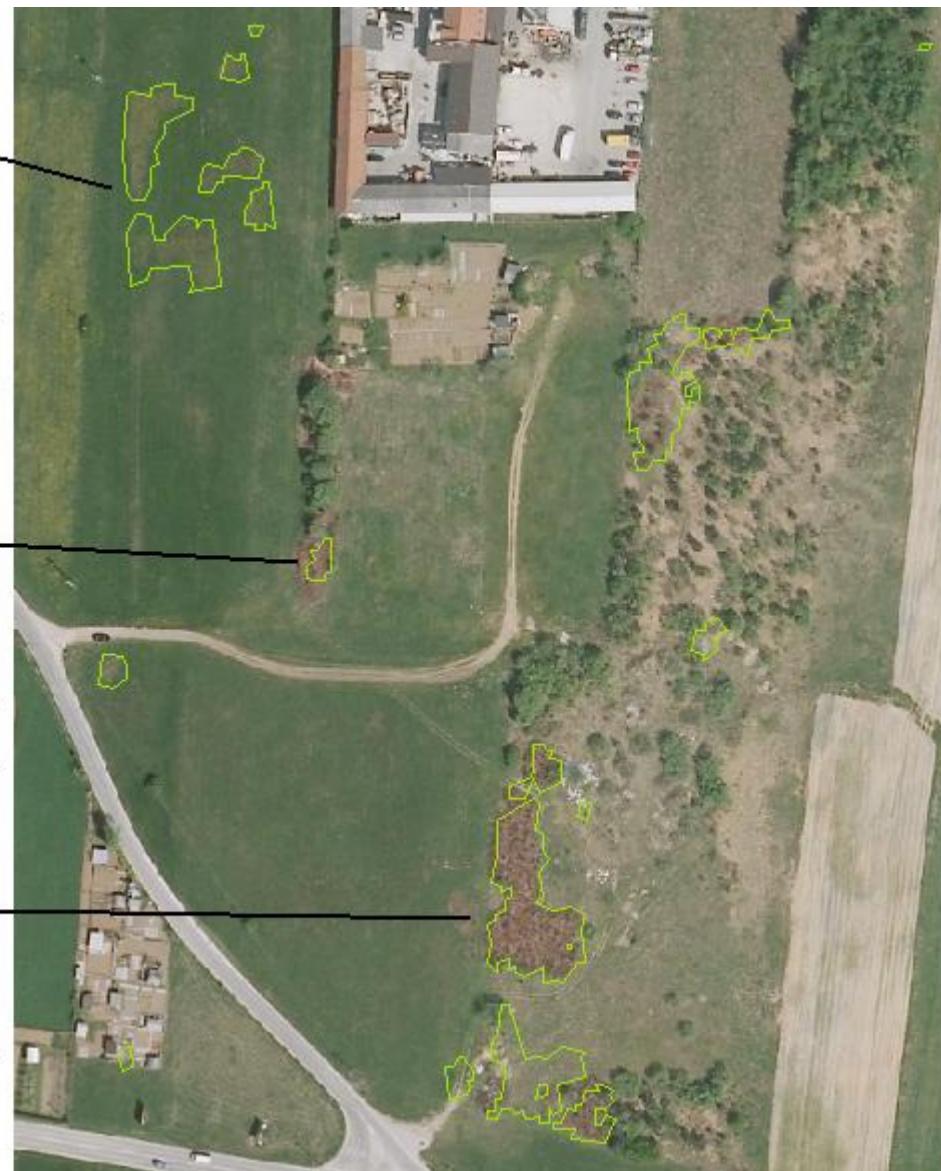


## Invasive plants – Japanese knotweed

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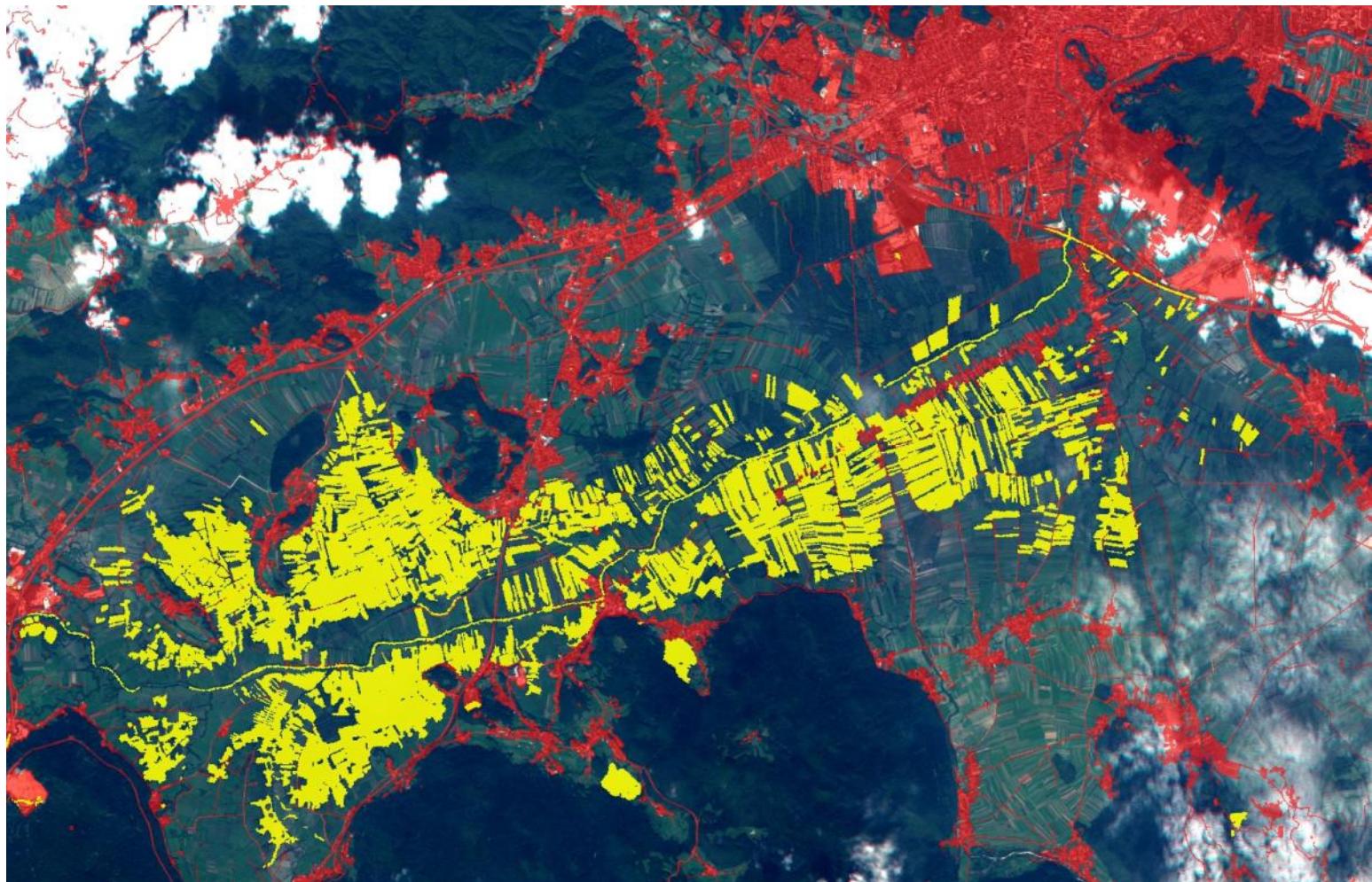




# Disaster monitoring

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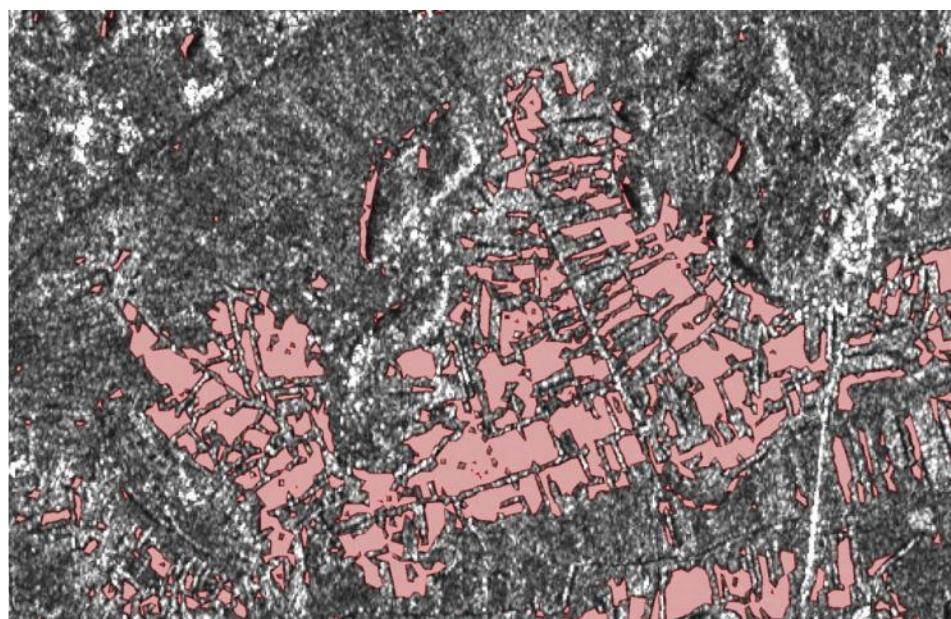
Floods around Ljubljana in September 2010, RapidEye image 23.9.2010



Radarsat-2

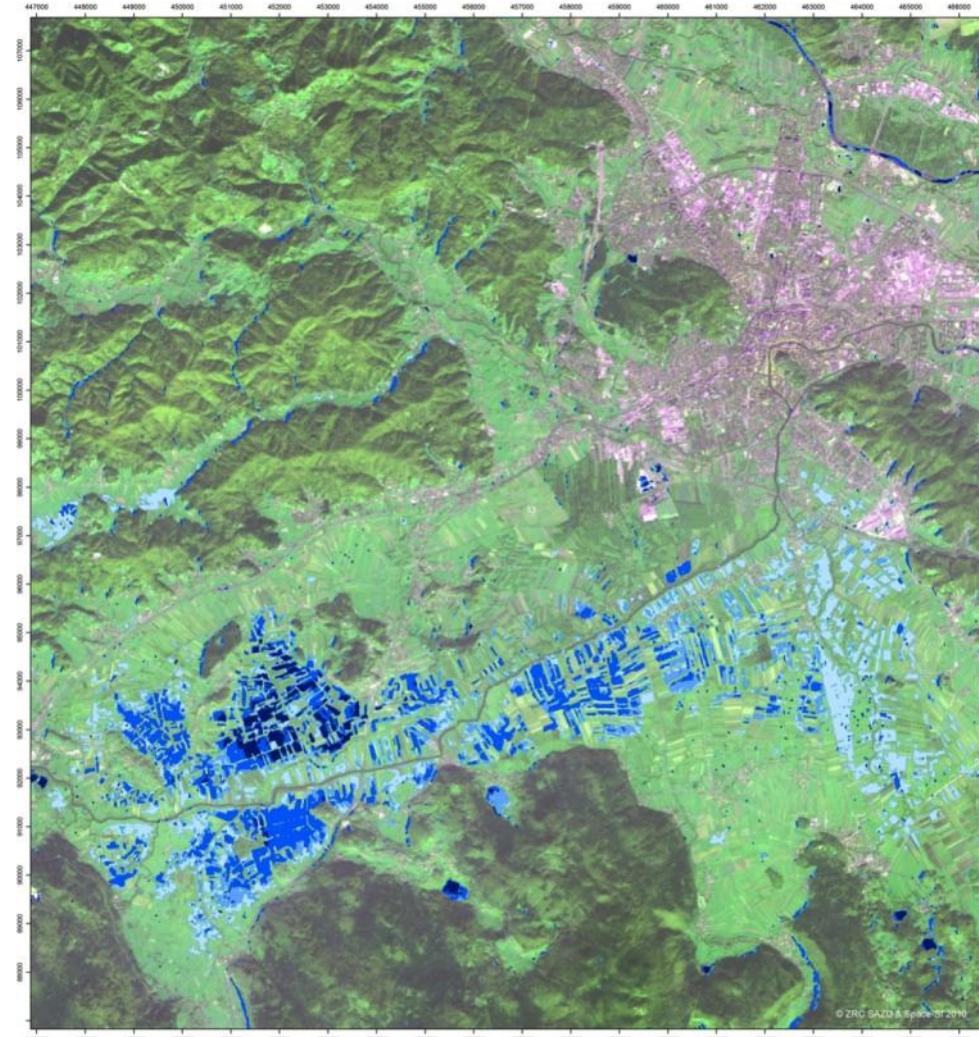


RapidEye



Event / Dogodek: Floods in Slovenia 2010 / Poplave v Sloveniji 2010  
Mapped area / Kartirano območje: Ljubljana

Situation map / Situacijska slika  
State / Stanje: 19.9. - 2.10.2010



## Floods around Ljubljana in September 2010 rapid mapping product

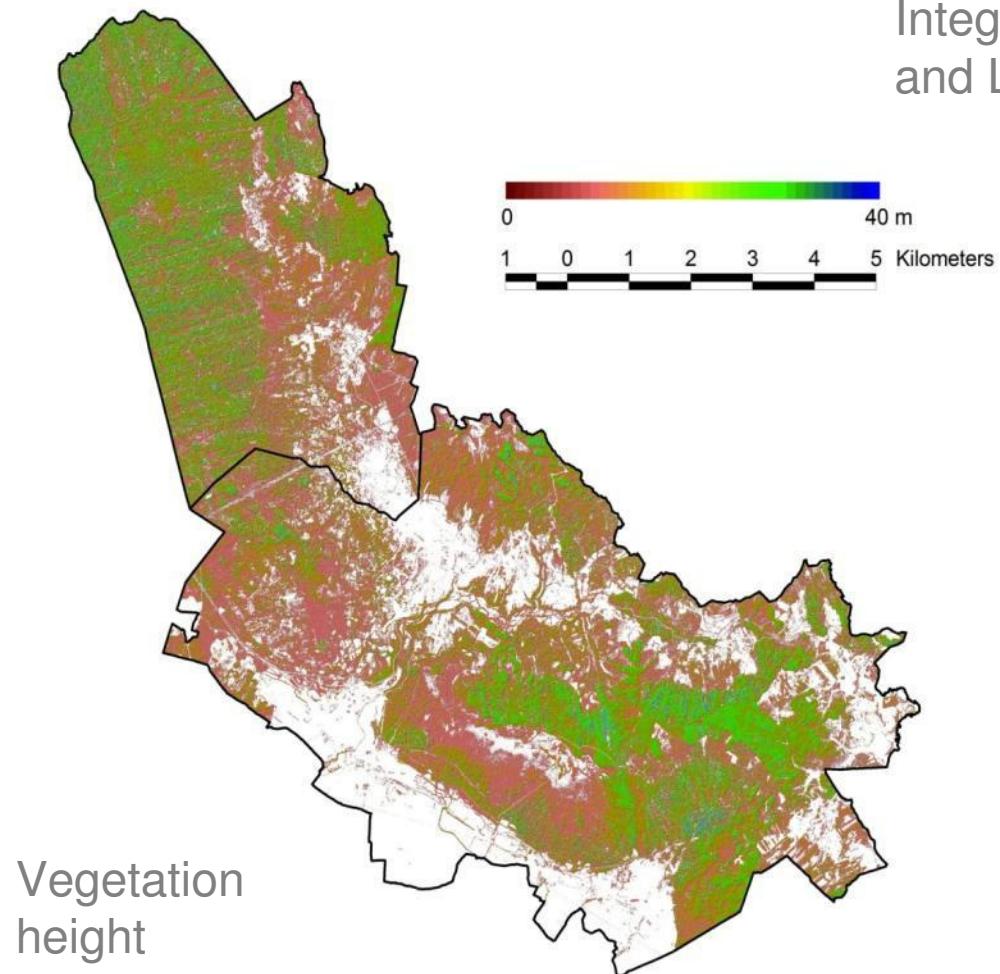




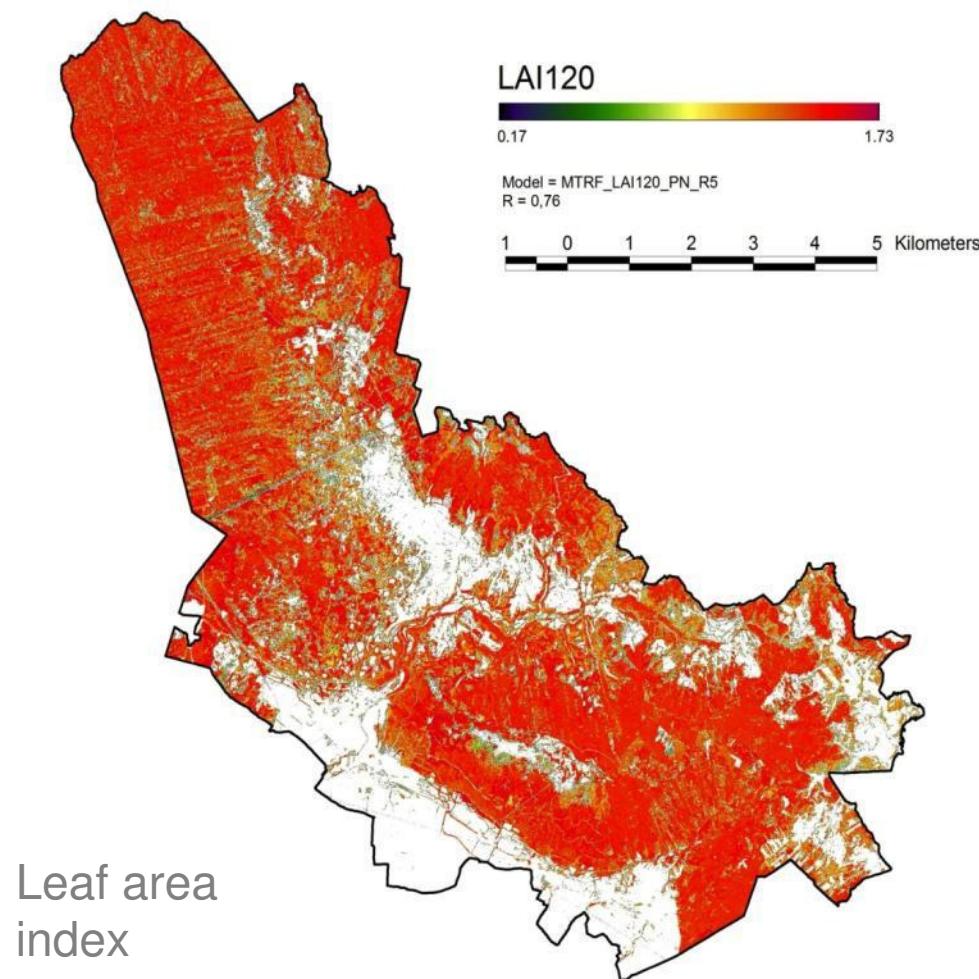
# Forest monitoring

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Integration of optical  
and LIDAR data

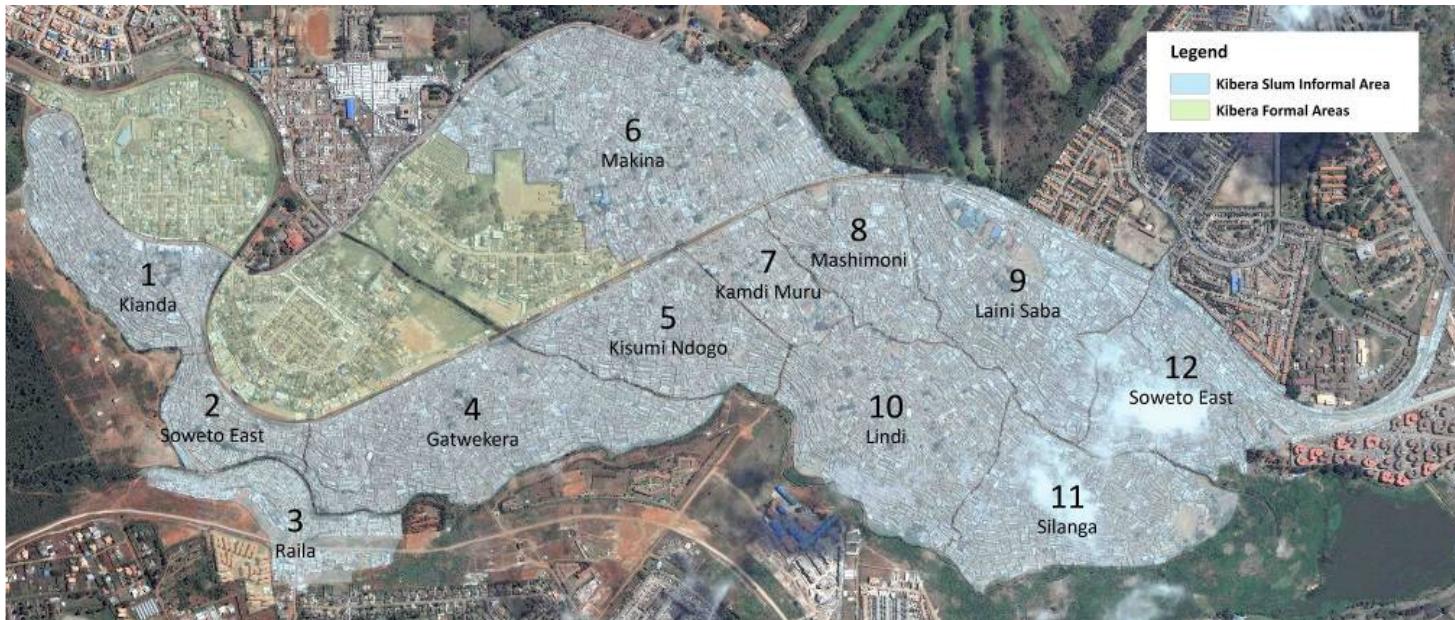


# Forest monitoring



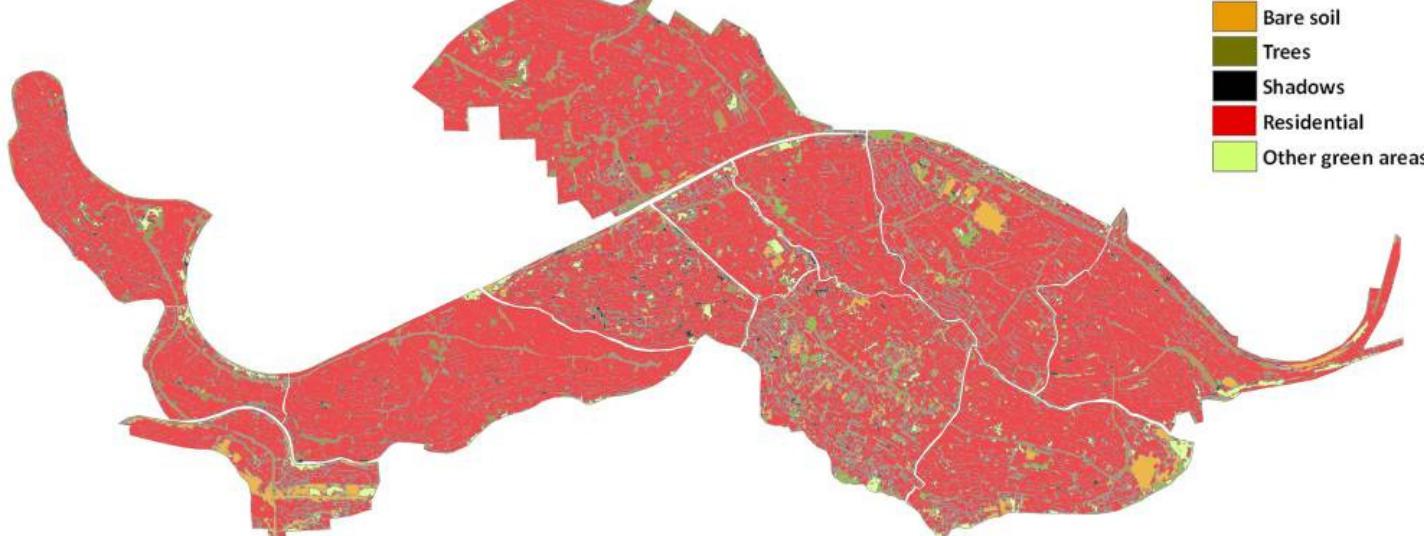
# NGO MapKibera – Land cover mapping

A



A: GeoEye image  
2009 and Kibera  
formal/informal  
settlements areas

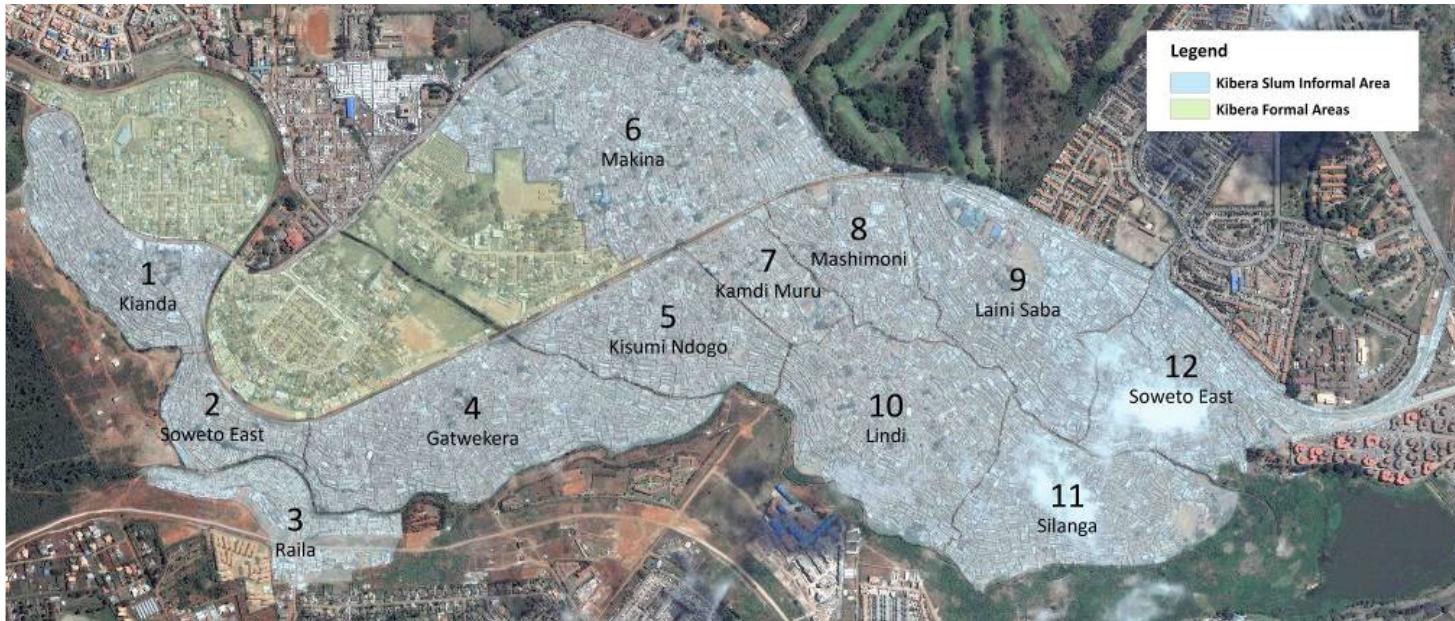
B



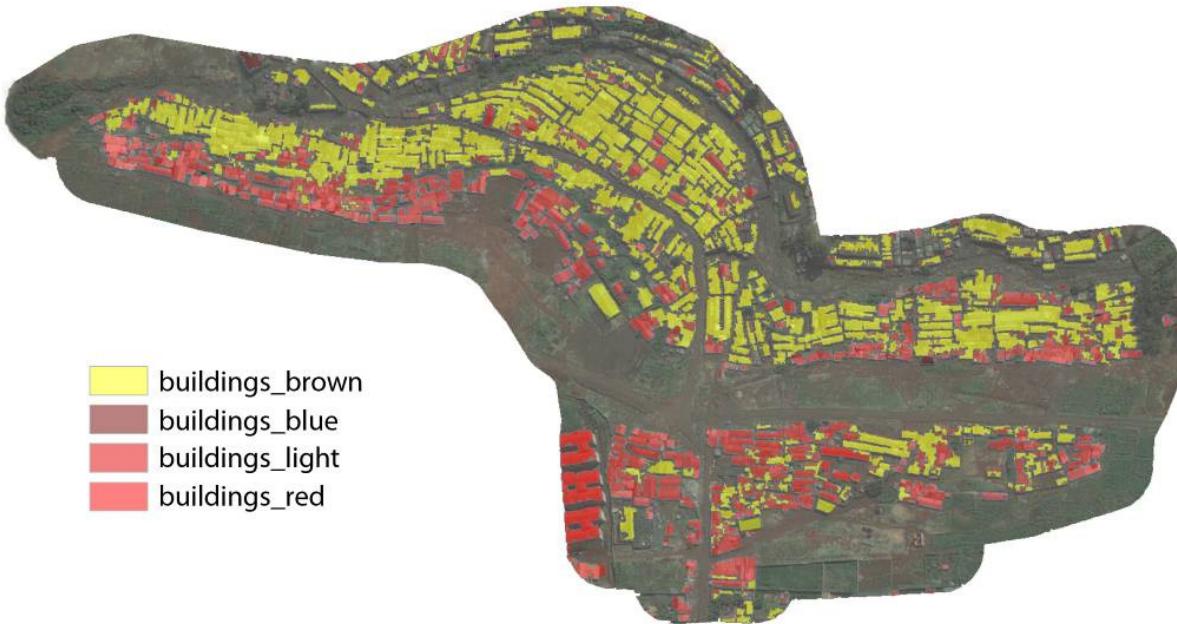
B: Land cover map  
obtained from  
GeoEye image with  
object-based  
classification

A

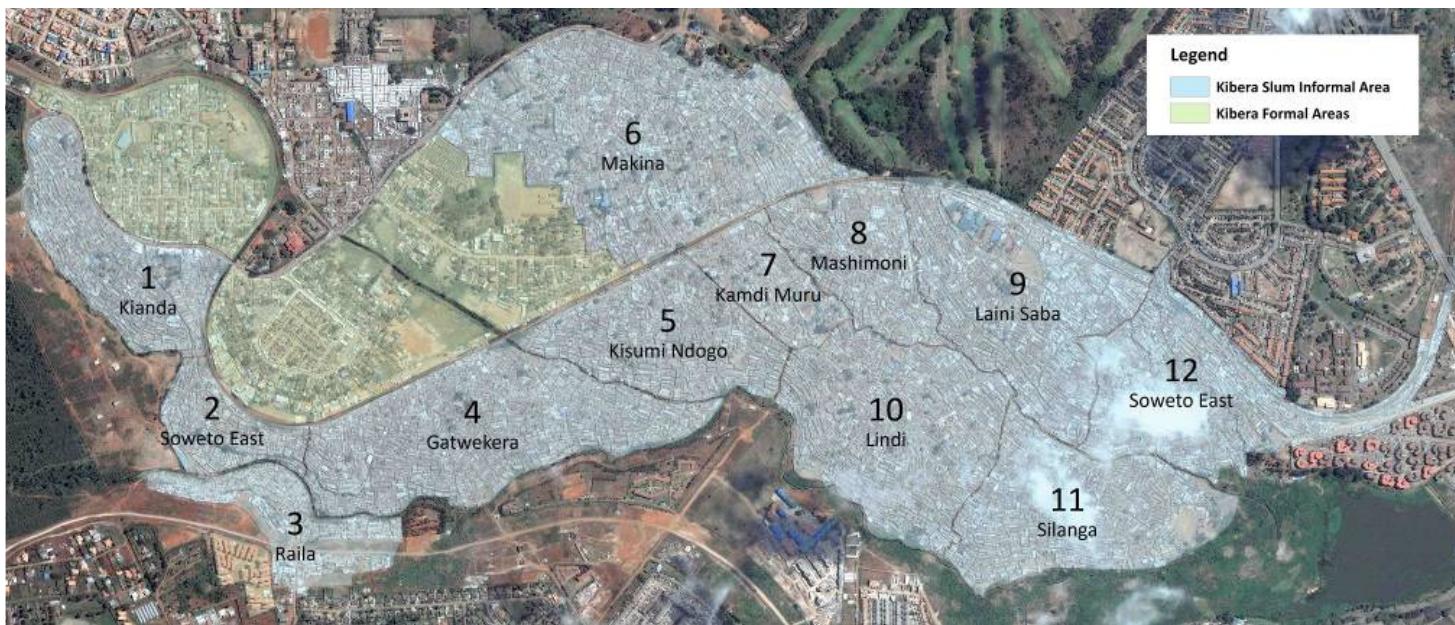
# NGO MapKibera – Land cover mapping



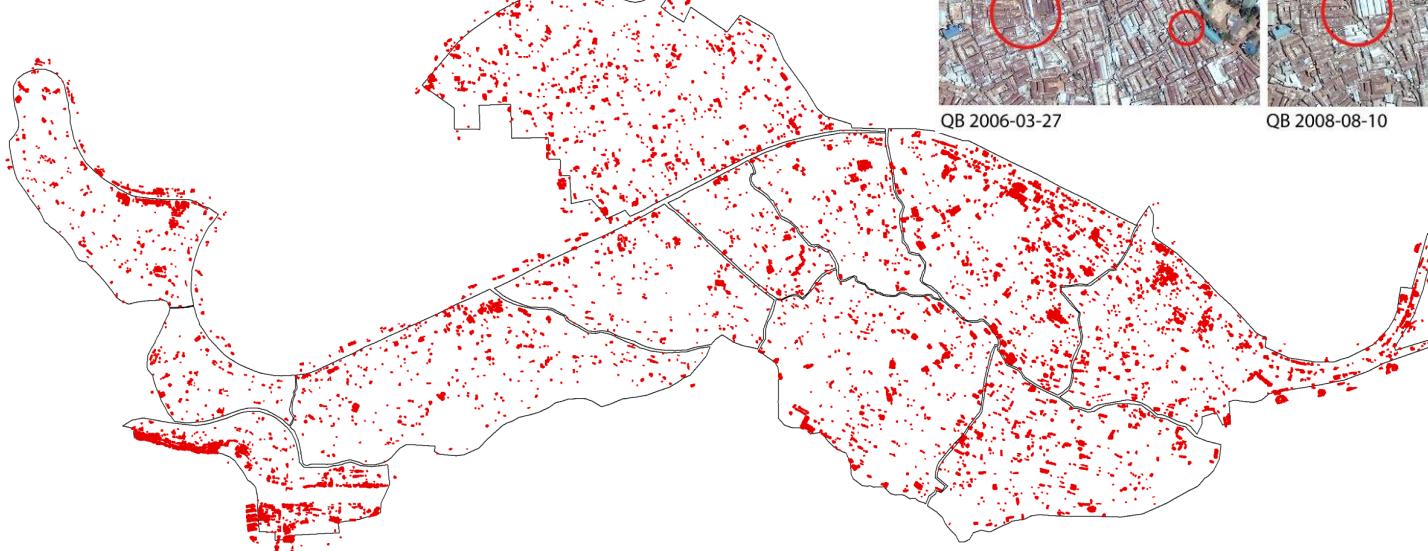
A: GeoEye image  
2009 and Kibera  
formal/informal  
settlements areas



B: Detailed object  
based classification  
results for residential  
areas in Raila village

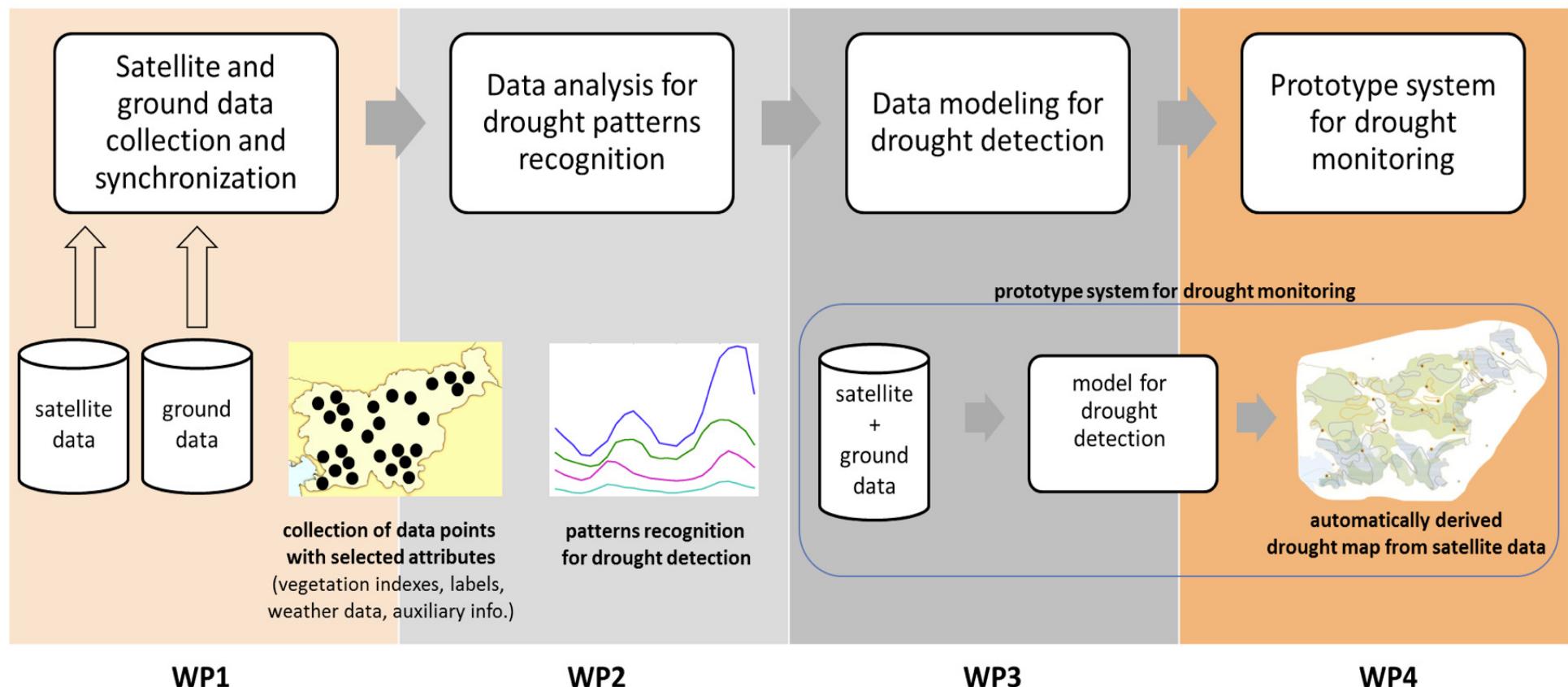
**A**

**A:** GeoEye image 2009 and Kibera formal/informal settlements areas

**C**

**C:** Change pattern obtained from GeoEye 2009 and QuickBird 2006 images with multi-level pixel-based approach

# Automatic Recognition of Vegetation Parameters from Satellite Data and Ground Measurements for Drought Monitoring





# Data

April – October  
2006 - 2012

## Ground data



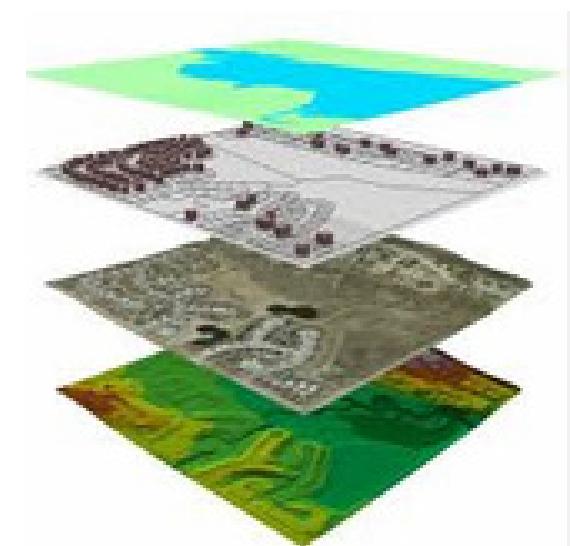
21 meteorological  
station  
7 forest weather  
stations

## Satellite data



4000+ MERIS and MODIS  
satellite images  
NDVI, fAPAR, EVI, LAI

## Ancillary data

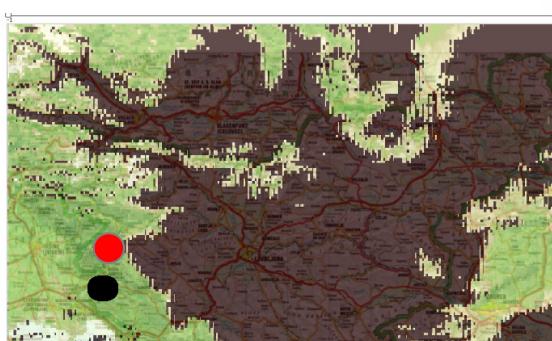
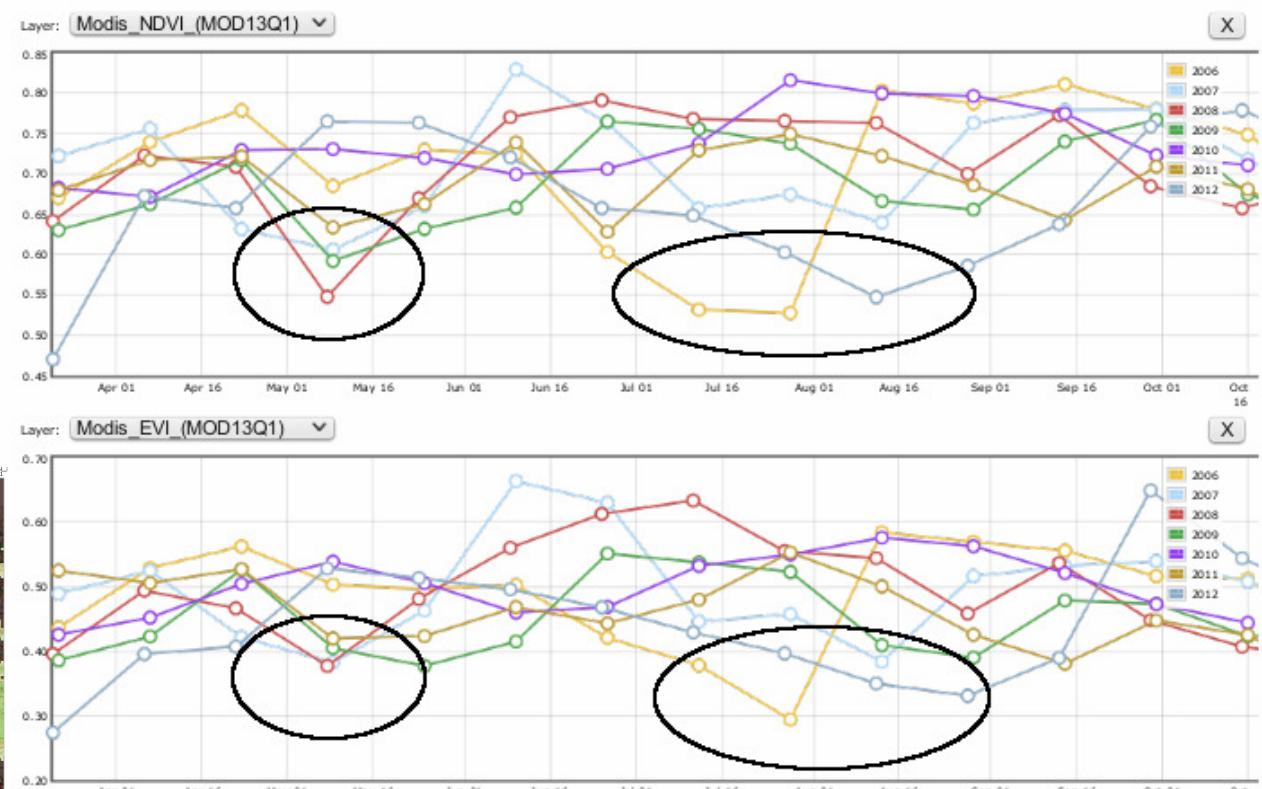


DEM  
Landuse  
Crop type  
Firest type

# Nova Gorica – MODIS



MODIS data  
top – NDVI,  
bottom – EVI



Nova Gorica location (SW Slovenia)



## Automatic image processing chain

increasing amount of remote sensing data  
(in great portion not used at all)

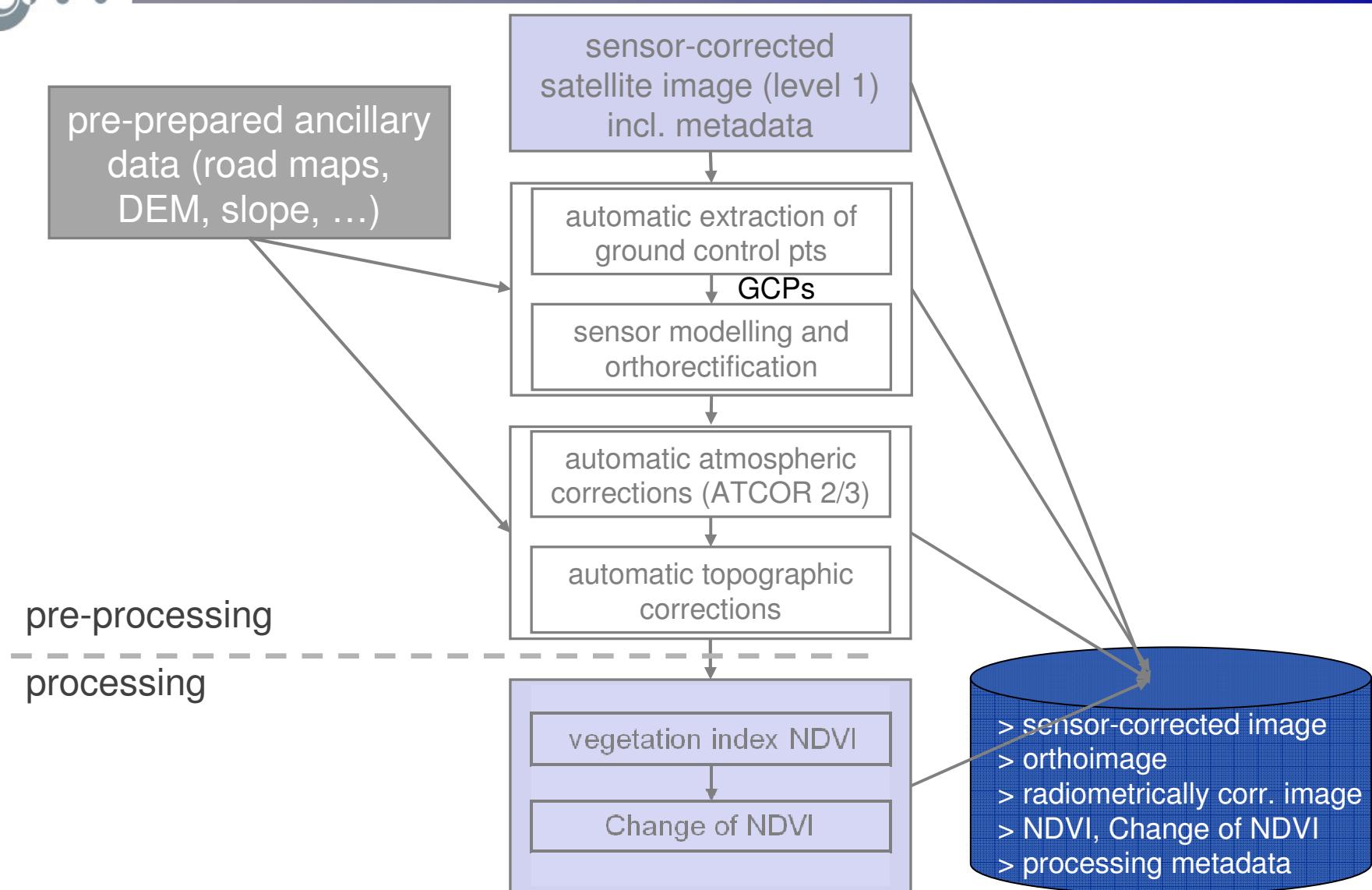


automatic processing and fast  
delivery of products generated from  
recently acquired satellite data

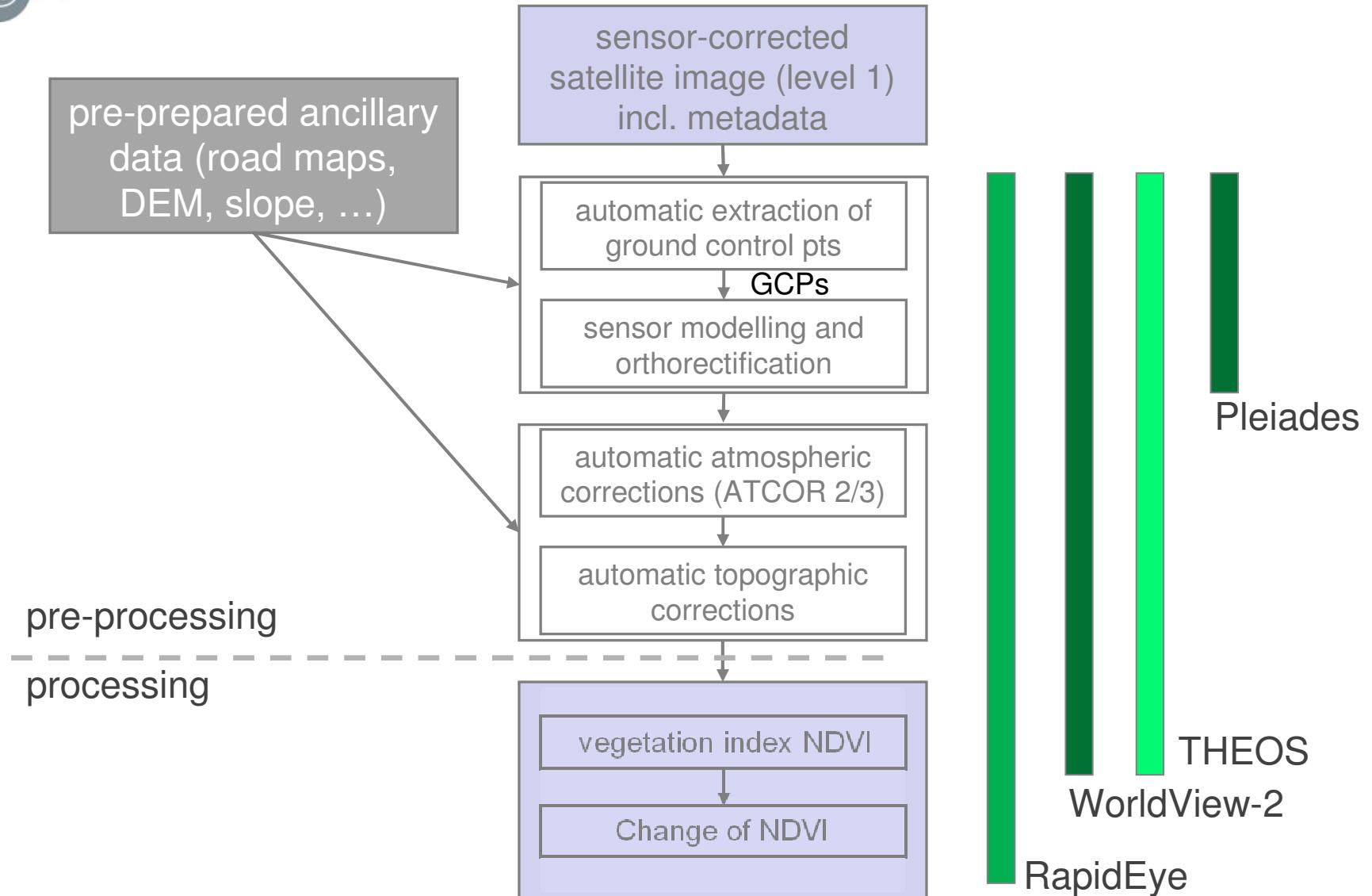
end-users having:

- > precise expert needs
- > basic knowledge of web mapping
- > limited or no knowledge about satellite data capabilities

# Processing workflow



# Sensors supported



# End-user viewer



SPACE-SI  
SLOVENIAN CENTER OF EXCELLENCE  
FOR SPACE SERVICES AND TECHNOLOGIES

search results project: 495 X

Project data

|                    |                  |
|--------------------|------------------|
| Project name       | Project: 495     |
| Project state      | Completed        |
| Acquisition date   | 02.09.2011 00:00 |
| Resolution [m]     | 6.5              |
| Cloud coverage [%] | 0.8              |
| Total RMSE         | 0.5              |

Show project on map Download data

Project phases

| Project phase id | Phase type                | Phase state | Start date       | End date         |
|------------------|---------------------------|-------------|------------------|------------------|
| 1488             | Initial                   | Completed   | 24.06.2013 18:04 | 24.06.2013 18:04 |
| 1496             | Orthorectified            | Completed   | 24.06.2013 18:05 | 24.06.2013 23:45 |
| 1499             | Radiometrically corrected | Completed   | 24.06.2013 18:05 | 24.06.2013 23:45 |

Layers

Project\_495

- Image boundaries
- Orthorectified (RGB)
- Radiometrically corrected (RGB)
- NDVI (RGB)
- Ground control points

Project\_495

- Image boundaries
- Orthorectified (RGB)
- Orthorectified (IR)
- NDVI (RGB)
- Ground control points

25 km

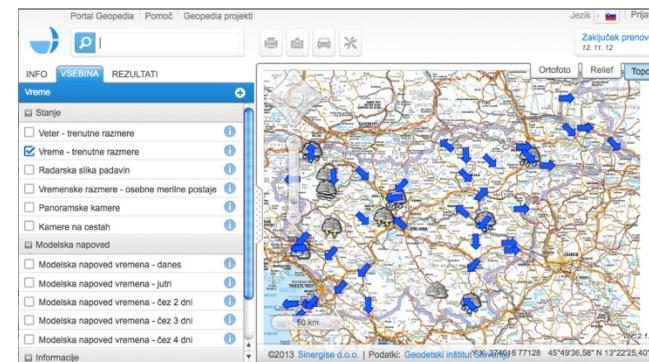
Y X 464288 95136 45°59'08.09"N 14°32'2.95"E

Java-based end-user viewer

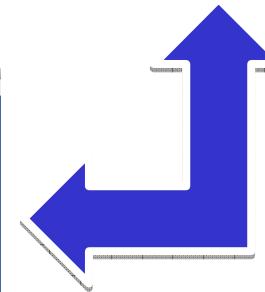
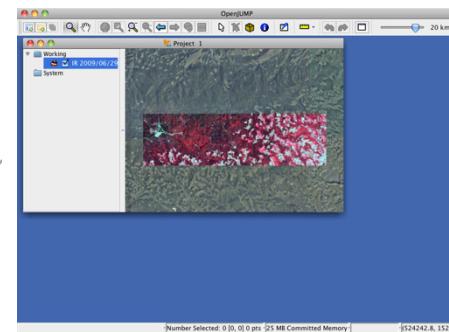
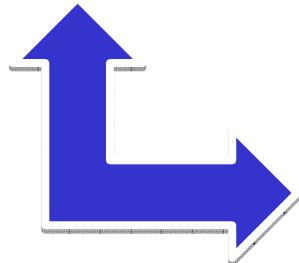
# Crowd sourcing



Mobile app



Web GIS

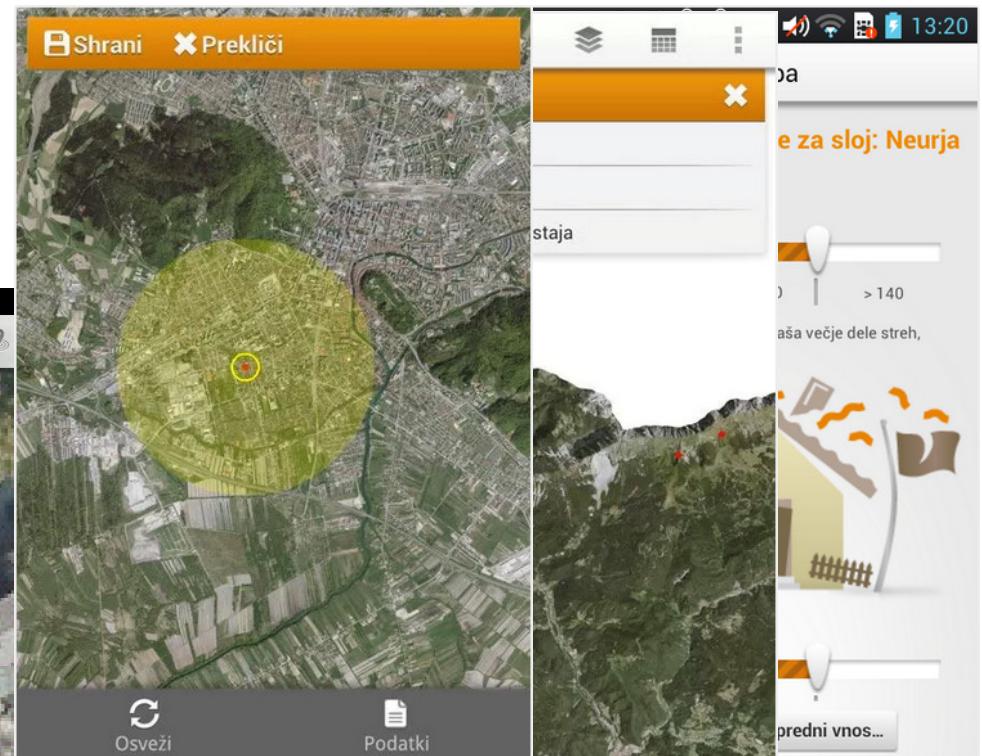
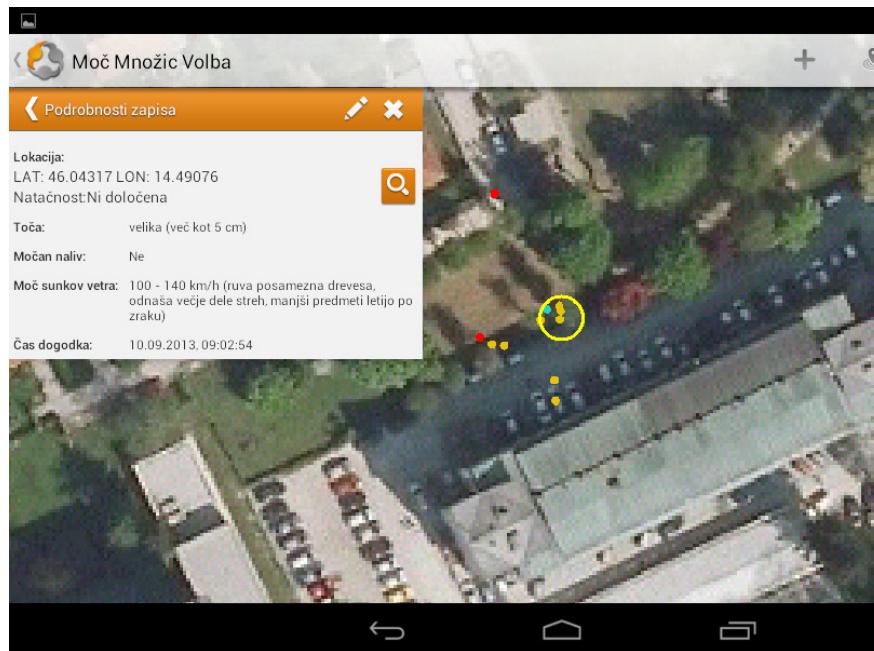


Web services

# Mobile app



- Storms, hail
- Water levels
- Water pollution



# Expert web app

- Quality control
- Data management
- Product generation
- Automatic flooded area detection /modeling



Izbrana poplava: Poplave 2010-09

Grega Milčinski

MočMnožic - poplave

Opis: Poplave 2010-09  
Začetek poplave > Thursday, 2010 September 02 13:22:00 UTC+2  
Konec poplave > Friday, 2010 September 03 15:45:00 UTC+2  
Fotografija poplave >

Ortofoto Relief Topo Arhiv

Poplave 2010-09

250 m

2013 Sinergise d.o.o. | Data: Geodetska uprava Republike Slovenije , Geodis

The screenshot shows a web-based application interface for flood monitoring. At the top, there's a navigation bar with tabs for 'POPLAVE' (selected), 'SLOJI', and 'REZULTATI'. Below it are several filter panels: 'PODATKI' (checkboxes for 'Slike - Cerk', 'Moč množic - poplave' checked, 'Poplave - urejevalnik točk' checked, 'Poplave - poplavljena področja' checked), 'VREMENSKIE RAZMERE' (checkbox for 'Vreme - trenutne razmere'), 'POI' (checkboxes for 'Železniške postaje', 'Policijske postaje', 'Bojnišnice in zdravstveni domovi', 'Reševalne postaje'), 'GEOGRAFIJA' (checkbox for 'Relief - piastrnice'), and 'RAZNO' (checkbox for 'Poplave - merilne točke'). The main area displays an orthophoto of a rural landscape with a flooded field outlined in blue and marked with orange stars. A red circle highlights a specific point within the flooded area. A scale bar indicates 250 meters. On the right, a sidebar provides details about the event: 'Poplave 2010-09', 'Začetek poplave' (Thursday, 2010 September 02 13:22:00 UTC+2), 'Konec poplave' (Friday, 2010 September 03 15:45:00 UTC+2), and a link to 'Fotografija poplave' (with a thumbnail image).

# Contacts



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