RISK SPACE TECHNOLOGY TRANSFER

Bulgarian Academy of Sciences

EO TECHNOLOGIES IN THE AGRICULTURAL SECTOR

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Member of BoD of EARSC

EARSC

EARSC is a trade association (non-profit Belgian company), founded in 1989, dedicated to helping European companies: *providing services (including consultancy) or supplying equipment in the field of remote sensing.*

Our mission is:

- to foster the development of the European Geo-Information Service Industry
- to represent European geospatial-information providers, creating a sustainable network between industry, decision makers and users

Today: >100 members from 22 countries in Europe

What does EARSC do?

Focus is on enabling the development of new business

1. Provide information to our members on programmes, policy and the sector; (business intelligence)
2. Maintain a knowledge of the industry, i.e. statistics, market information, etc.
3. Promote professional standards within the industry (certification)
4. Promote the industry and its capabilities by:
   - Creating links between EO services sector and other business secto e.g. oil & gas, insurance, public institutions e.g. the World Bank
   - Organising events offering networking opportunities as well as focused information
   - Advocacy towards policy makers on issues of concern
   - Awareness and media. e.g. eomag, OGEOZine, etc.

Market Development & Promotion

OGEO:
Link with Oil & Gas Industry

EO Portal (wiki):
Information on Geospatial services

EO4OG: guide to geospatial products for the O&G Industry

Research Corner

Eo4All
Links with IFI's

EOpages:
Brokerage site

EOmag:
Sector magazine

Achievement Award

Annual Report

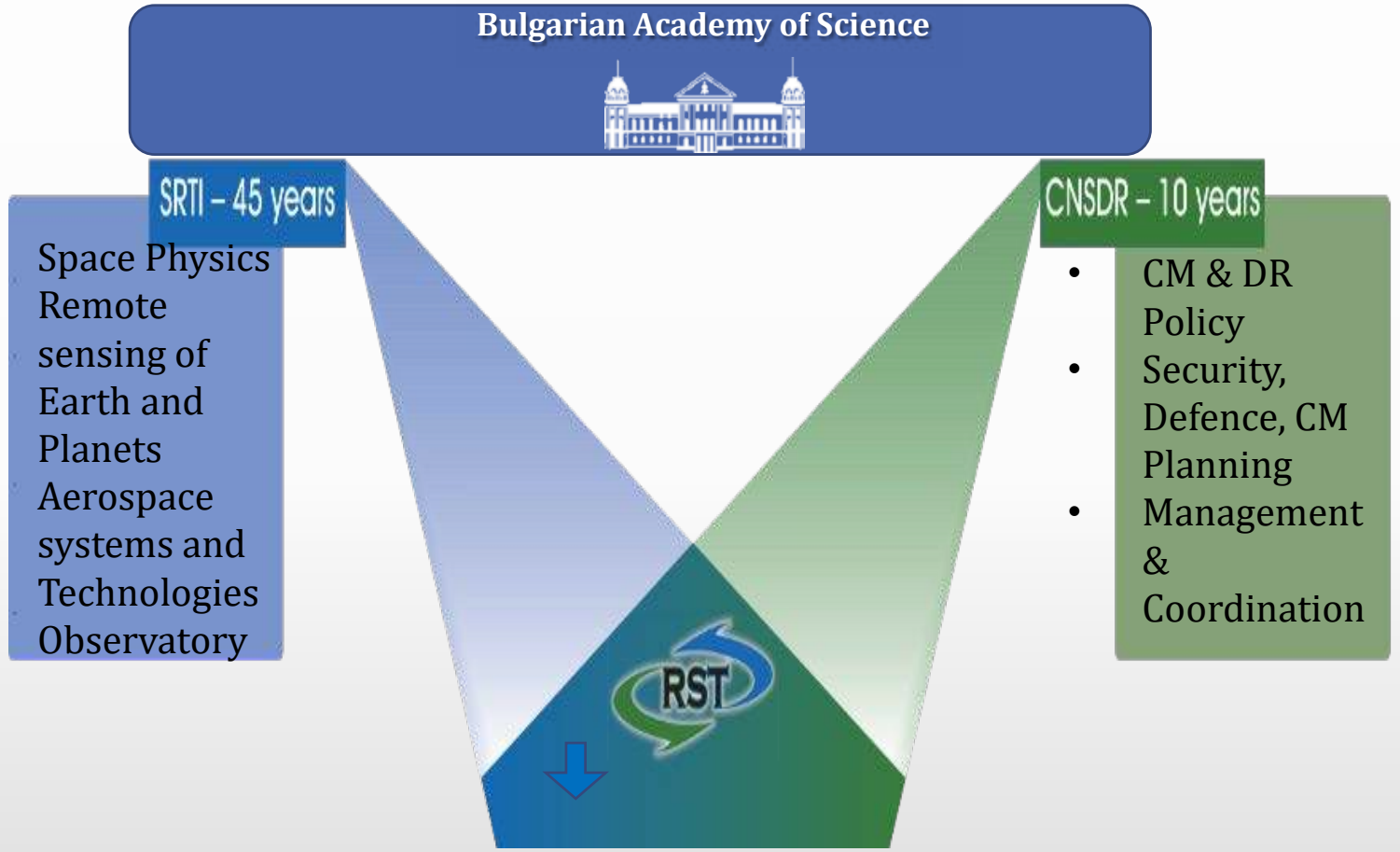
EARSC on Twitter

Risk Space Technology Transfer Office

- Contract of National Program "Competitiveness" - ERDF-EU
- Project partners:

  Space Research And Technology Institute (SRTI) – BAS

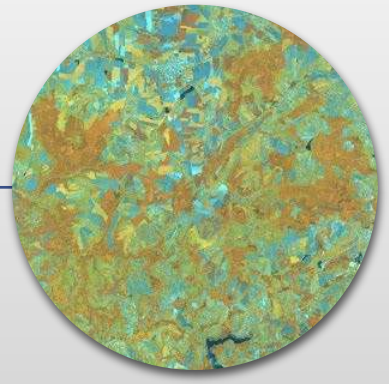
  Center For National Security And Defense Research (CNSDR) – BAS



Technology transfer projects

Mapping of natural disasters

Mapping of anthropogenic hazards



Satellite images according to HR Image Acquisition Specifications for the CAP Checks (Cwrs)

EO Proven Capacity

- **RESOLUTION**
- **SENSITIVITY**
- **TIME SERIES, CHANGE DETECTION**

Resolution

The same area at 4 different resolutions

Resolution

Sensitivity

Sensitivity

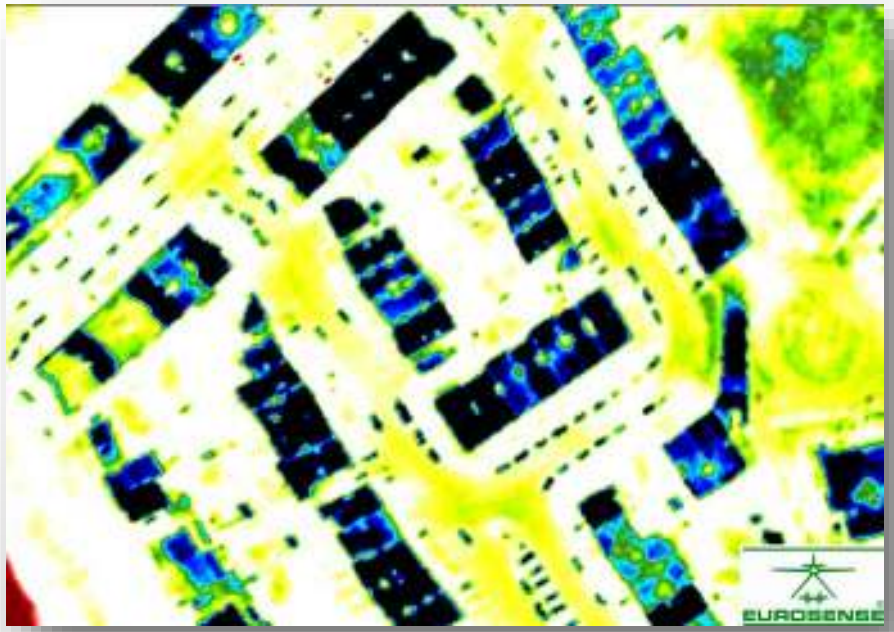
Sensitivity

EO INNOVATIONS

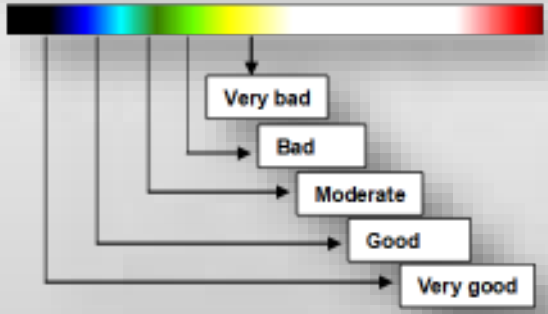
- **THERMAL MAPPING**
- **HYPERSPECTRAL**
- **SAR**

Thermal Mapping

Heat Loss Study of Buildings



Thermal InfraRed Image



Colour Image

Detection of weak insulation spots in roofs and heat losses

➔ Also possible for industrial and agricultural buildings

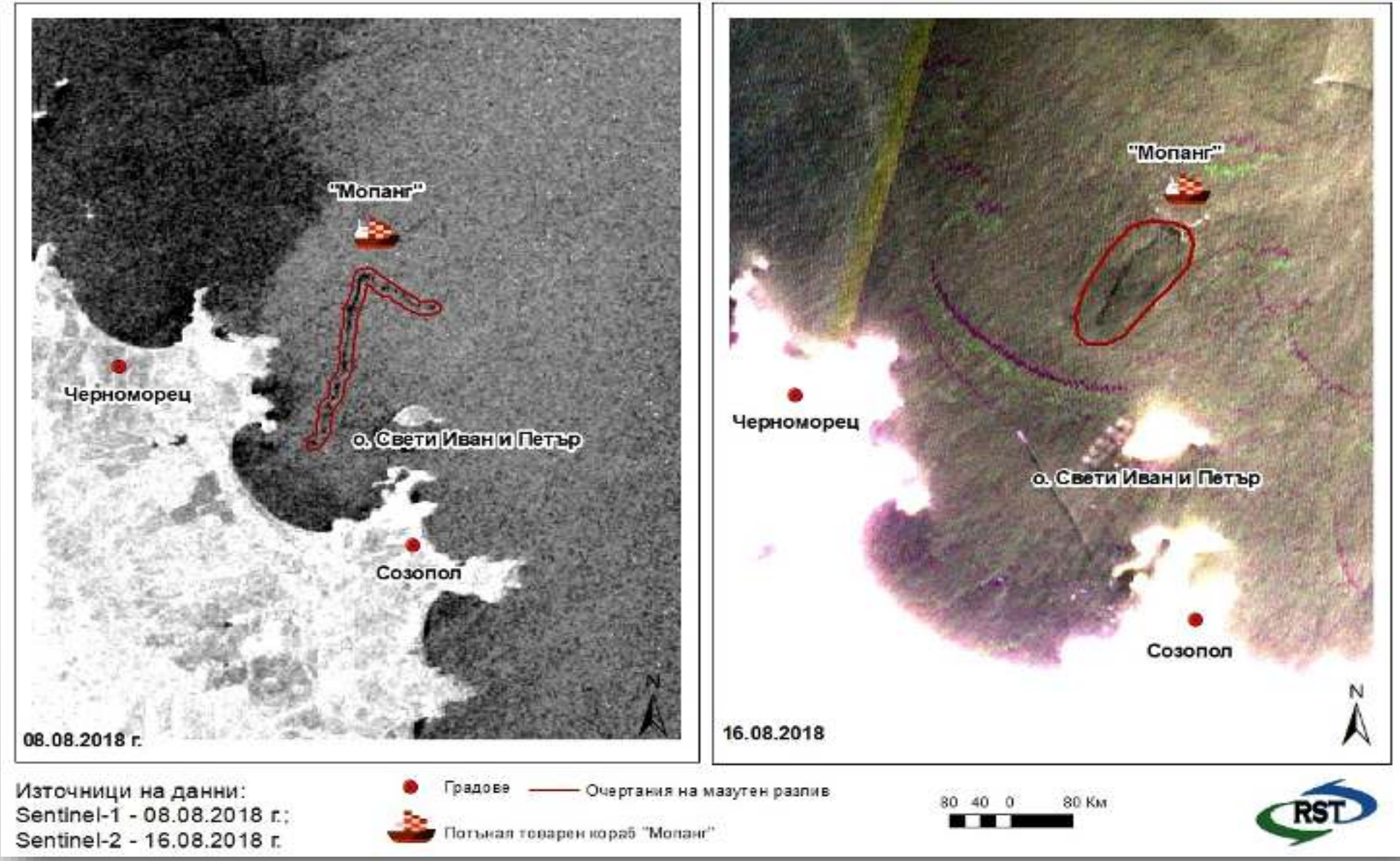
Preliminary Ground Testing Of The Hyperspectral System

A tree on the left side of the images and Vitosha mountain in the background

Band combination: 859-650-550 nm

Band combination: 1000-650-550 nm

Oil sill from the Mopang ship August 2018 – SAR, Sentinel-1



EU'S COMMON AGRICULTURAL POLICY (CAP)

&

SATELLITE TECHNOLOGIES

Modernise The EU's CAP via Satellite Technologies

1. COMMISSION IMPLEMENTING REGULATION (EU) 2018/746 of 18 May 2018

- As part of its ongoing move to simplify and modernise the EU's Common Agricultural Policy (CAP), the European Commission has adopted new rules that will for the first time expressly allow a range of modern technologies to be used when carrying out checks for area-based CAP payments.
- This includes the possibility to completely replace physical checks on farms with a system of automated checks based on analysis of Earth observation data.
- The new rules, which came into force on 22 May 2018, will allow data from the EU's Copernicus Sentinel satellites and other Earth observation data to be used as evidence when checking farmers' fulfilment of requirements under the CAP for area-based payments (either direct payments to farmers or rural development support payments), as well as cross-compliance requirements, such as stubble burning.
- Visits to the field will only be necessary when the digital evidence is not sufficient to verify compliance.

Modernise The EU's CAP via Satellite Technologies

2. Phil Hogan, European Commissioner for Agriculture and Rural Development, said:

- "This new satellite technology will significantly reduce the number of field inspections, removing the climate of fear, which causes significant stress for farmers.
- It will also benefit public administrations, by reducing the costs of administering controls and checks.
- It is thus a win-win for farmers and administrators."

THE SENTINELS

Space Component

		Key Features
 SENTINEL-1: 4-40m resolution, 3 day revisit at equator	***S1A and 1B in orbit***	Polar-orbiting, all-weather, day-and-night radar imaging
 SENTINEL-2: 10-60m resolution, 5 days revisit time	***S2A and 2B in orbit***	Polar-orbiting, multispectral optical, high-resolution imaging
 SENTINEL-3: 300-1200m resolution, <2 days revisit	***S3A and 3B in orbit***	Optical and altimeter mission monitoring sea and land parameters
 SENTINEL-4: 8km resolution, 60 min revisit time	*1st Launch 2020*	Payload for atmosphere chemistry monitoring on MTG-S
 SENTINEL-5p: 7-68km resolution, 1 day revisit	***S5P launched 13/10/2017***	Mission to reduce data gaps between Envisat, and Sentinel 5
 SENTINEL-5: 7.5-50km resolution, 1 day	*1st Launch 2021*	Payload for atmosphere chemistry monitoring on MetOp 2nd Gen
 SENTINEL-6: 10 day revisit time	*1st Launch 2020*	Radar altimeter to measure sea-surface height globally

COPERNICUS SERVICES

Copernicus

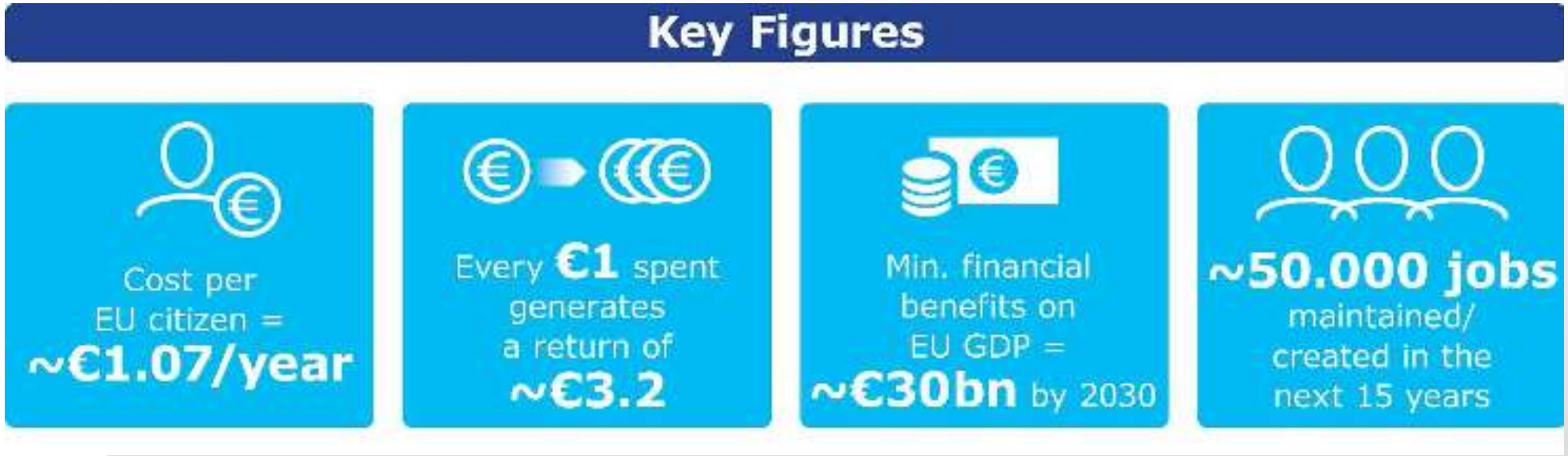
Monitoring the State of the Earth System Environment ...

... Six cross-cutting Thematic Services

COPERNICUS ECONOMIC BENEFITS

Copernicus

- Poised to generate significant **socio-economic benefits**
- Driver for **research, innovation** and the creation of **highly skilled jobs**



COPERNICUS: a public good

- **free and open access**

Operational Service

- Long term and reliable provision of global products and services
  - Near real time & consistent archive of biophysical parameters of land surface
  - From medium-low resolution EO sensors
- Fully validated and quality controlled products

A wide range of applications:

Water management, Land cover & use changes, forestry, desertification, biodiversity, natural resources management, and **Agriculture & Food Security, …**

- Direct support for EU's Policies, commitments under international treaties & conventions and a key contribution to GEO's global initiatives (e.g. GEOGLAM)

EU – COMMON AGRICULTURAL POLICY

Source: http://ec.europa.eu/agriculture/publi/fact/clear/2007_en.pdf

~ 10 m Farmers

~ 175 m ha Agr. Land

~ 140 m Ref. Parcels

~ € 55 bn Subsidy Payments

Control of Farmer Subsidies with Remote Sensing


Cadastre


Declarations

Area and Crop Determination

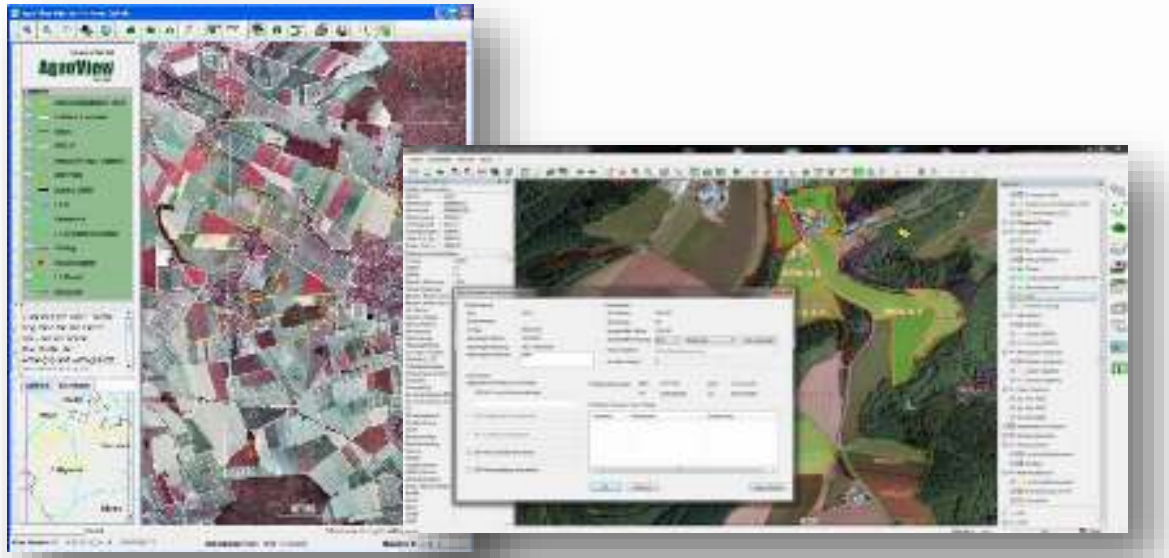
Fradulent Declarations


Images


Additional data

RS & GIS since 2005 compulsory

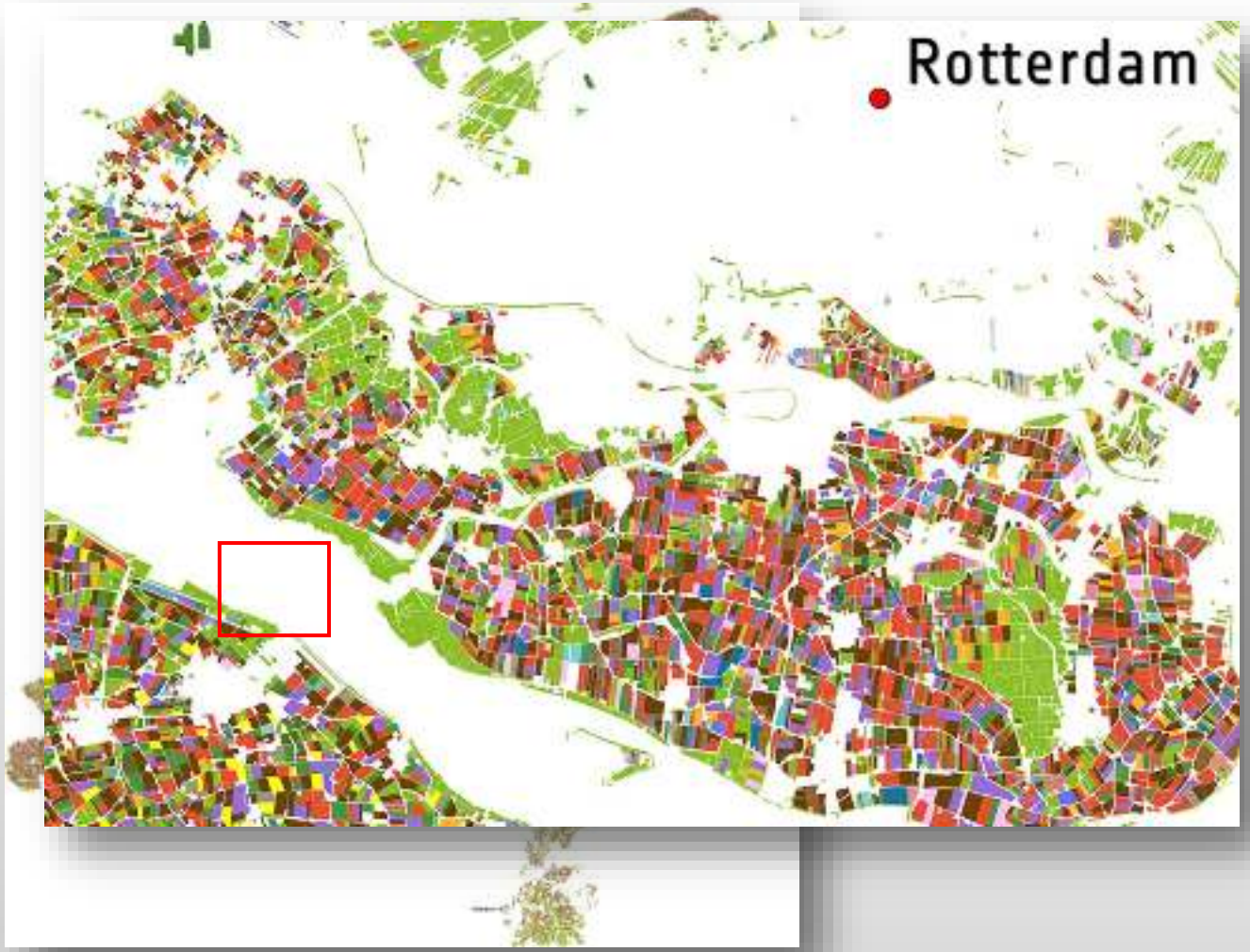
- GIS Software for Farmers
- GIS Software for Administrations
- Implementation of Agricultural Reference Systems



Cadastral Parcels | Agricultural Parcels | Farmers' Blocks | Physical Blocks

TYPICAL EXAMPLES

AGRICULTURE MAPPING



Agricultural landscape of the Netherlands

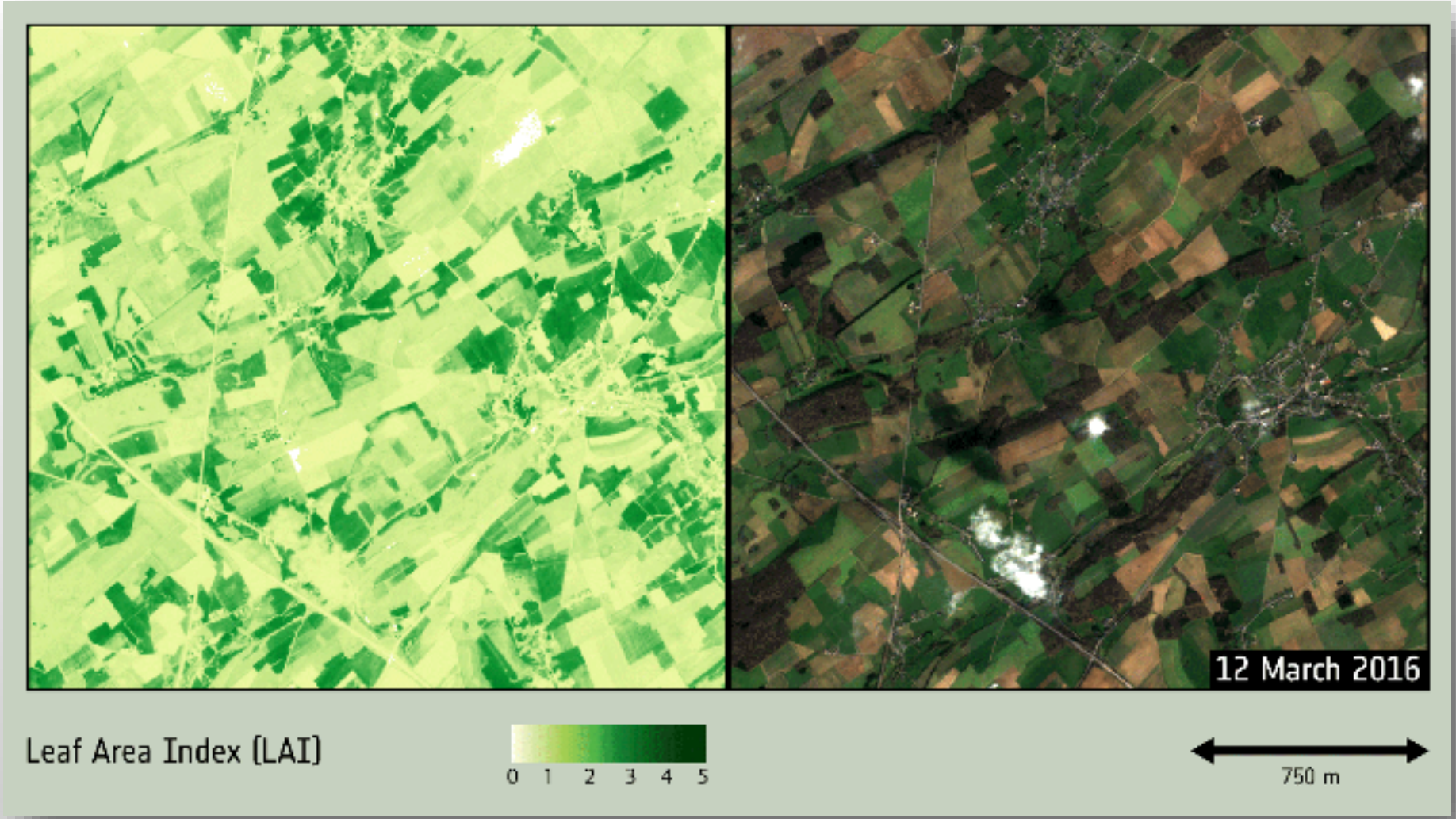
Oat	Tulip
Sugar beet	Winter carrot
Clover root	Winter wheat
Winter barley	Maize
Summer barley	Permanent crops
Lilium	Grass
Medicago	Summer wheat
Onion	Fallow
Potato	Other crops

Credits: Contains modified Copernicus Sentinel data (2017) and Land Parcel Information System (LPIS) of Netherlands, processed by ESA-Sen4CAP (led by UCLouvain with CS-Romania, e-GEOS, GISAT and Sinergise)

Agricultural_monitoring_in_spain – February To October 2016

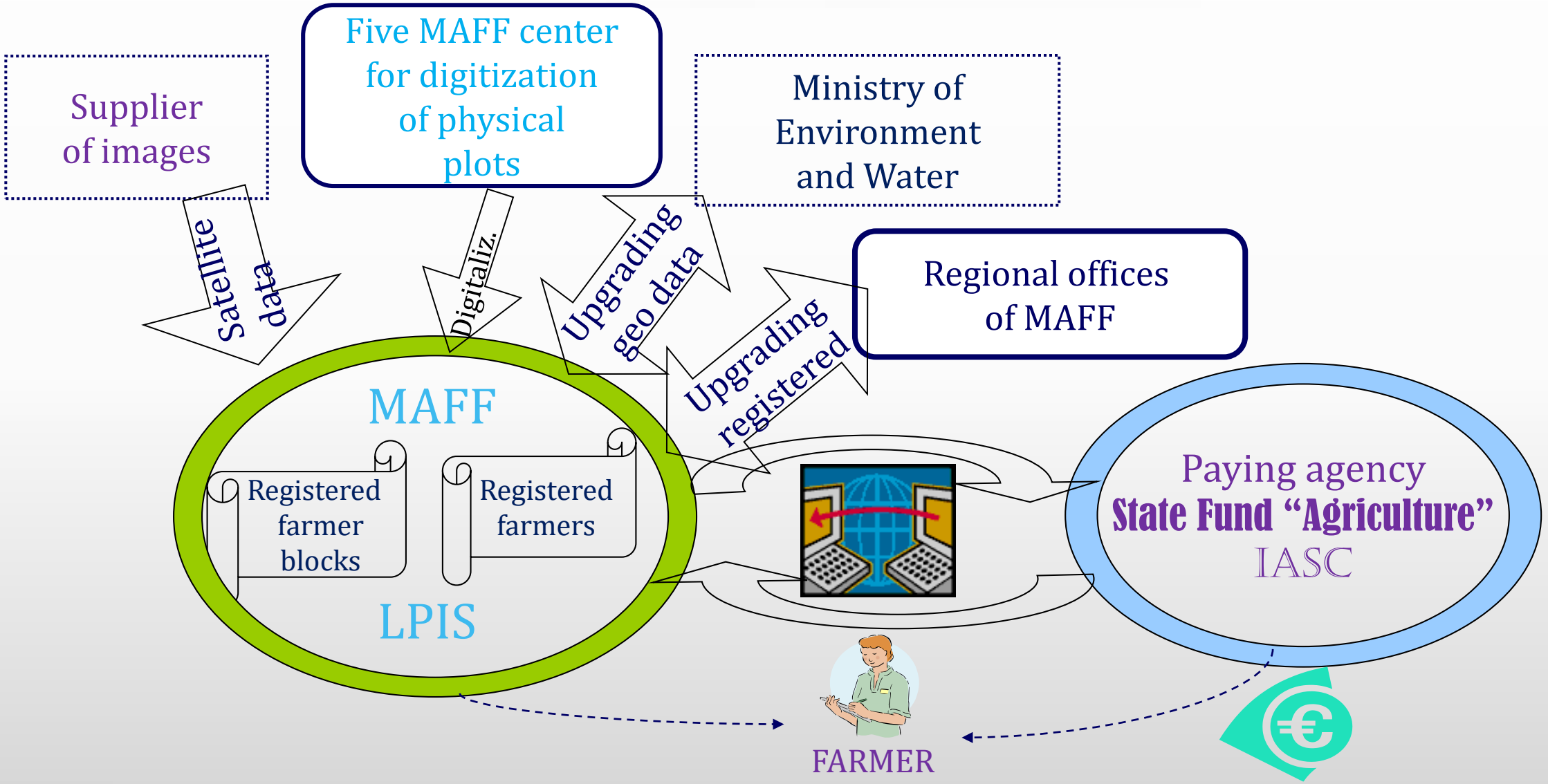
Changing landscape in Spain's Brazo de Este natural park and around the city of Los Palacios y Villafranca. Copyright: Contains modified Copernicus Sentinel data (2016), processed by ESA

Monitoring_crop_growth – Belgium, March-september 2016

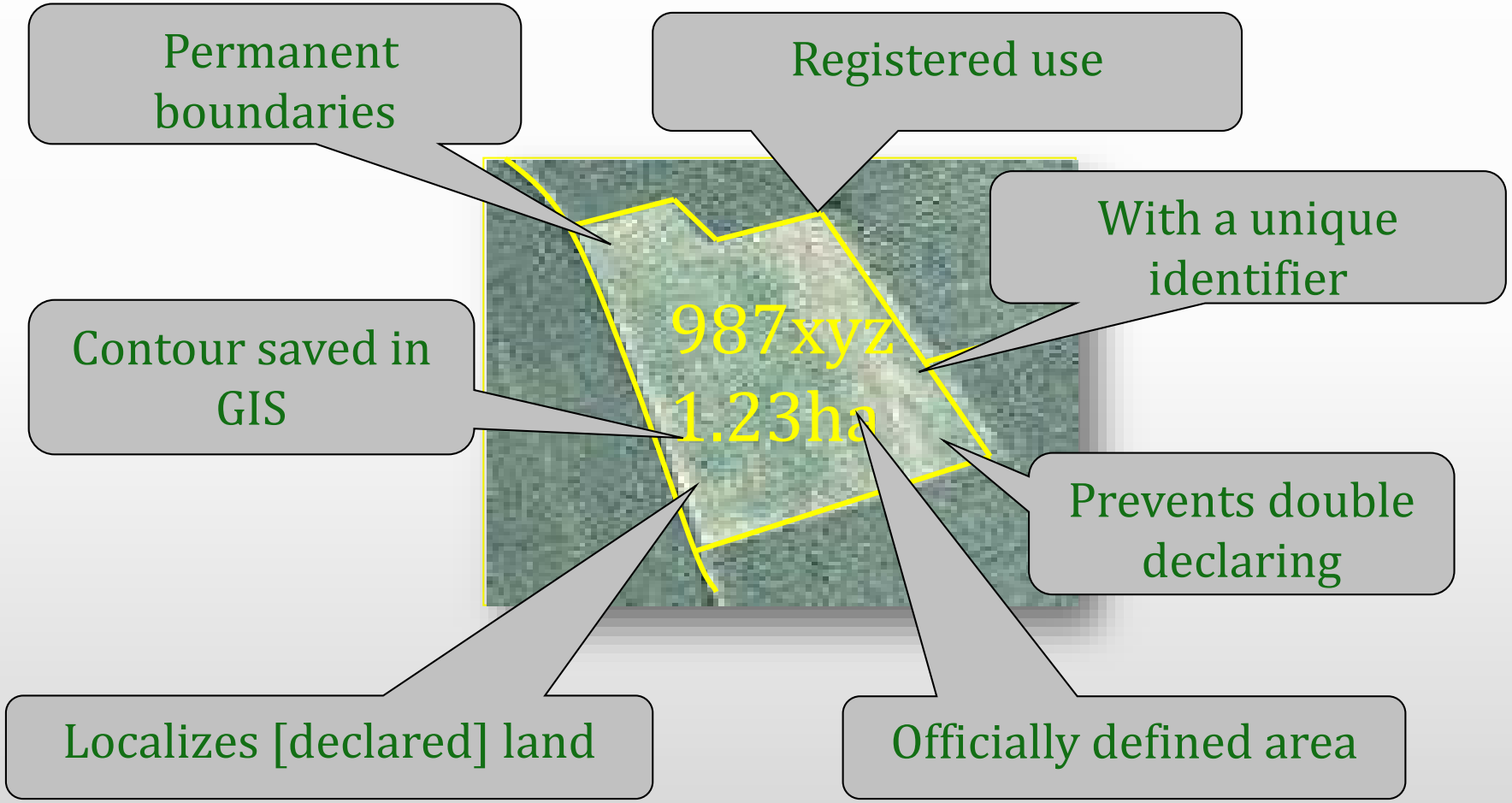


Integrated Administration and Control System **(IACS)** **&** Land Parcel Identification System **(LPIS)**

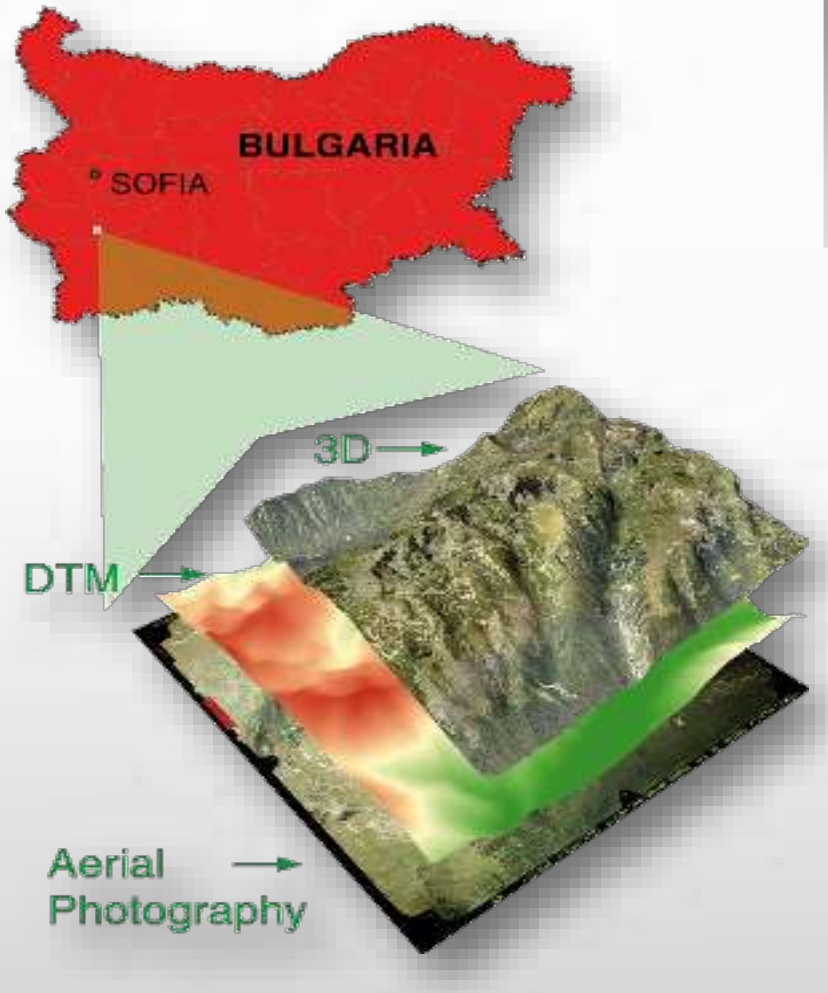
LPIS and IASC in Bulgaria



IACS - Bulgaria

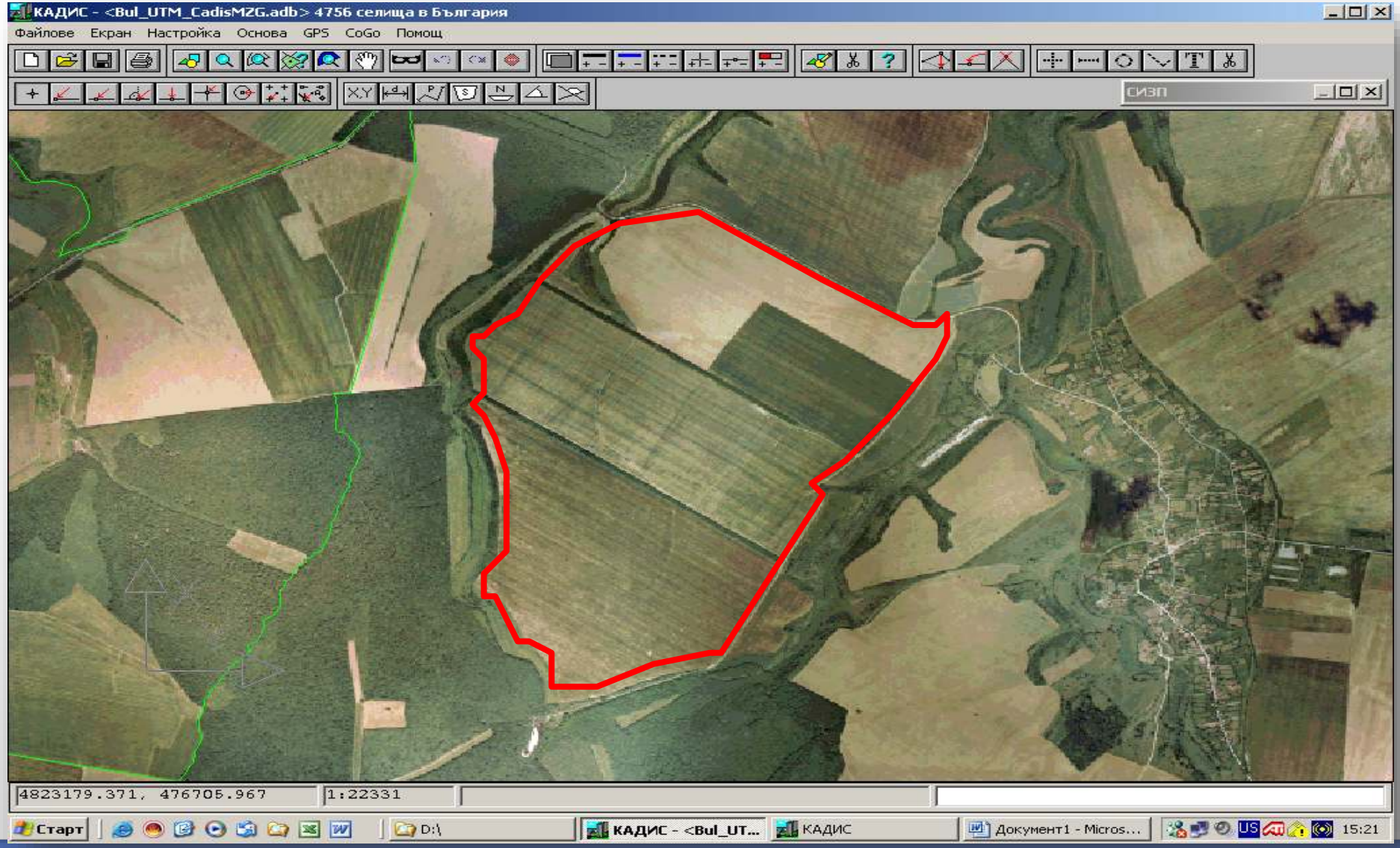


LPIS Orthophoto map of Bulgaria M1:5000

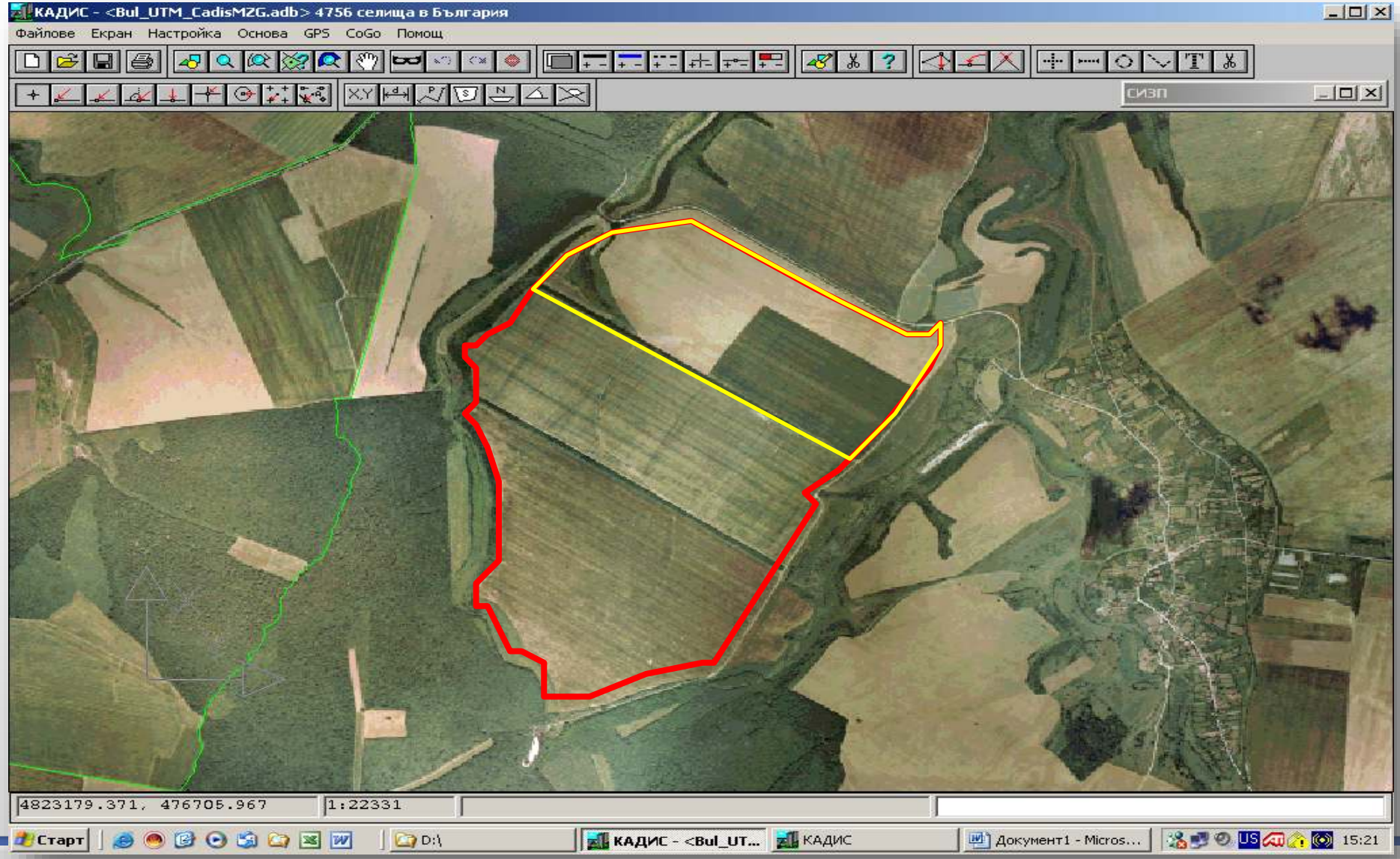


110 000	km² aerial photography by EUROSENSE
15 000	photographs 1: 25 000
7 000	orthos 1: 5 000

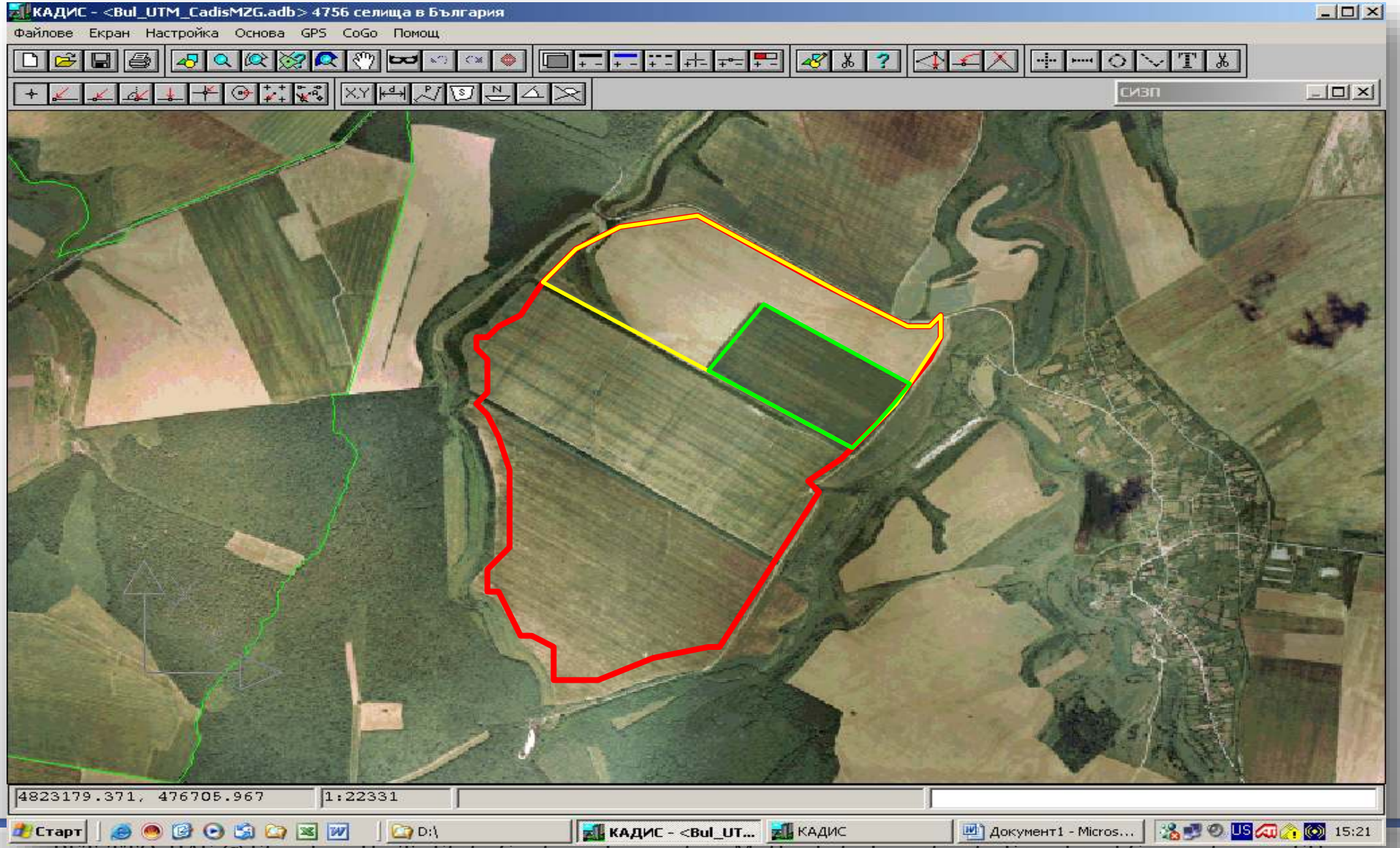
Determination Of The Physical Plot



Definition Of The Agricultural Plot

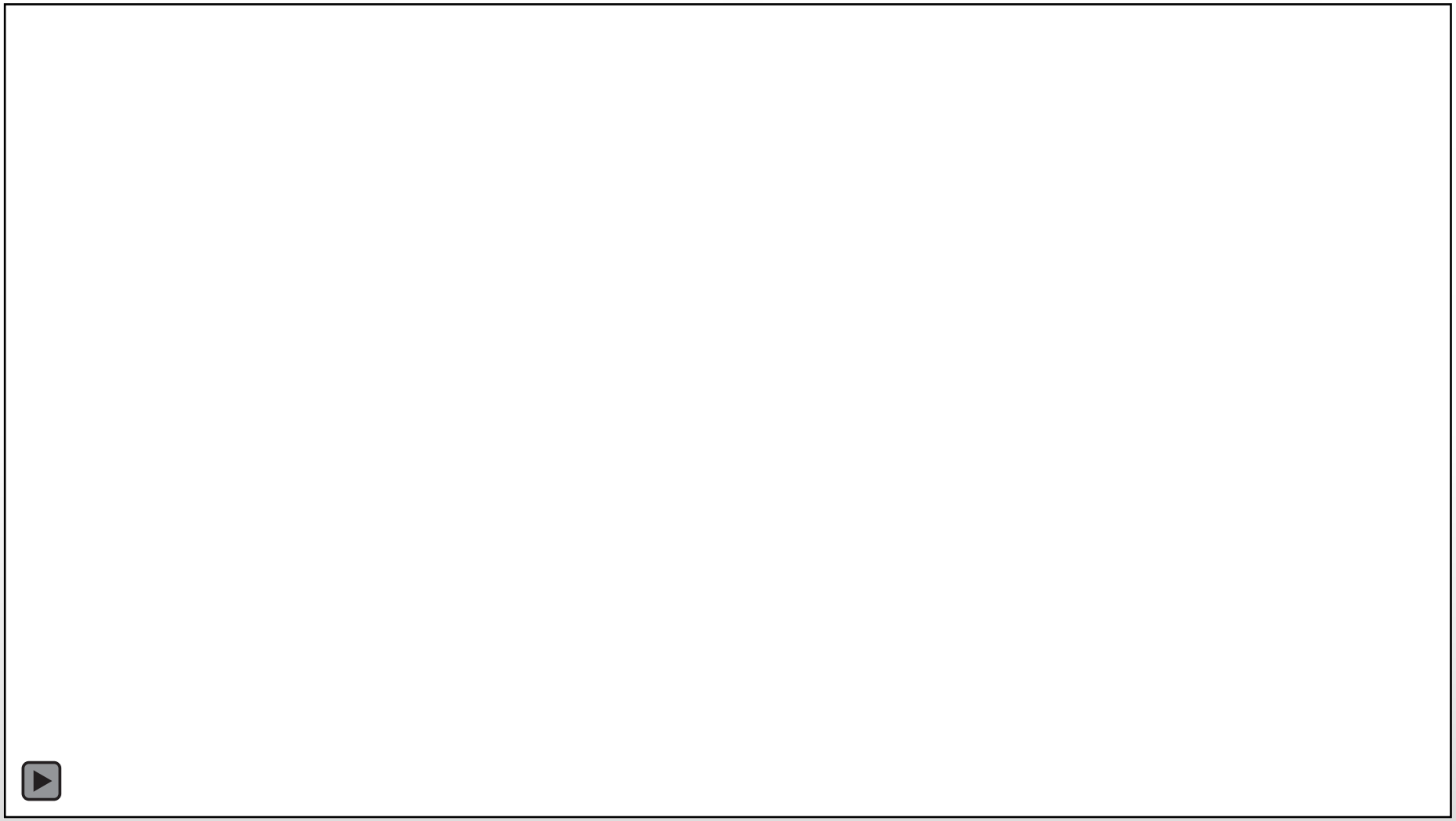


Determination Of The Agricultural Plot

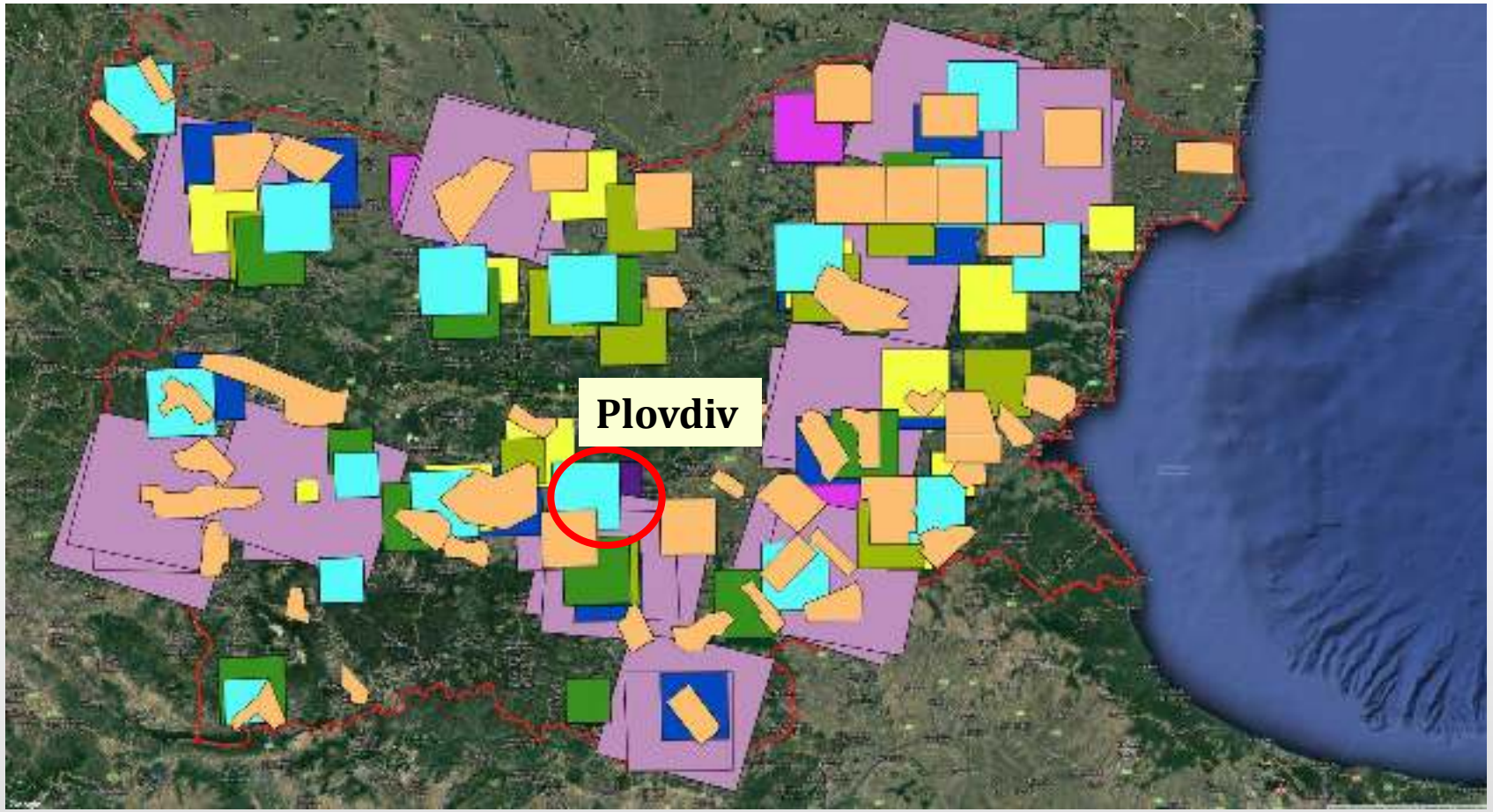


Control with Remote Sensing (CwRS) via Satellite in Bulgaria

CwRS in Bulgaria – spatial coverage



CwRS in Bulgaria –spatial coverage



CwRS in Bulgaria time series

CwRS in time series

CwRS in time series

True Colors

28 July 2015

12 July 2015

02 June 2015

23 April 2015

04 April 2015

22 March 2015

CwRS in time series

IR Colors

28 July 2015

CAP Support In Romania

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1. LPIS data integration
2. Copernicus Sentinel -2 data ingestion
3. Automatic detection of crop families based on Satellite Images Time Series
   - Minimum 0.5 ha parcel
   - 20 + different crops
4. Reporting thematic maps
   - Crop maps
   - Vegetation status indicators
   - Inconsistencies maps – pixel and parcel level

Processing Change

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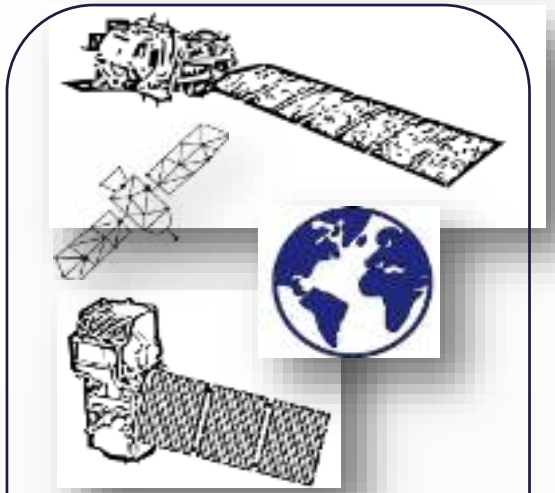


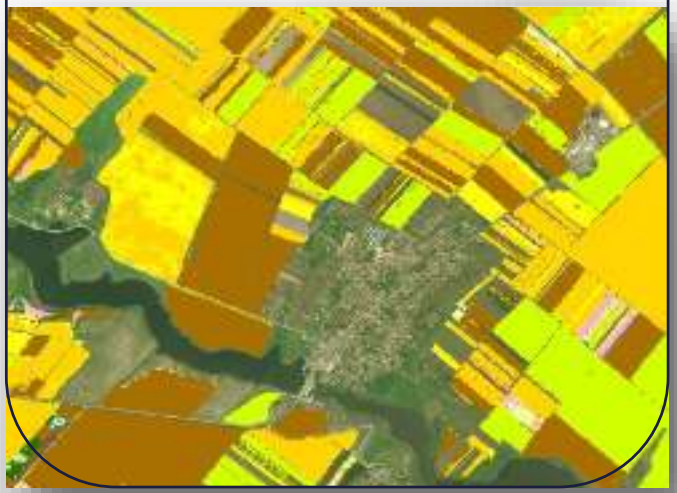
Earth Observation

Data transmission

Imagery and

information processing

Agricultural monitoring



CROP FAMILIES DETECTION

TERRASIGNA

Legend

- AOI - Study case
- Country border

Crop families

- Wheatlike crops
- Maizelike crops
- Sunflower and related crops
- Rapeseed and related crops
- Grasslands, pastures, meadows

An automatic detection of crop families, based Sentinel-2 time series, has been performed for an AOI situated in Ialomita county.
The analysis involved grouping the pixels into five classes, corresponding to different crop families: wheat and similar crop types, maize and similar crop types, sunflower and related crops, rapeseed and related crops and grassland / pastures.

THANK YOU !

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