Meeting Copernicus Objectives by Research and Development Projects

IGiK perspective

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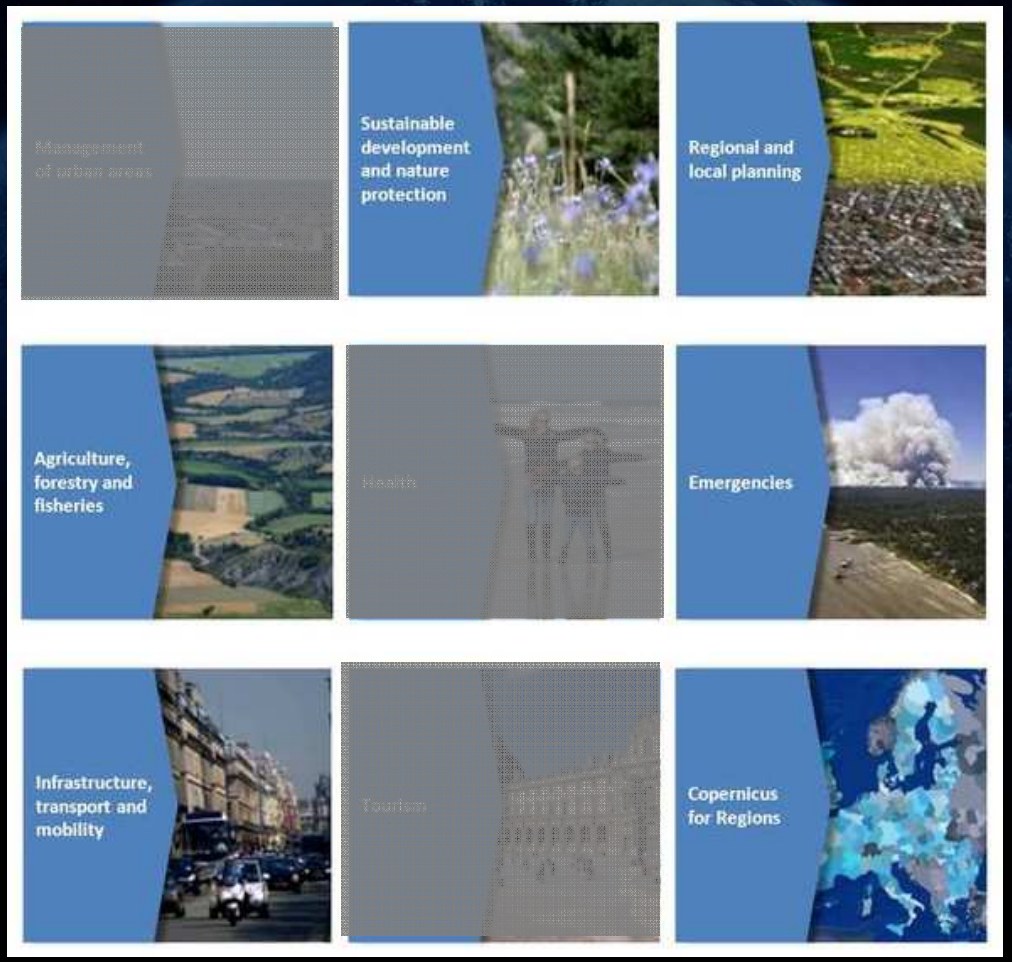
Copernicus Objectives

- to use multi-source data to get a timely and quality information, services and knowledge, and to provide autonomous and independent access to information in relation to environment and security on a global level.
- to pull together all the information obtained by the Copernicus environmental satellites, air and ground stations to provide a comprehensive picture of the "health" of Earth.

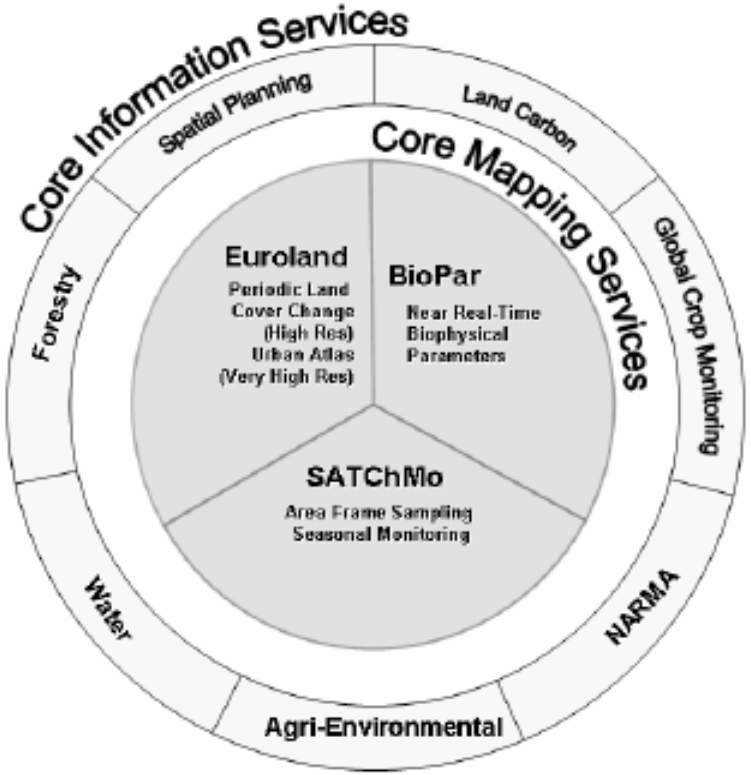
Domains of **Copernicus** Applications



Some research projects

- GEOLAND2
- GIO Land Monitoring – CORINE Land Cover
- Agriculture production prediction and assessment
- Draught, Fires, Flood Monitoring
- THE ISSUE
- DORIS_Net
- ENERGIC OD

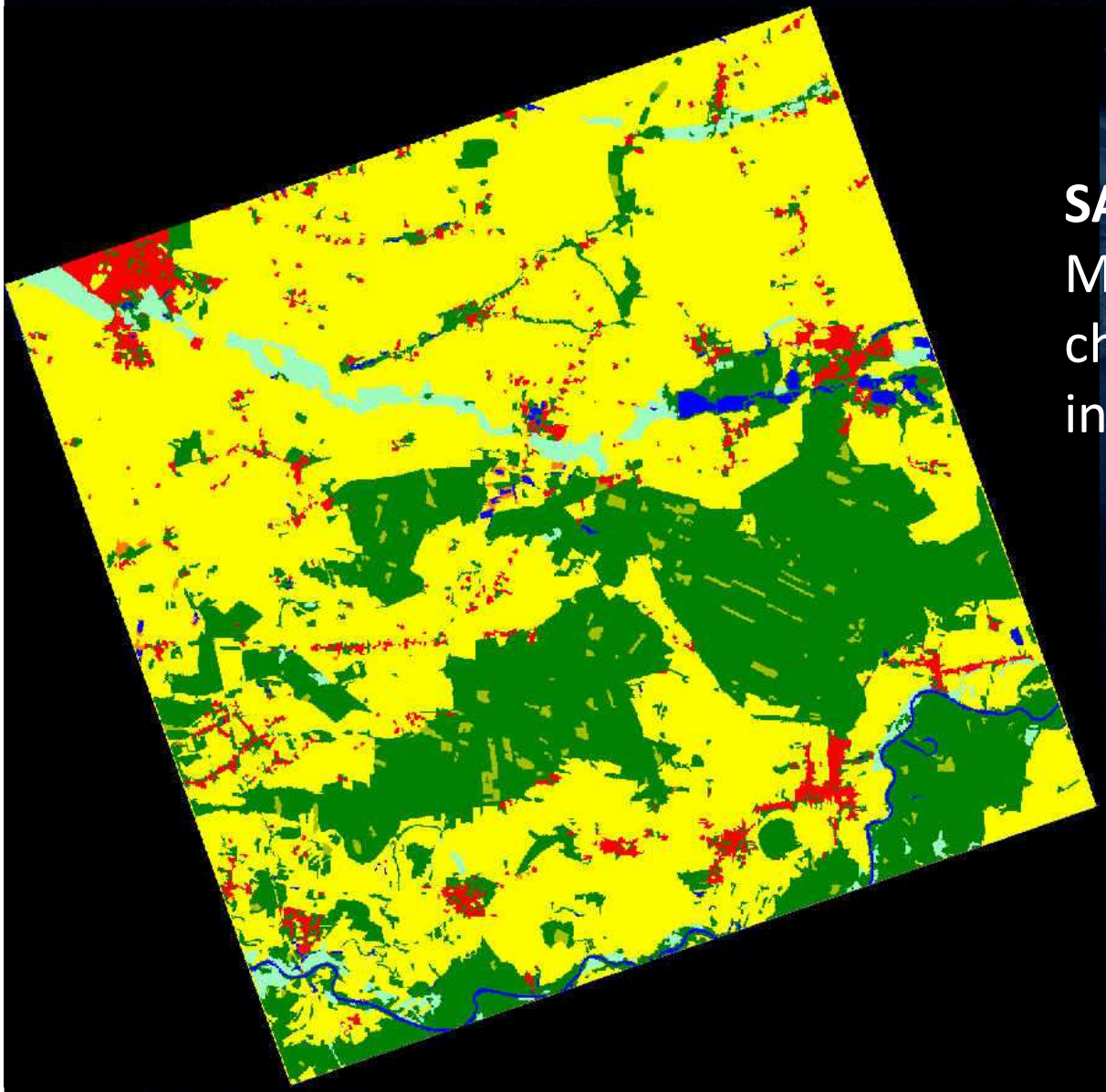
GEOLAND2 - Towards an Operational GMES Land Monitoring Core Service



3 Core Mapping Service

- Land Cover & Land use (EUROLAND)
- Biogeophysical Parameters (BioPar)
- Seasonal & Annual Change Monitoring (SATChMo)

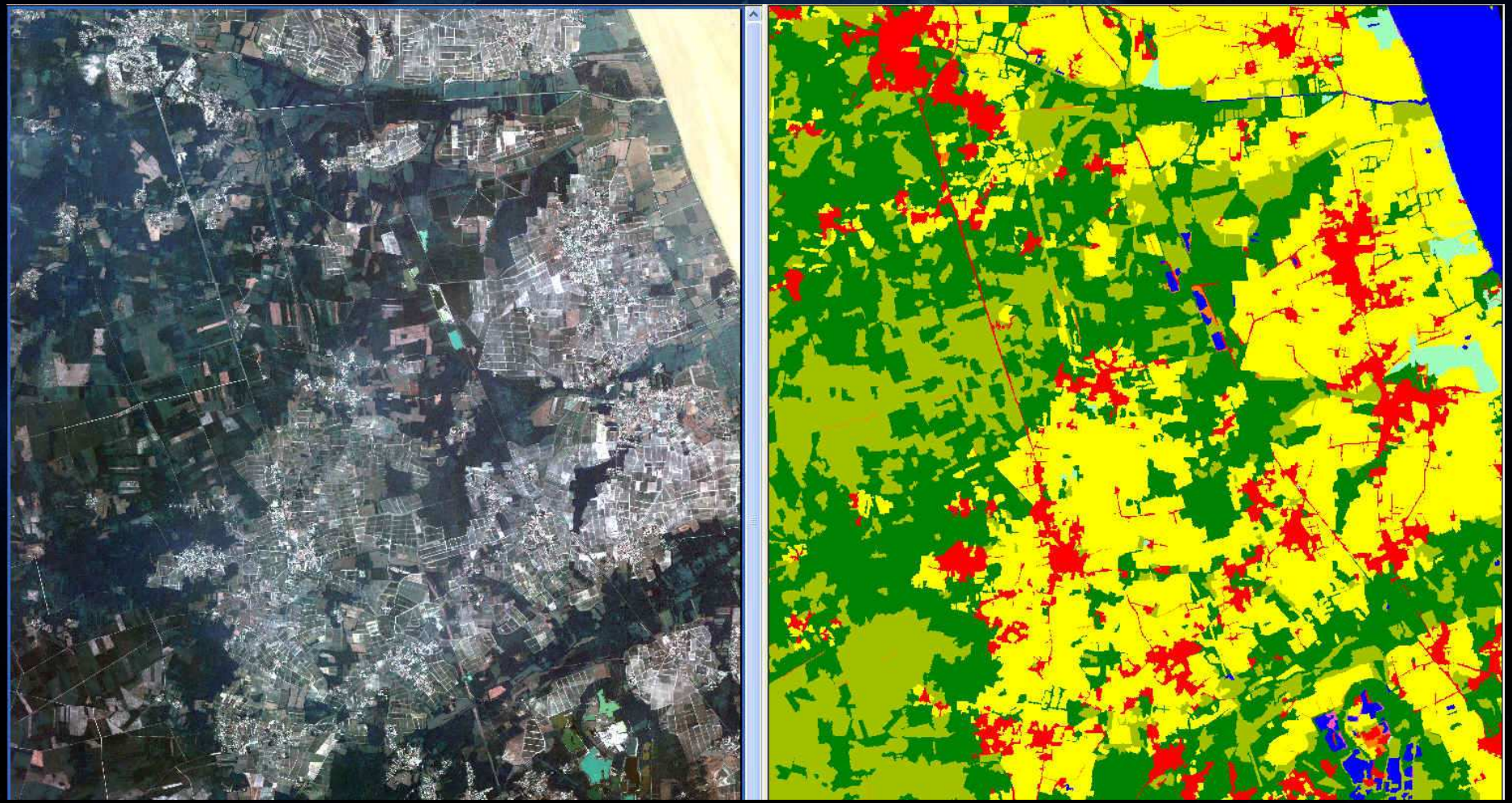
Automatic land cover classification



SATChMo
Method of land cover changes detection applied in 10 European regions

Land Cover Classification in selected regions

France


01_Urban_artificial
02_Bare ground (soil, rock, sand dunes, dry lakes, inter-tidal mud)
03_Water
04_Snow_and_ice
05_Agricultural_areas
06_Forest_woodland_trees
07_Sparse_woody_vegetation
08_Grassland (natural grasslands)
09_Other_vegetation (moorland, reed beds, saltmarch)
10_Cloud_voids_etc

Copernicus Land Monitoring component in Poland

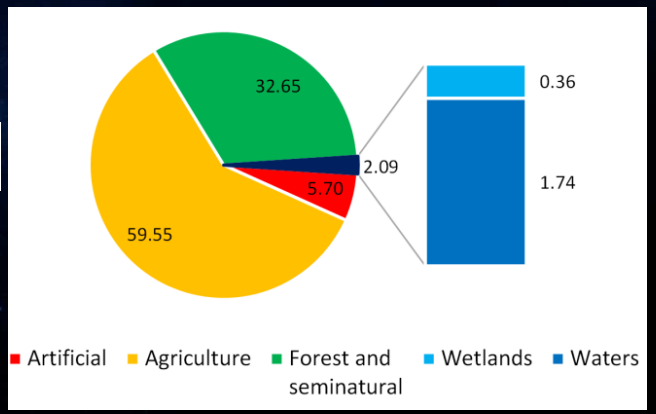
CORINE Land Cover 2012 Map for Poland

Nomenclature three levels – 44 classes at level-3

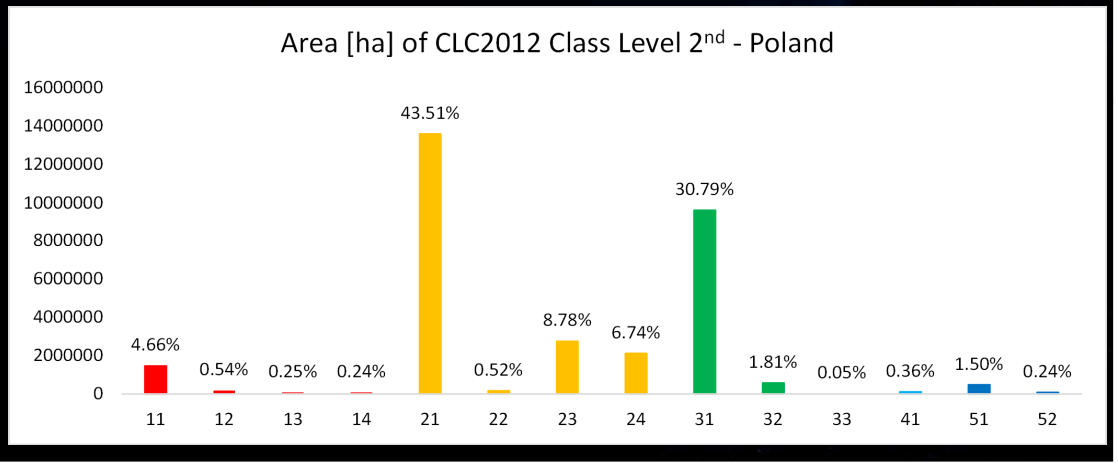
- Mapping land cover changes **2006-2012** (MMU 5 ha)
- Producing **CLC2012** database (MMU 25 ha)

Long heritage: CLC1990, CLC2000, CLC2006 – IGIK participated in all pervious CLC inventories

CLC2012- level 1

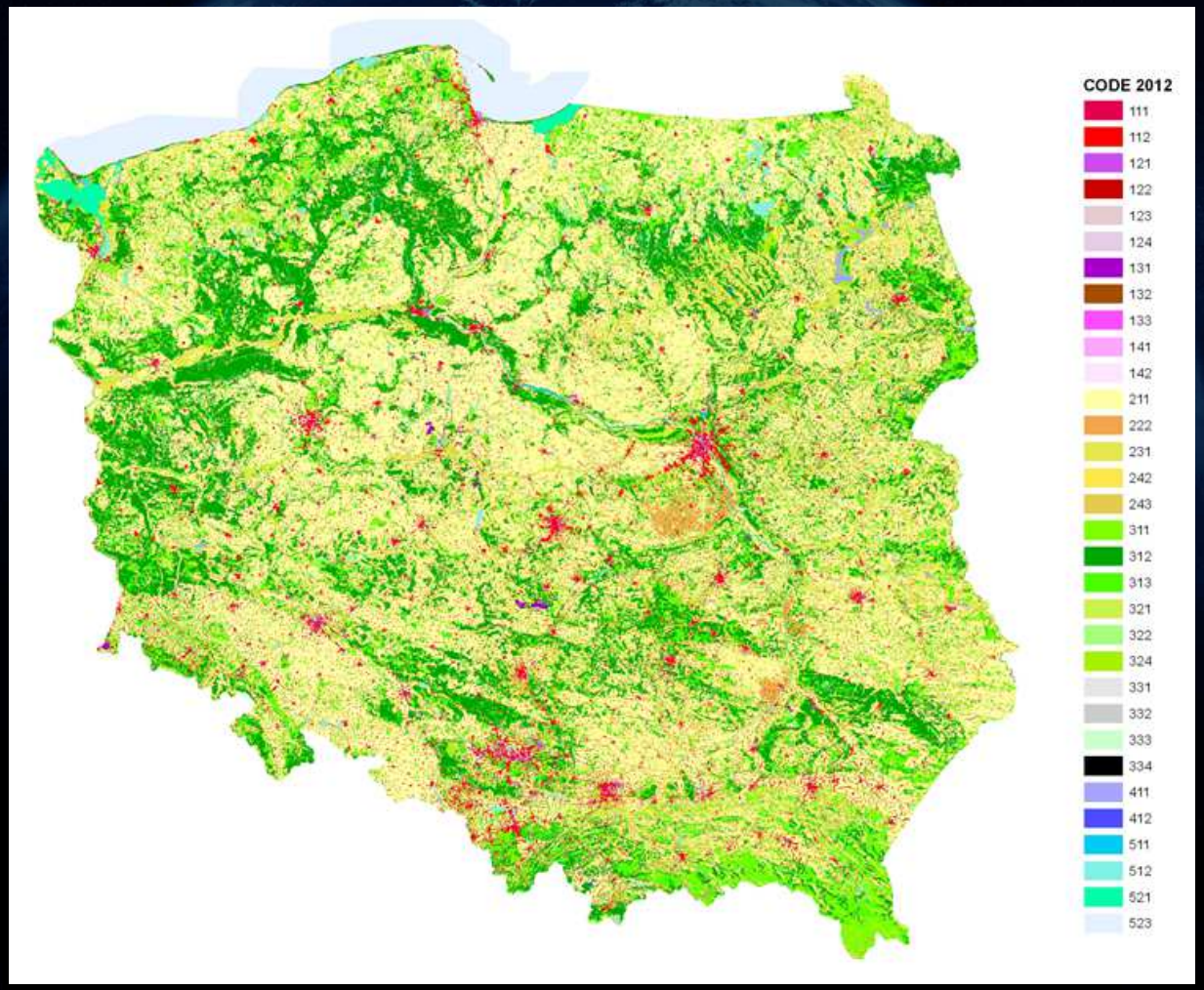


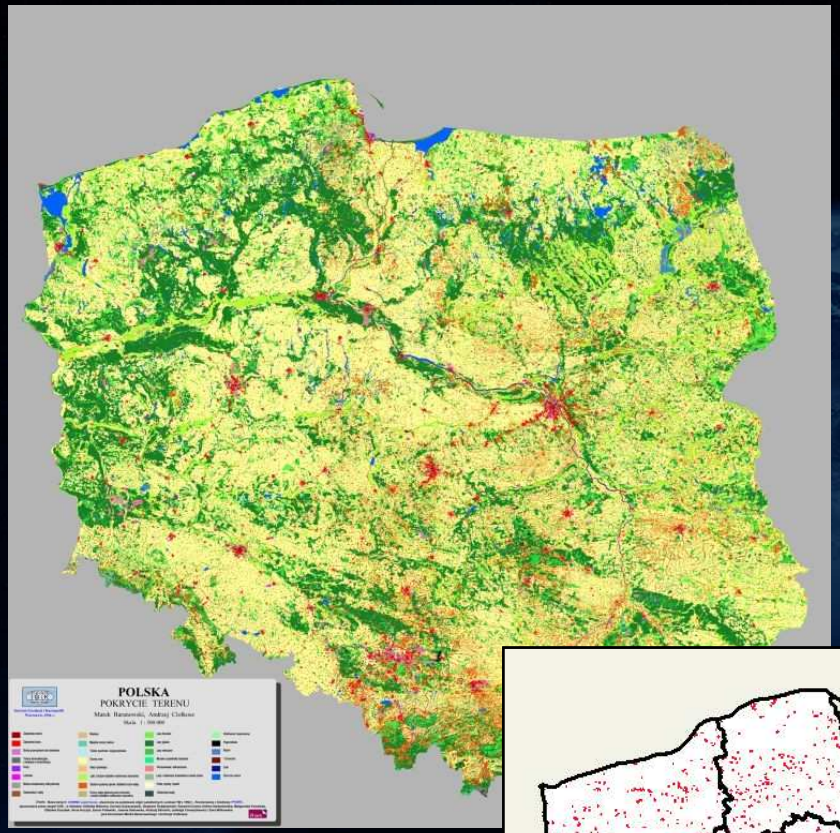
CLC2012- level 2

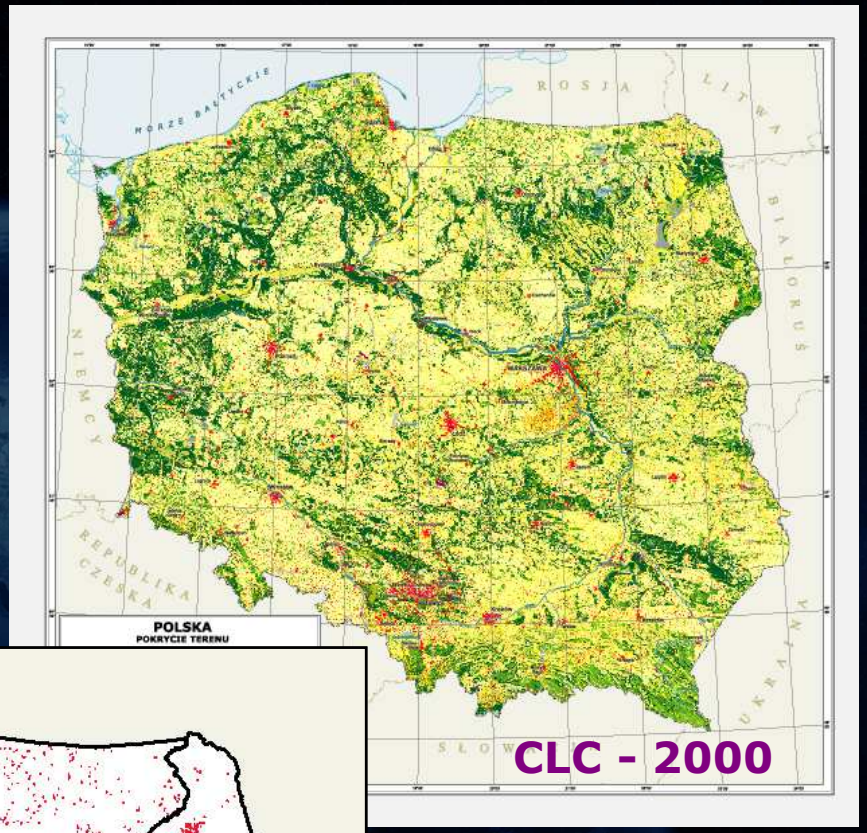


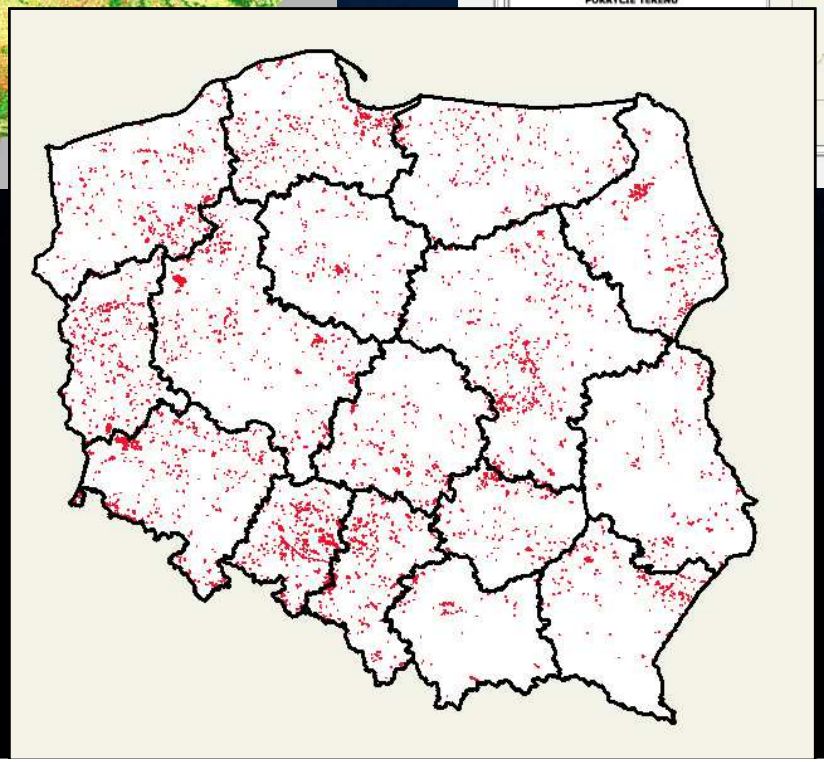
Copernicus Land Monitoring component in Poland

CLC2012- level 3 (with buffer) – 31 classes in Poland





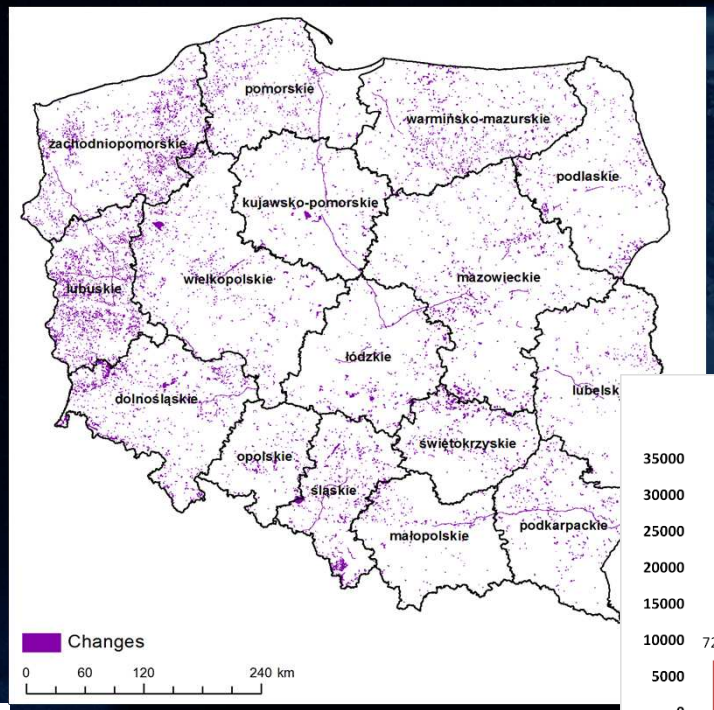




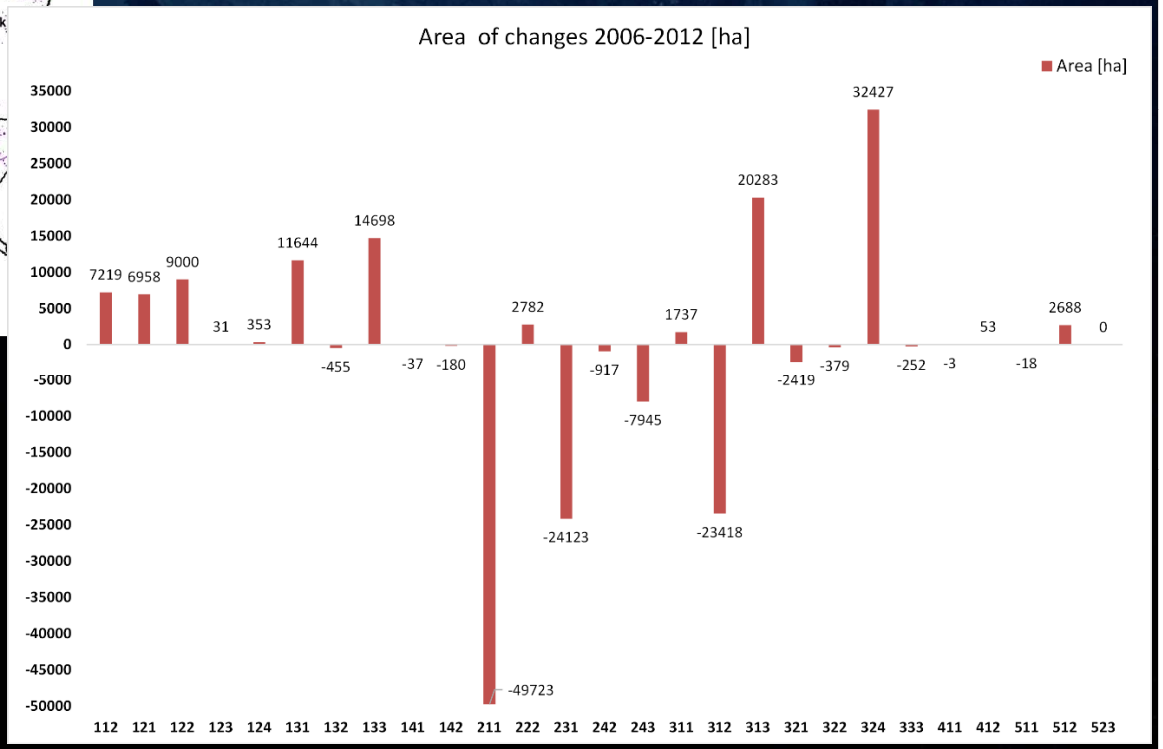
Distribution of land cover changes

1990 →2000

Copernicus Land Monitoring component in Poland



CLC-changes 2006-2012

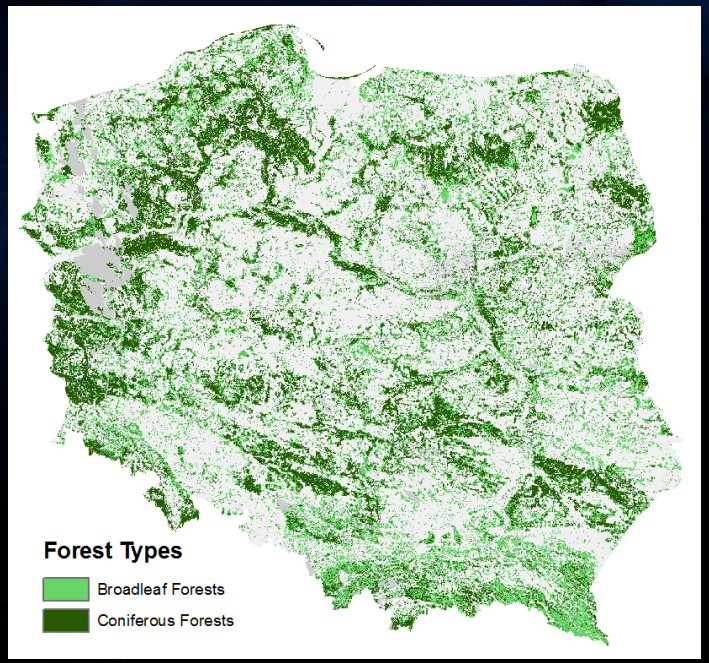


http://www.igik.edu.pl/pl/corine-projekt

Copernicus Land Monitoring component in Poland

Verification and enhancement of the 5 high resolution layers (HRLs):

- Imperviousness,
- Forest (Tree cover and Forest type),
- Permanent grasslands,
- Wet lands and water bodies

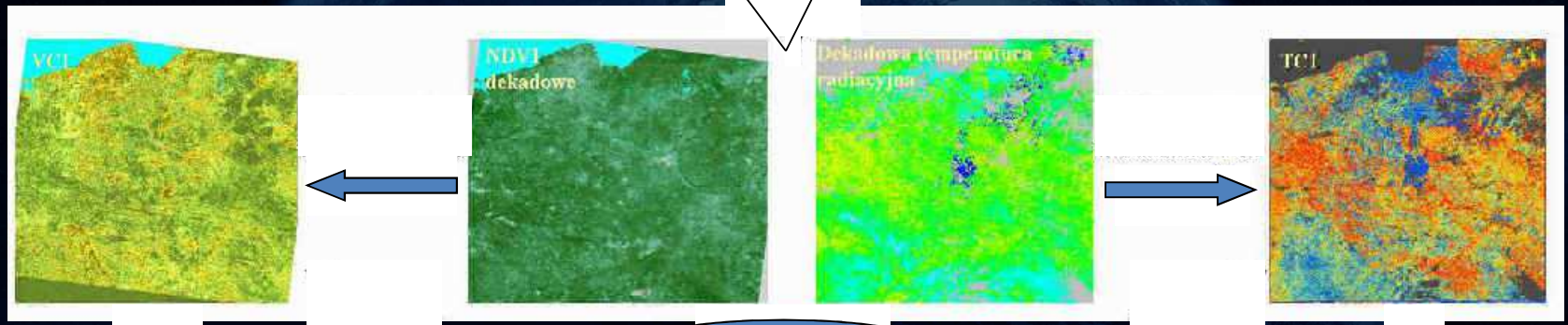


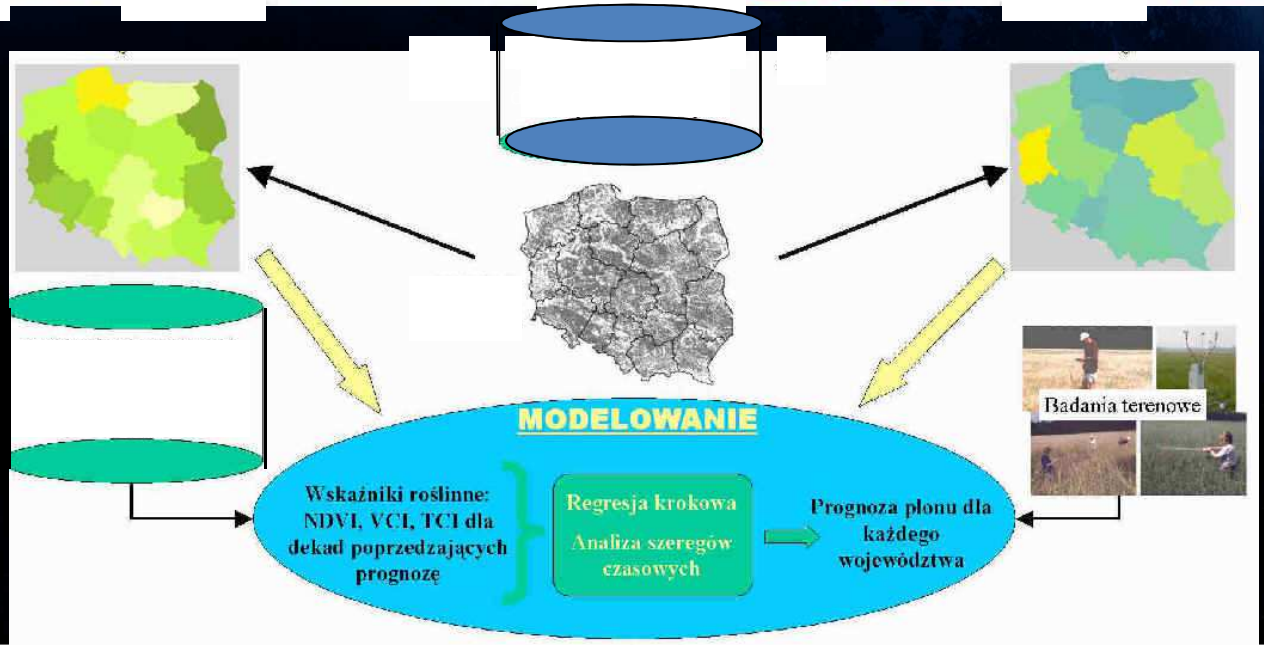
MMU 20x20 m

Reference year 2012

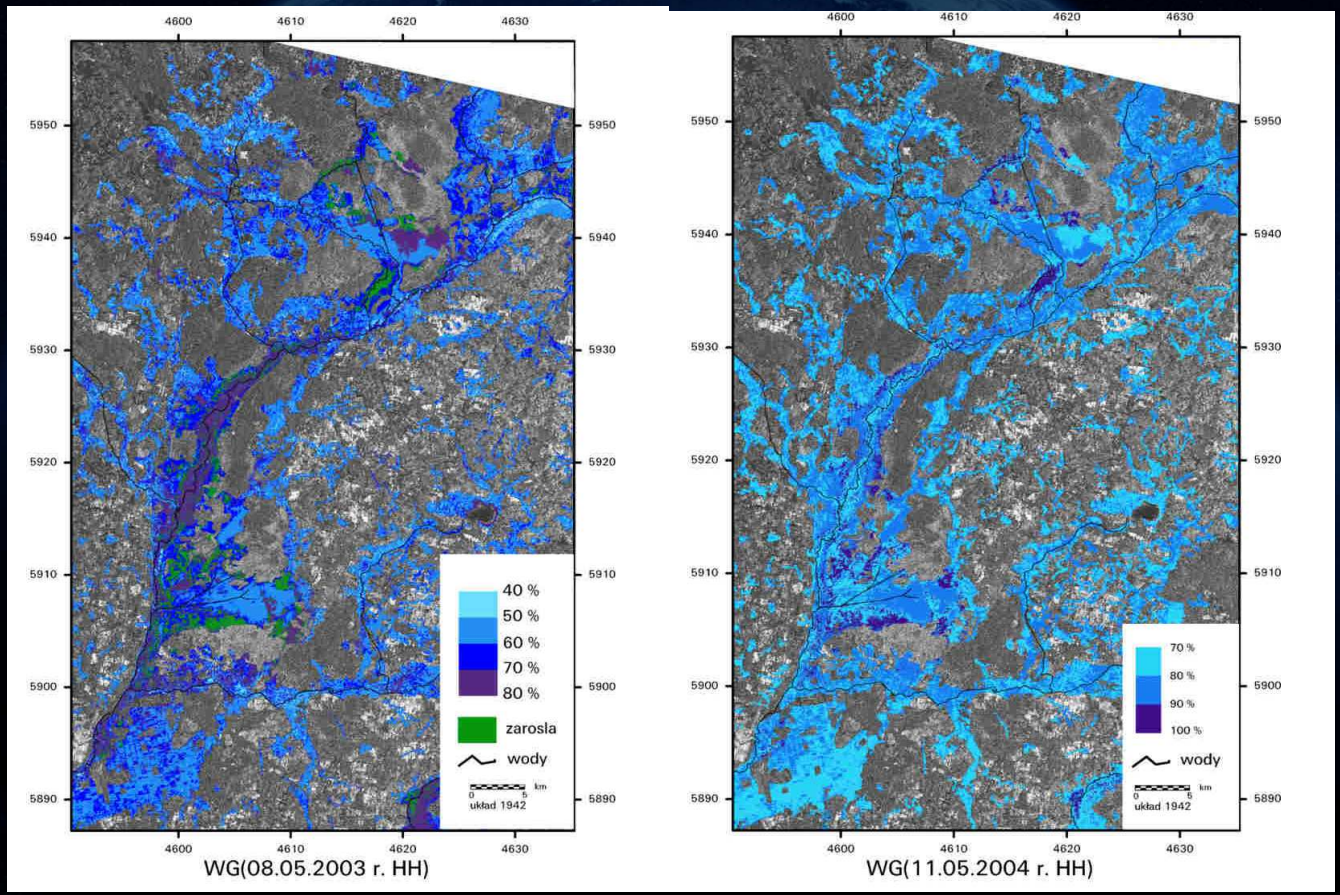
Verification against *in situ* data

Cereal Yield Forecasting based on satellte data

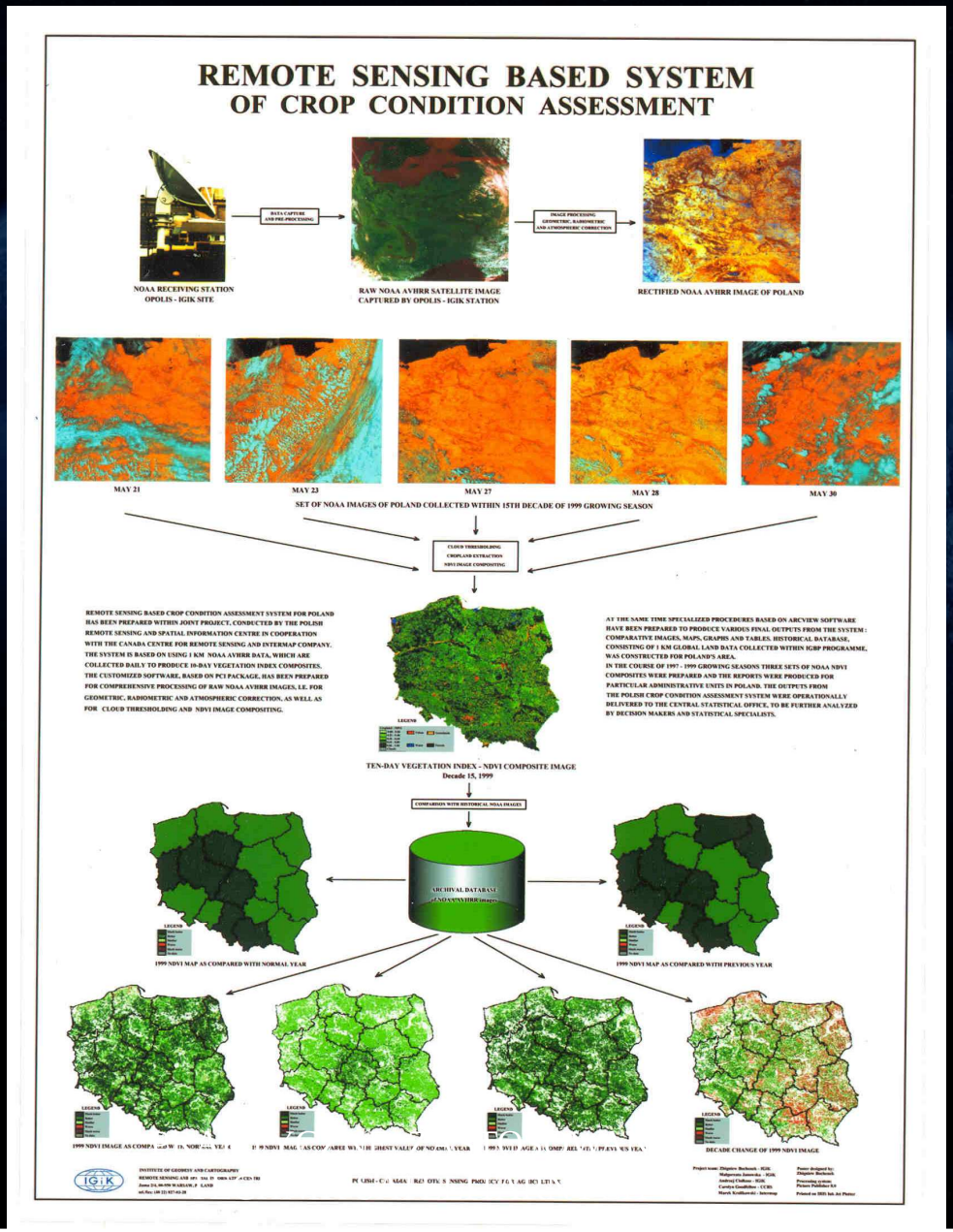




Grassland soil moisture in Biebrza Valley based on the microwave images by Envisat mission



Remote sensing based system of crop condition assessment



Vegetation indicators

Standardized vegetation index

$$NDVI = \frac{K_2 - K_1}{K_2 + K_1}$$

Processed vegetation index

$$TVI = \left(\frac{K_2 - K_1}{K_2 + K_1} + 0{,}5 \right)^{0{,}5} \times 100$$

Vegetation condition index

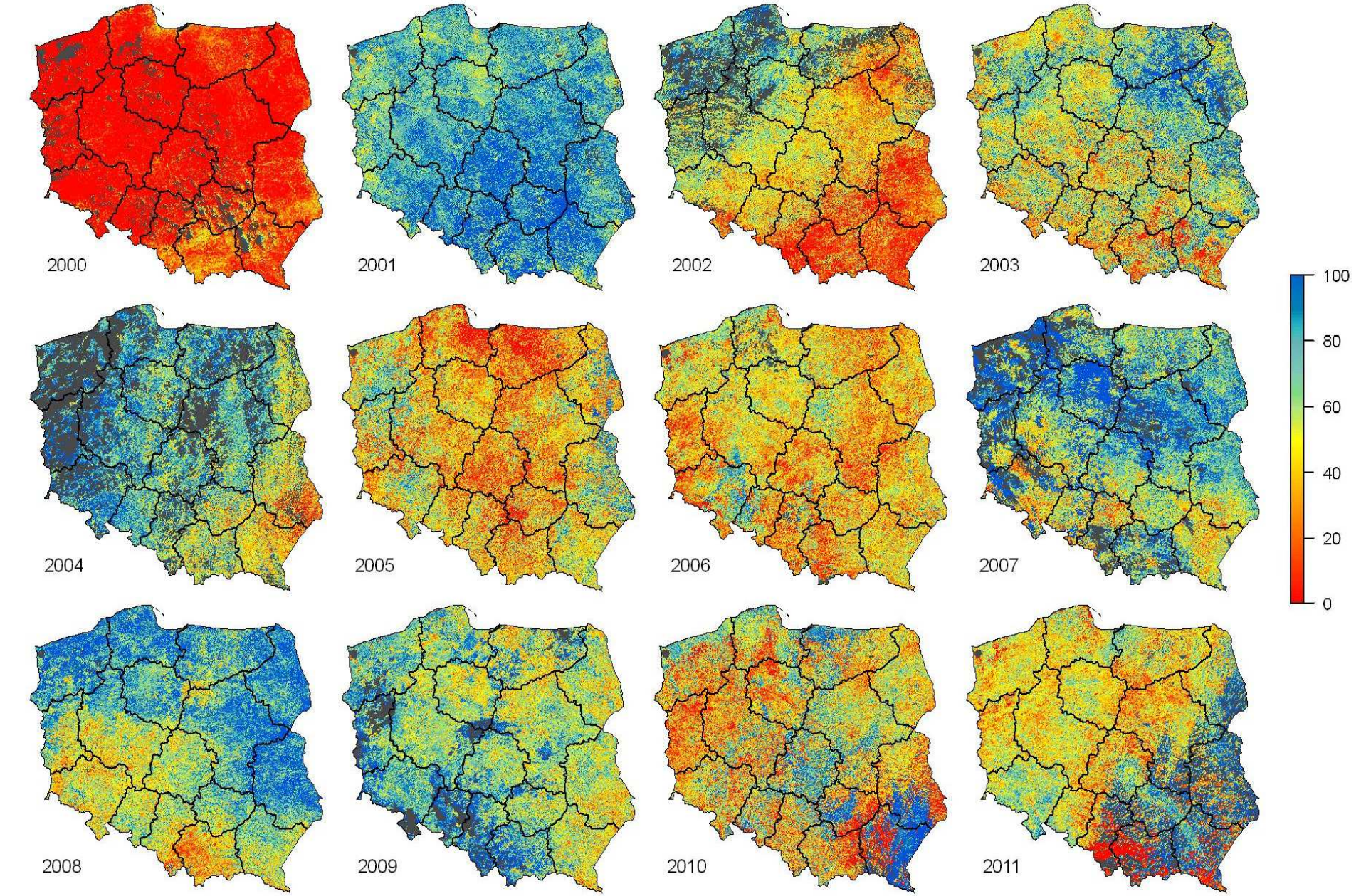
$$VCI = 100 \times \frac{NDVI - NDVI_{min}}{NDVI_{max} - NDVI_{min}}$$

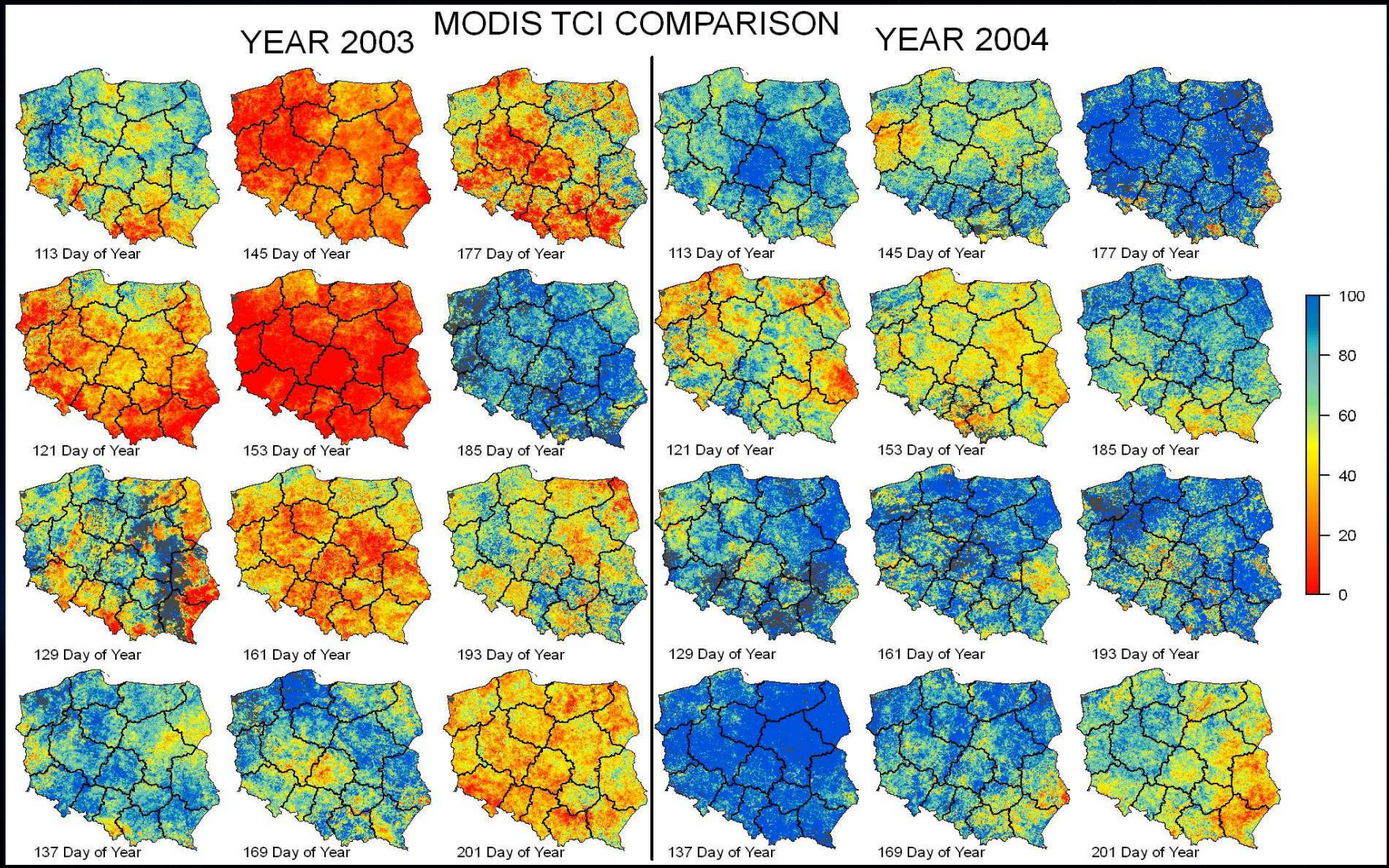
Thermal condition index

$$TCI = 100 \times \frac{T_{\max} - T_{akt}}{T_{\max} - T_{\min}}$$

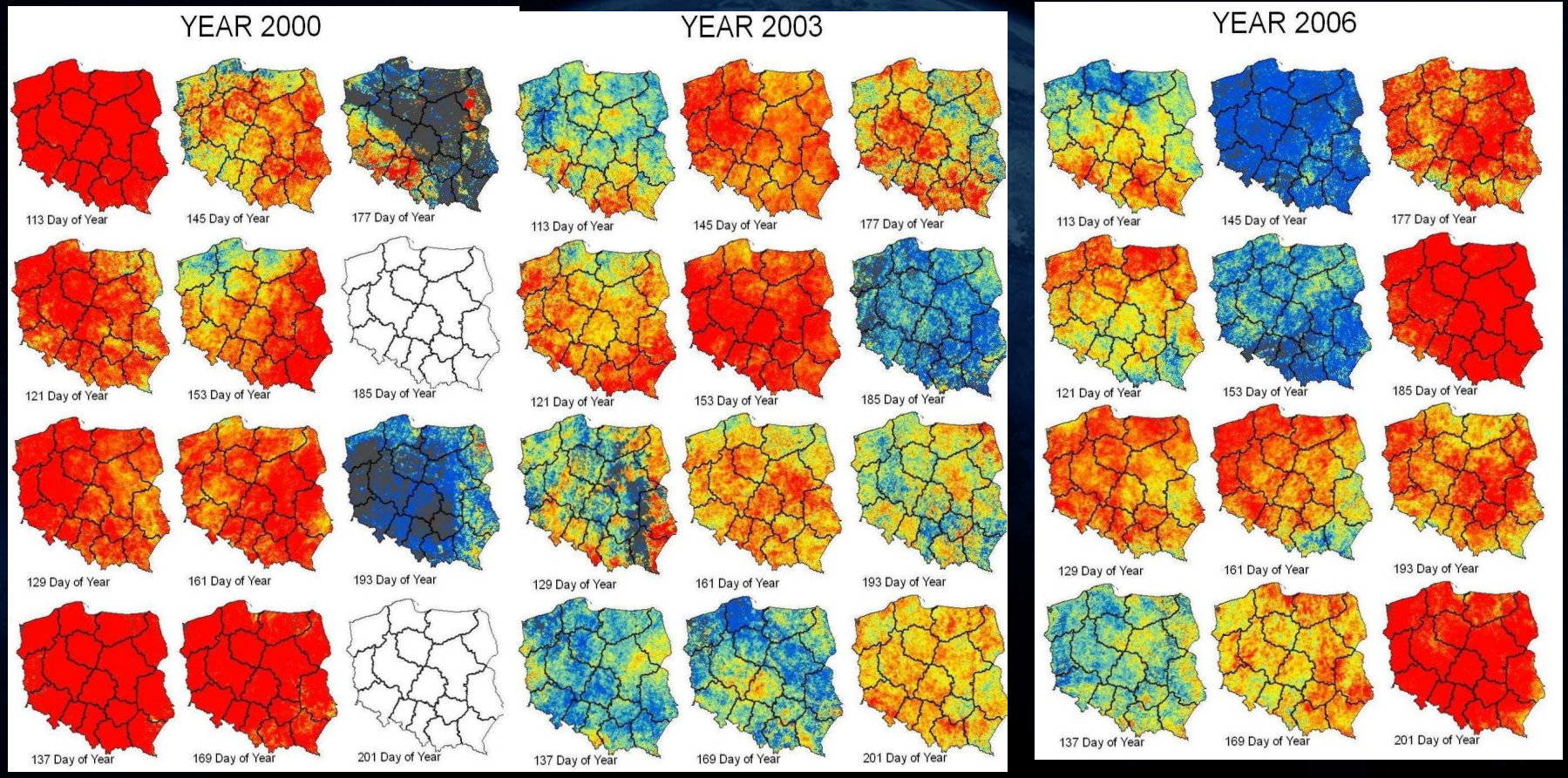
Ten days standardise observations for 17 years

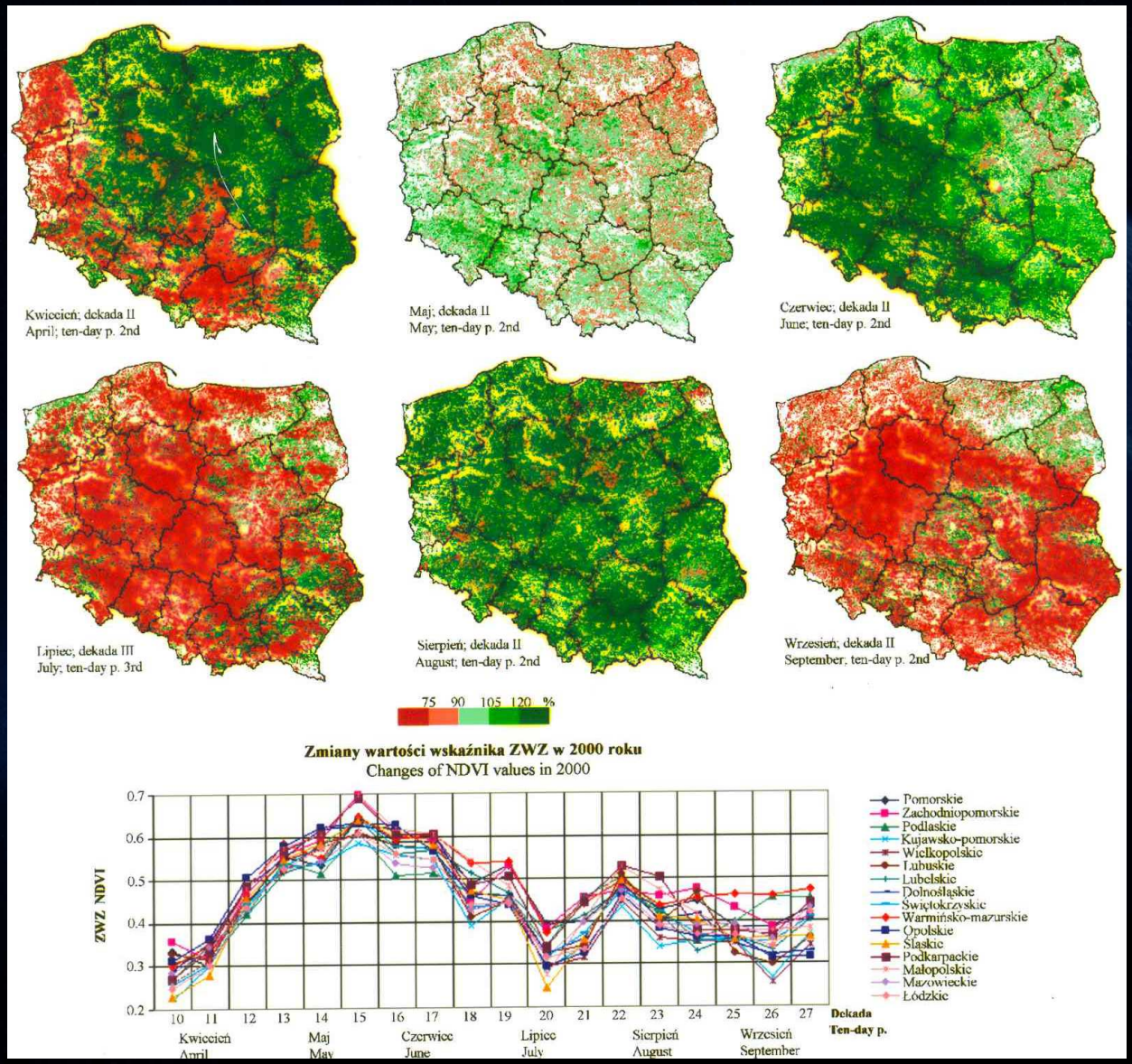
NOAA TCI 2000 ÷ 2011 18-TEN DAY PERIOD




MODIS TCI COMPARISON
YEAR 2003
YEAR 2004
113 Day of Year
145 Day of Year
177 Day of Year
121 Day of Year
153 Day of Year
185 Day of Year
129 Day of Year
161 Day of Year
193 Day of Year
137 Day of Year
169 Day of Year
201 Day of Year
100
80
60
40
20
0

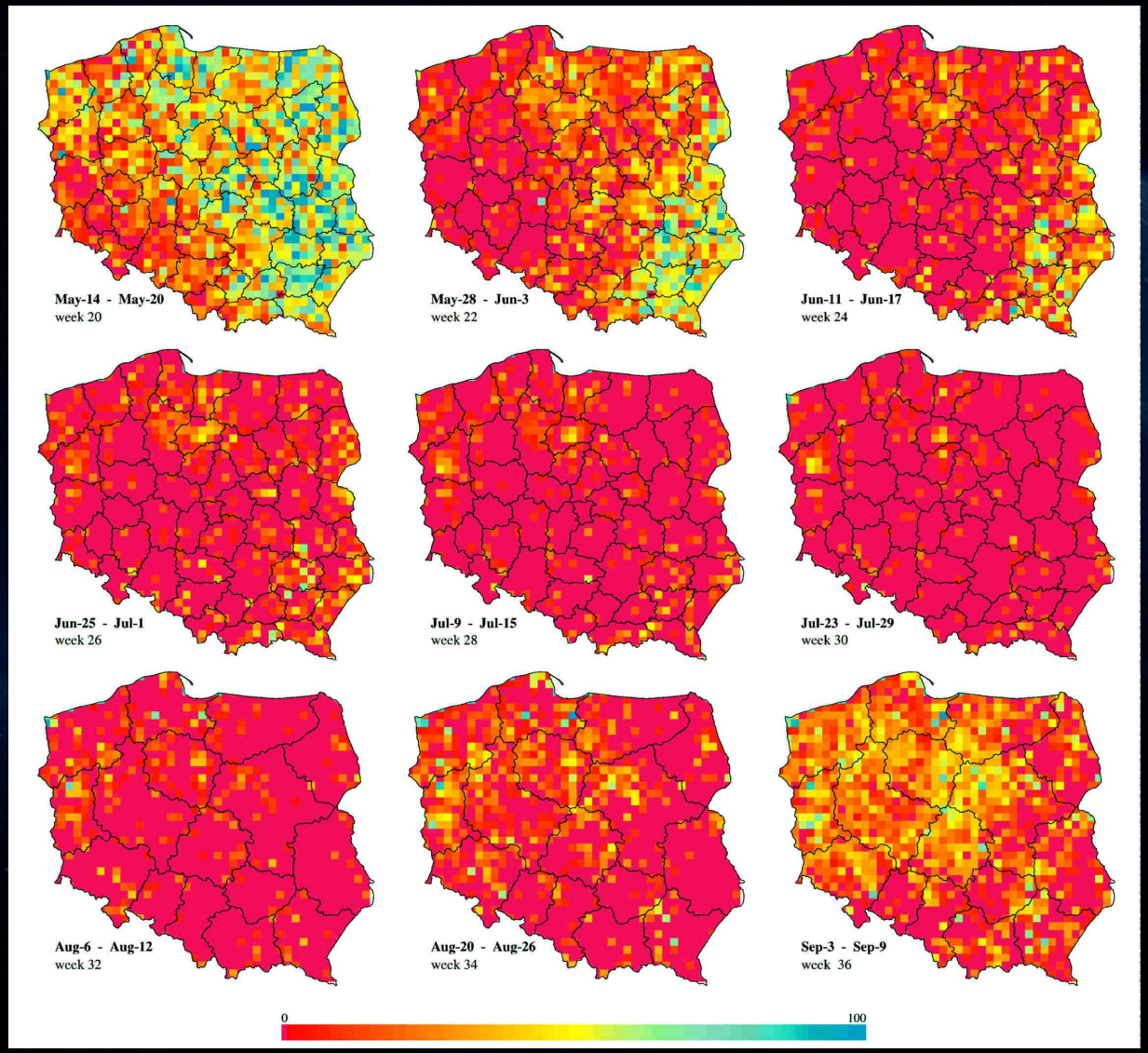
MODIS TCI – YEARS WITH DROUGHT





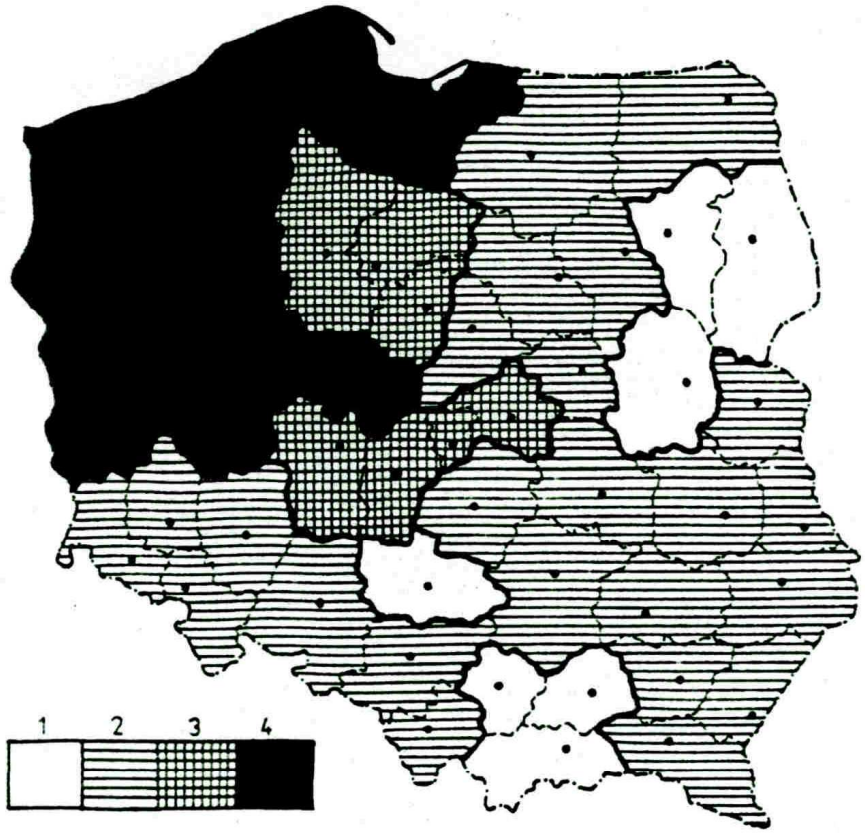
Monitoring of cultivable plants

Draft monitoring in Poland

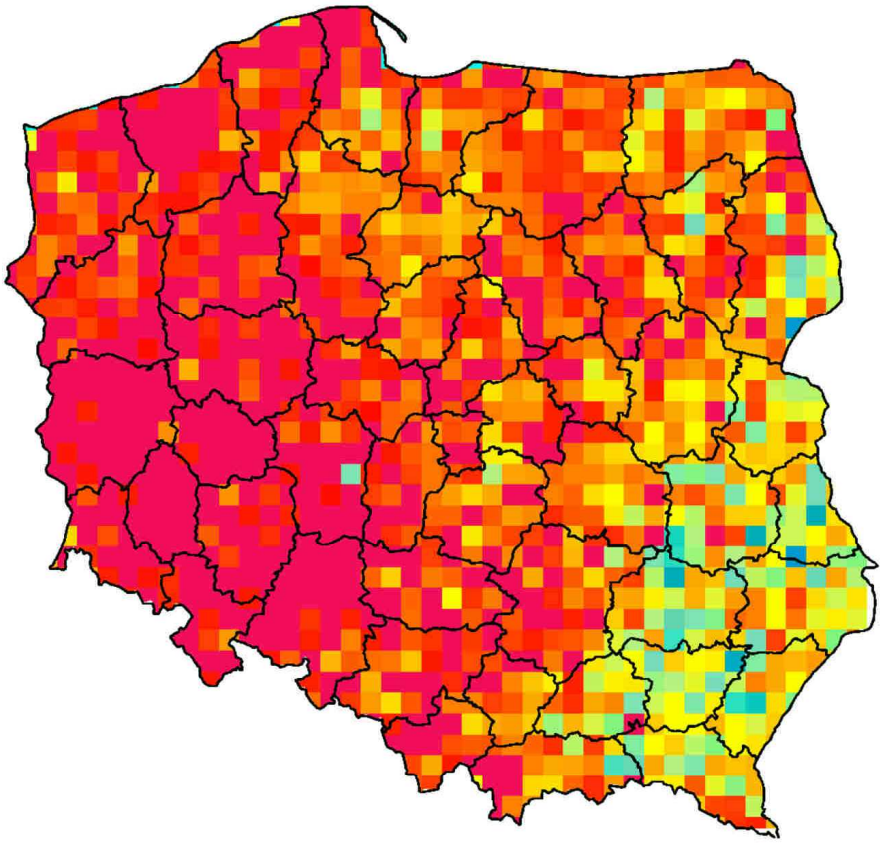


in ten days interval

Drought in 1992 r.

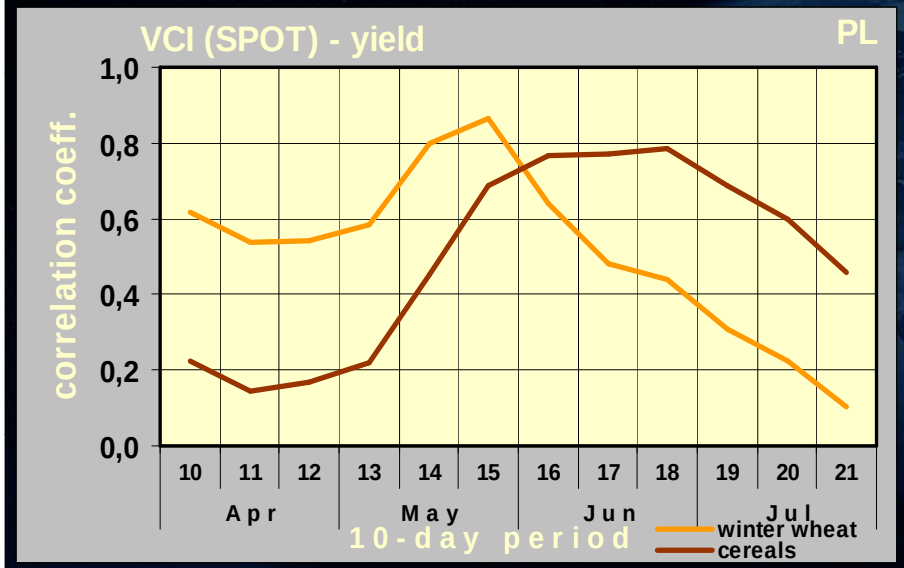


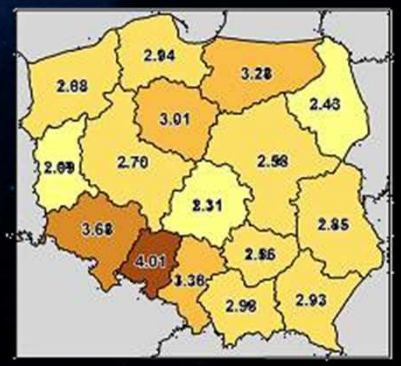
30 czerwca 1992
26 tydzień

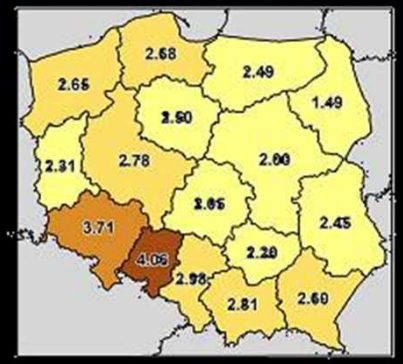


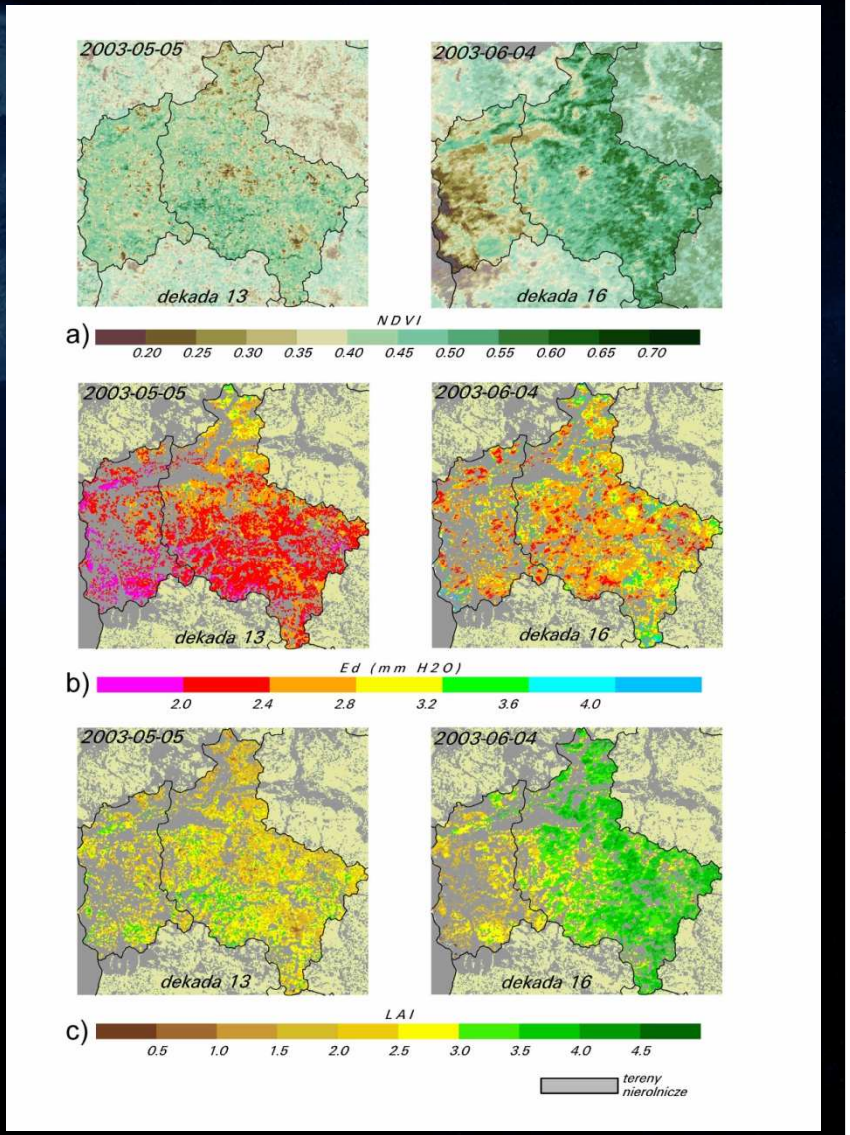
25 maja - 3 czerwca 1992
22 tydzień

Draughts and Yield Reduction Forecast

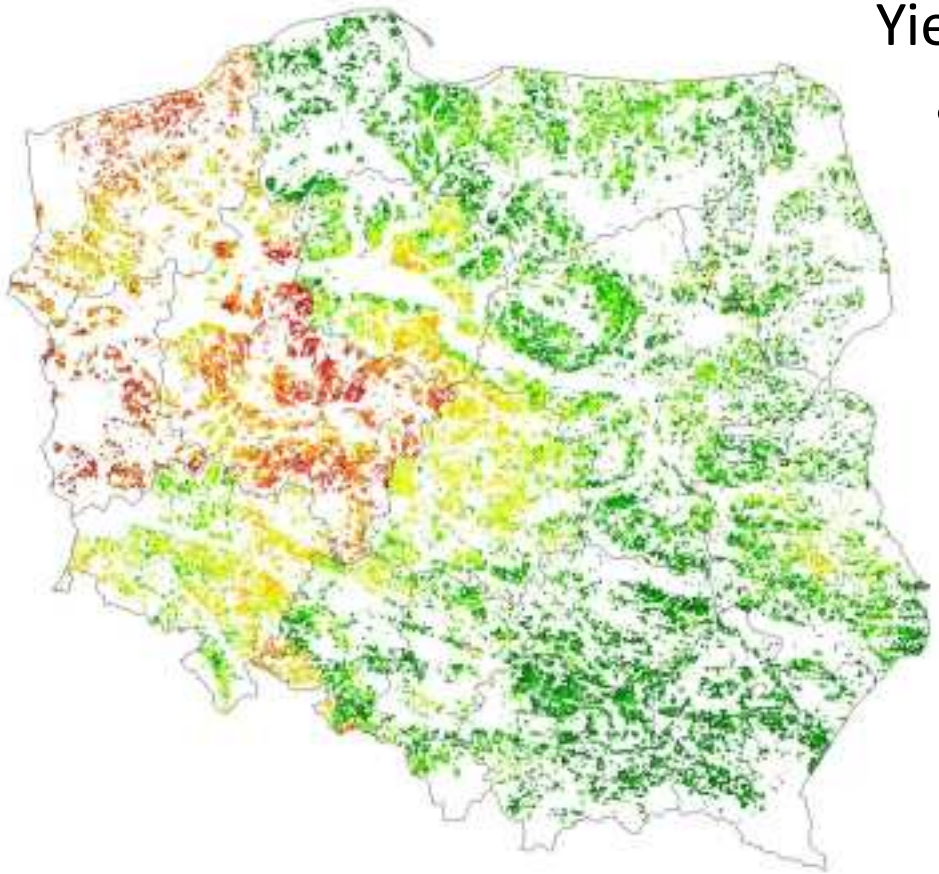








Yield reduction forecast as on 11 June 2012



%

(0 - 5 >

(5 - 10 >

(10 - 15 >

(15 - 20 >

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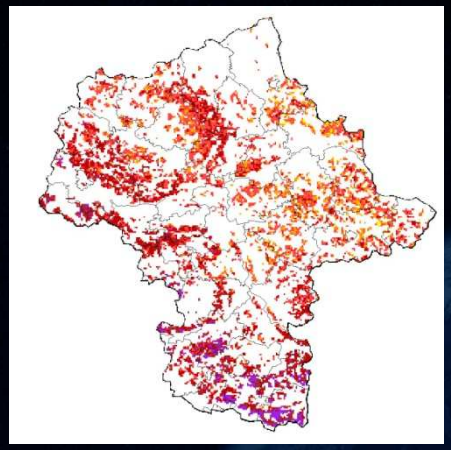
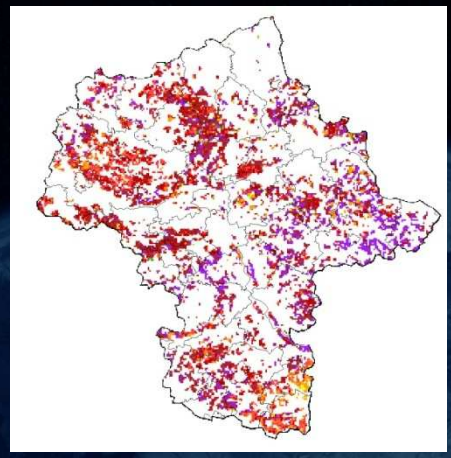
(40 - 45 >

(45 - 50 >

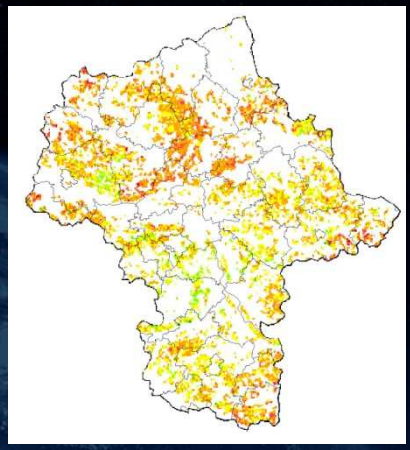
2003



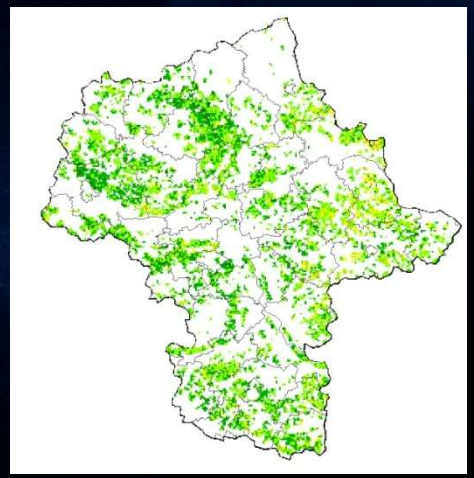
2006



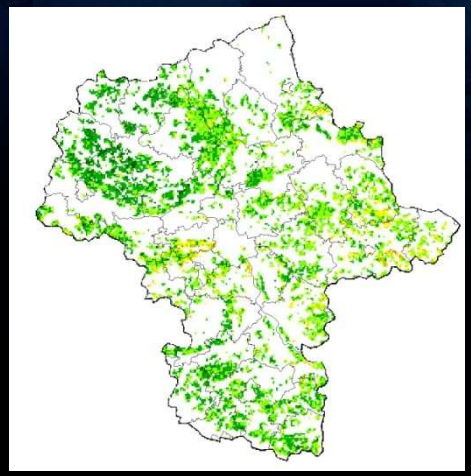
2010

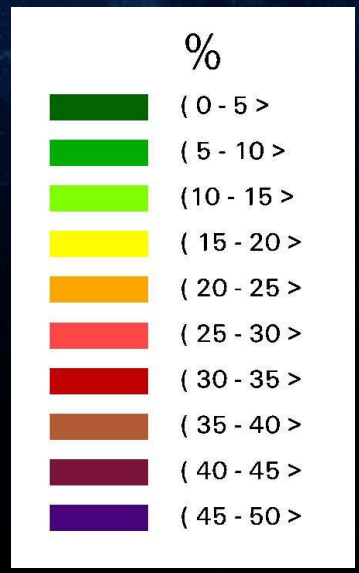


2007



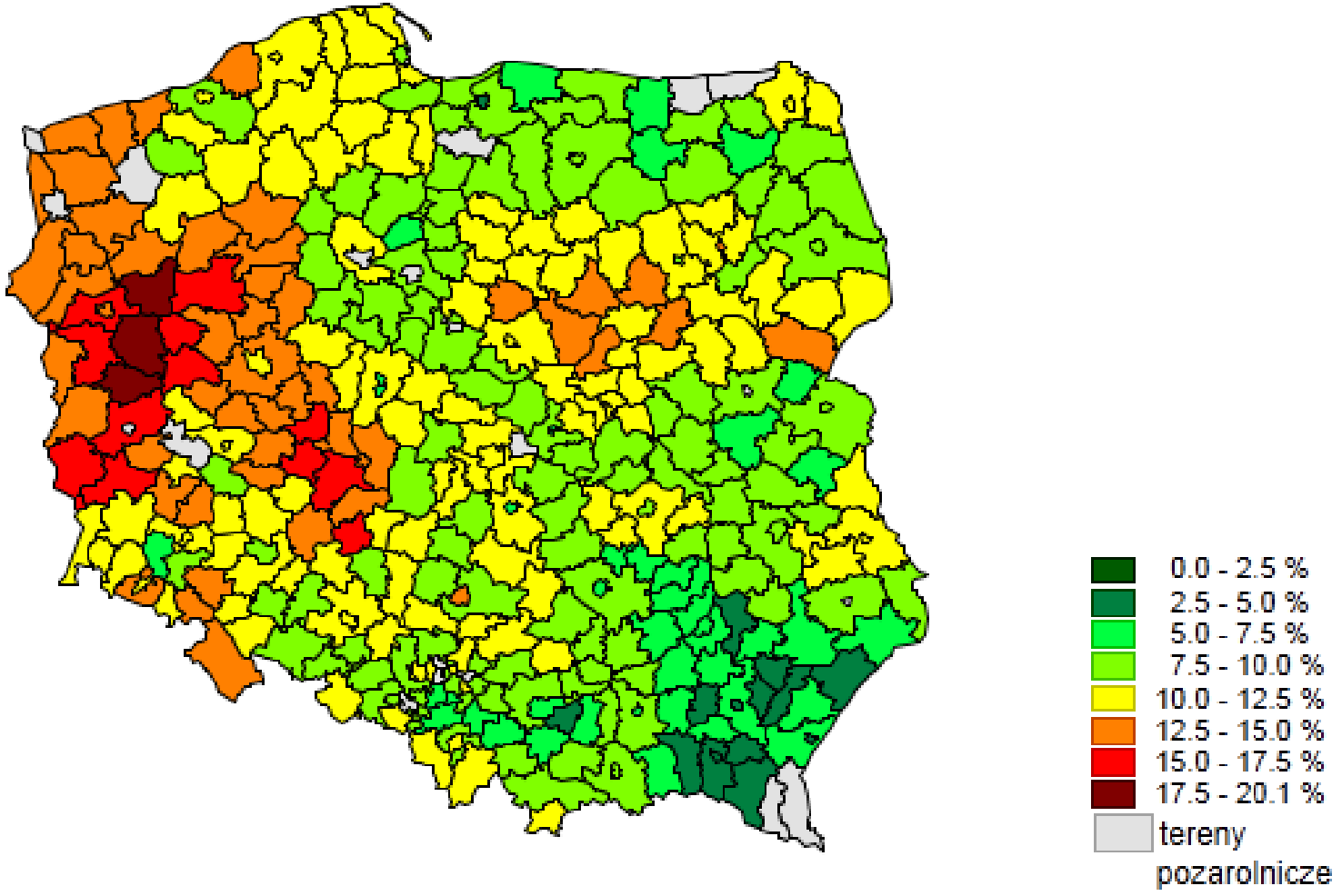
2009



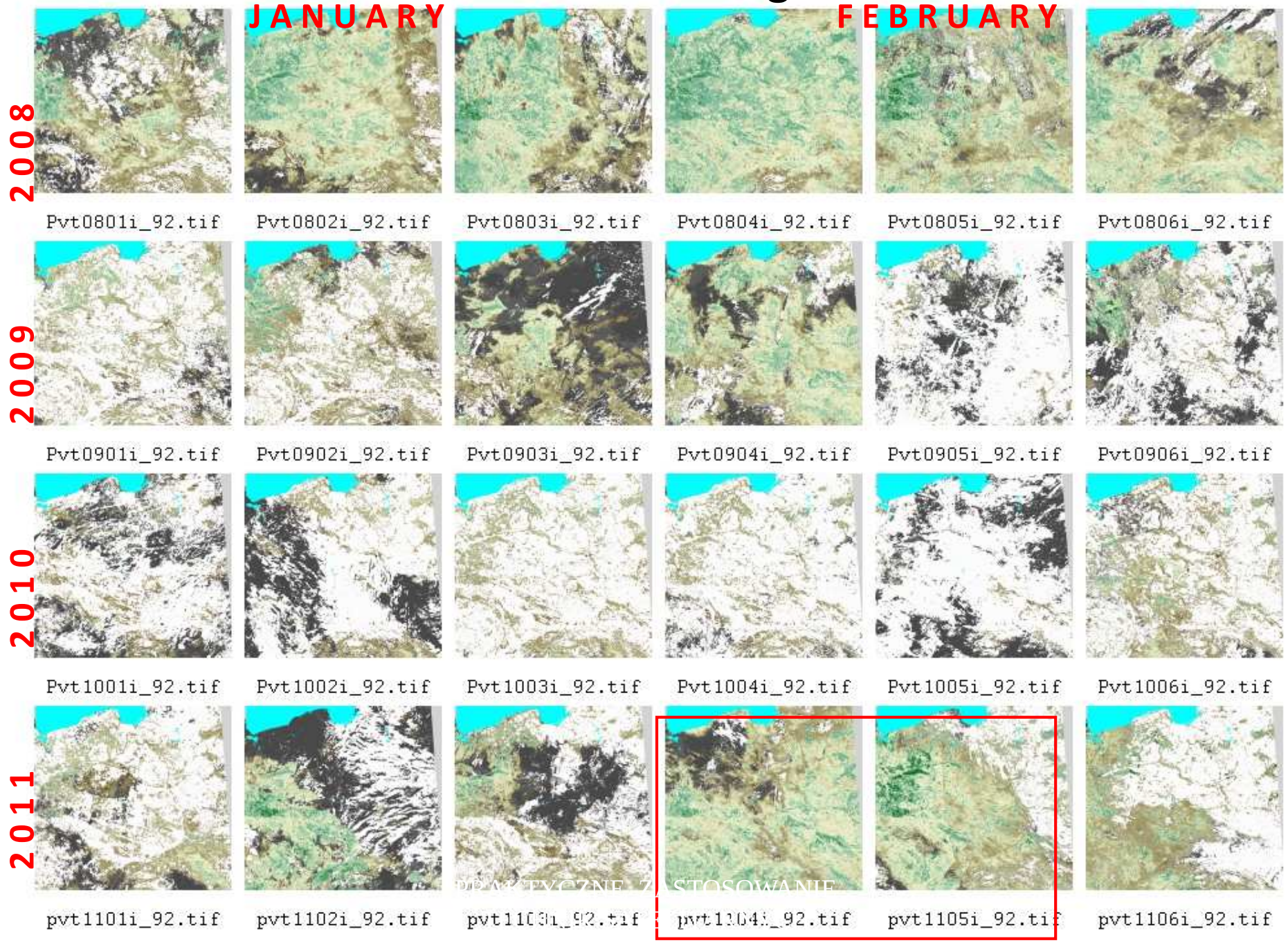


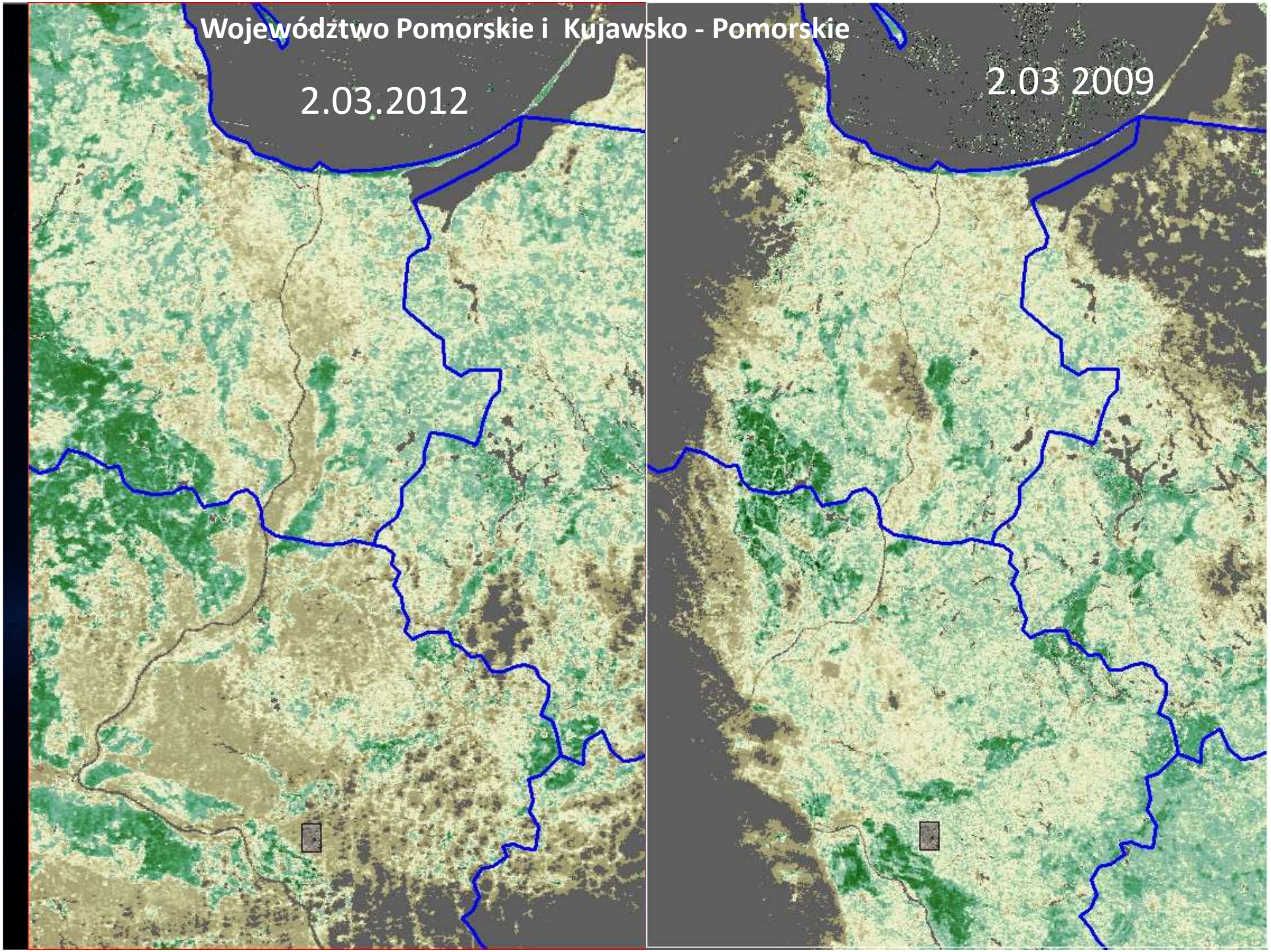
Rape and wheat yield reduction in Mazovia – the same ten days period in various years

Yield reduction median by powiats



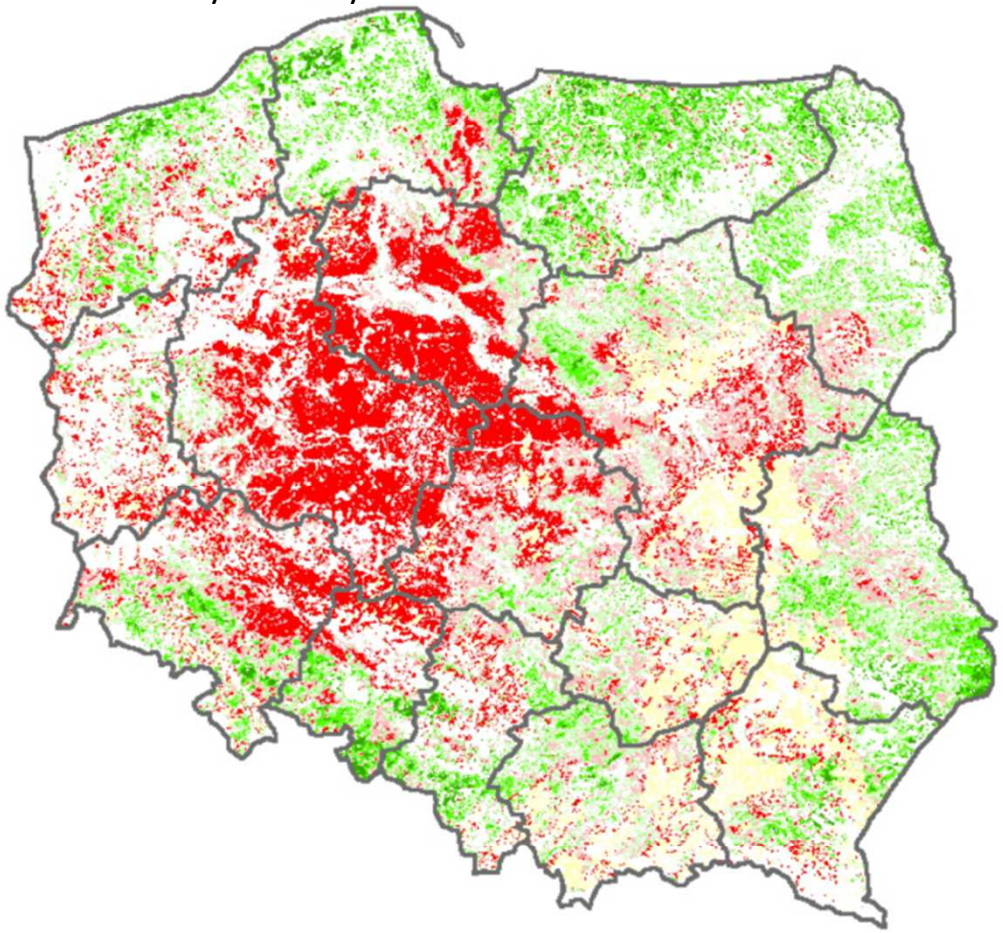
Snow coverage




Województwo Pomorskie i Kujawsko - Pomorskie
2.03.2012
2.03 2009

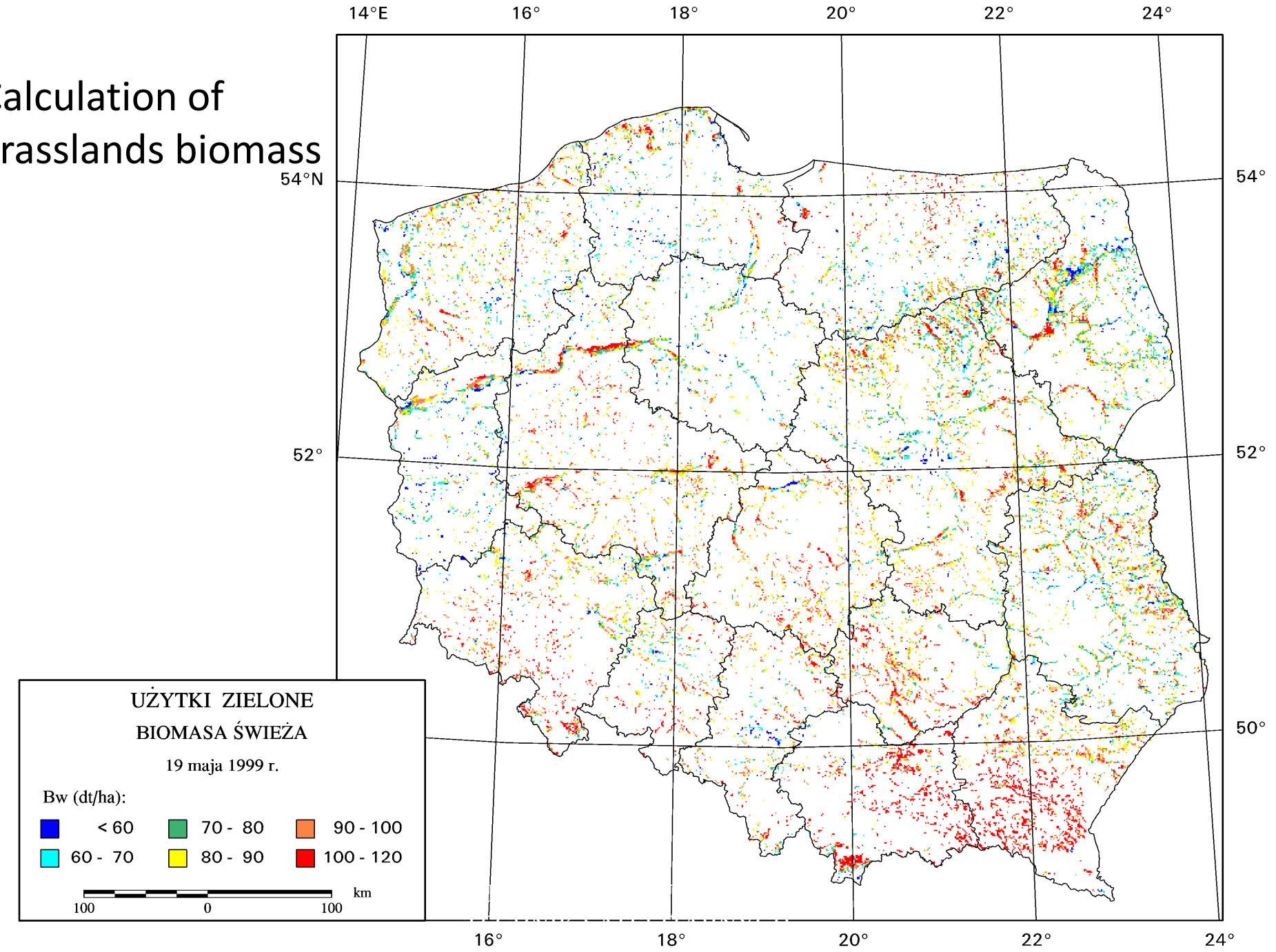
Vegetation Index comparision

11th ten days period to an average
for the same ten days of the year



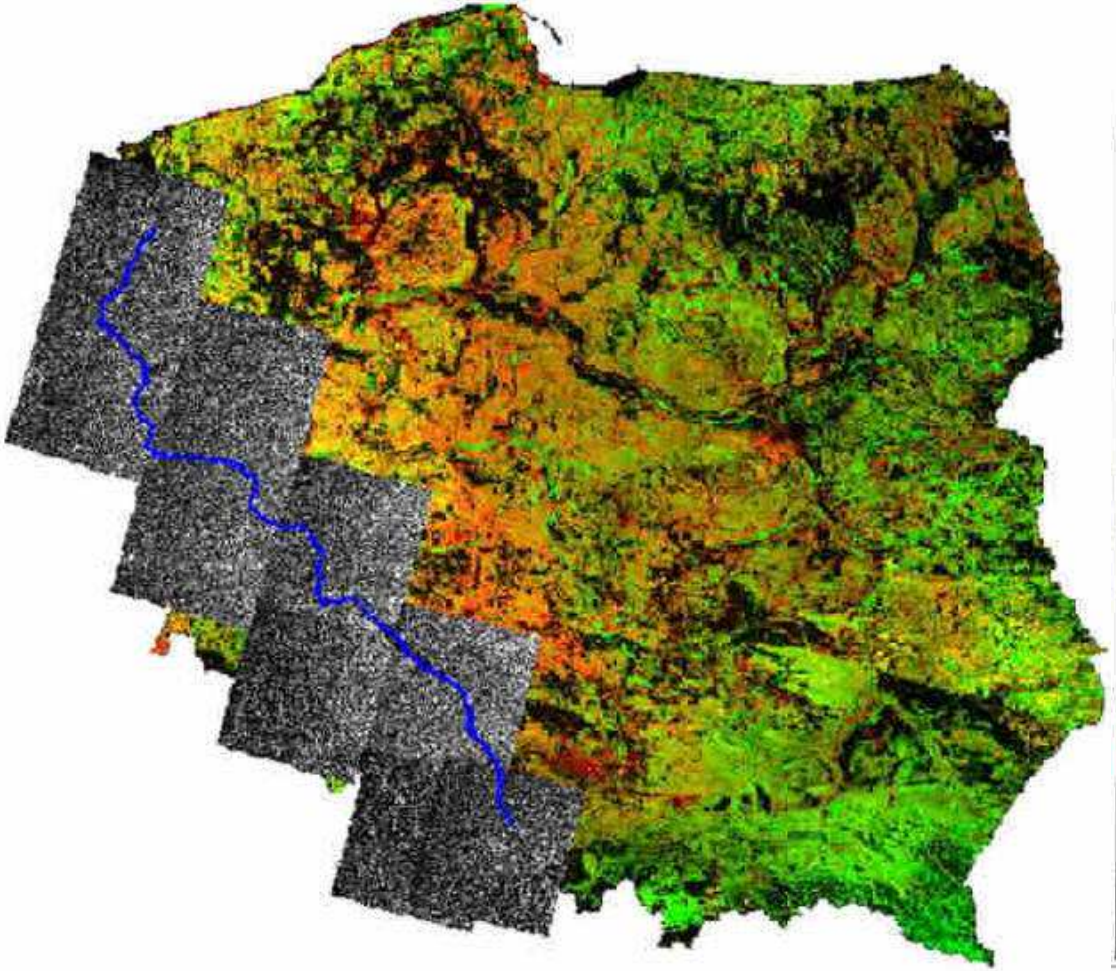
Kujawsko-Pomorskie
zoz.65,1% – rzepak – 61,2%
Wielkopolskie z.oz 35,2%; 46,5%
Mazowieckie z.oz – 20%; rz. 20%

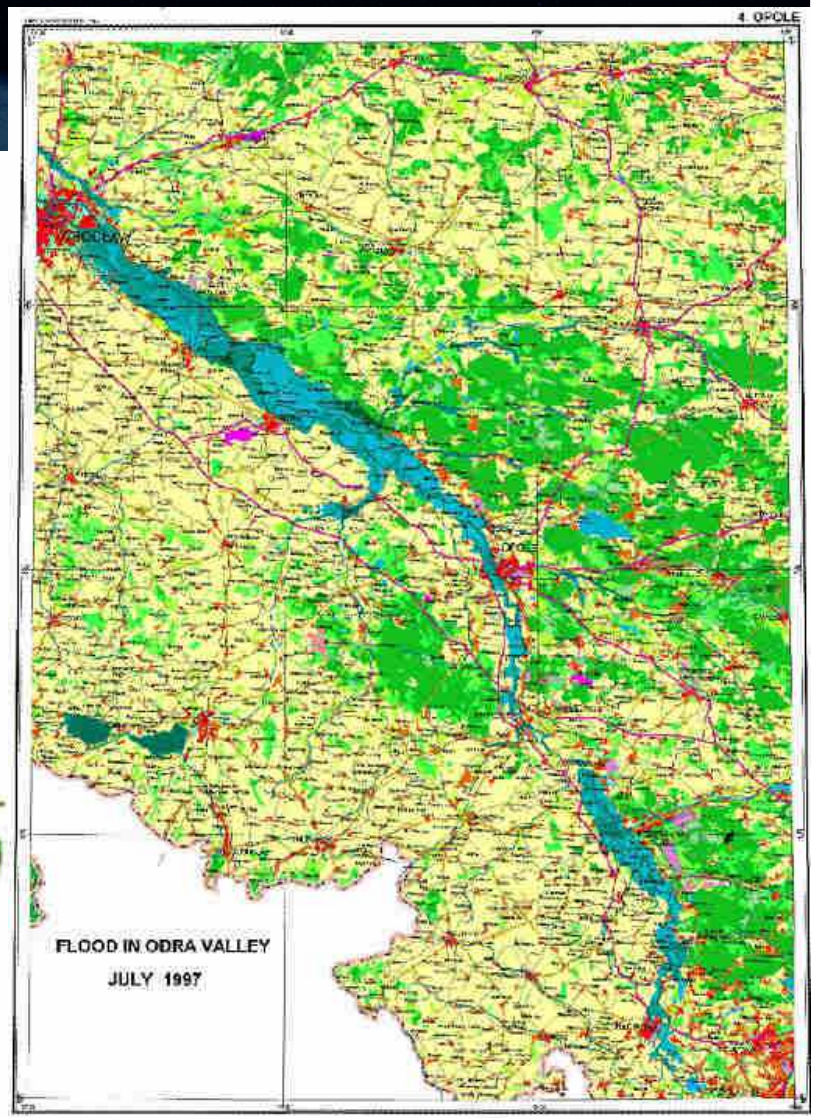
Calculation of grasslands biomass



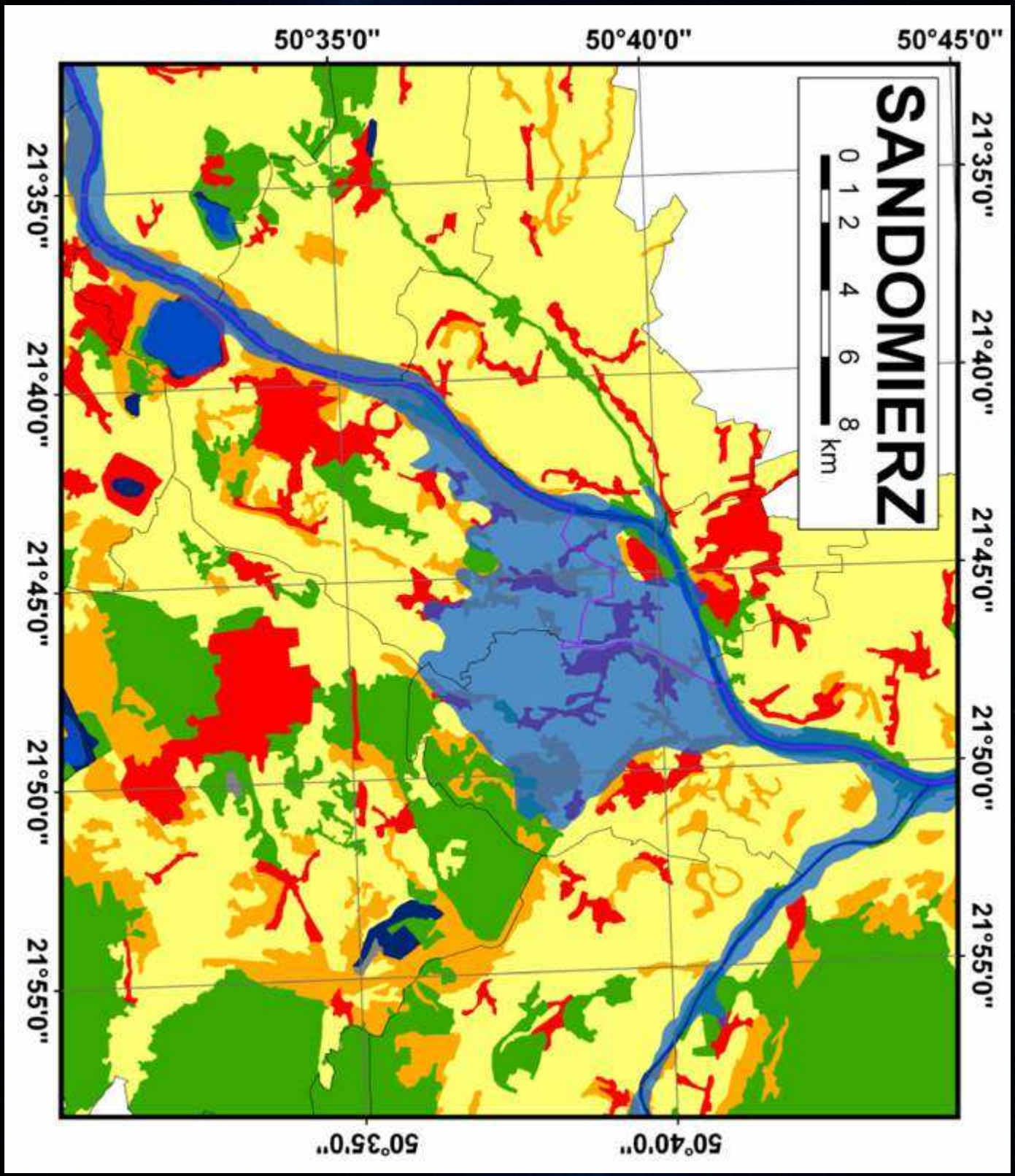
FLOOD IN 1997

Images taken by ERS-2 satellite
for days: 12, 15, 18 i 21 July 1997

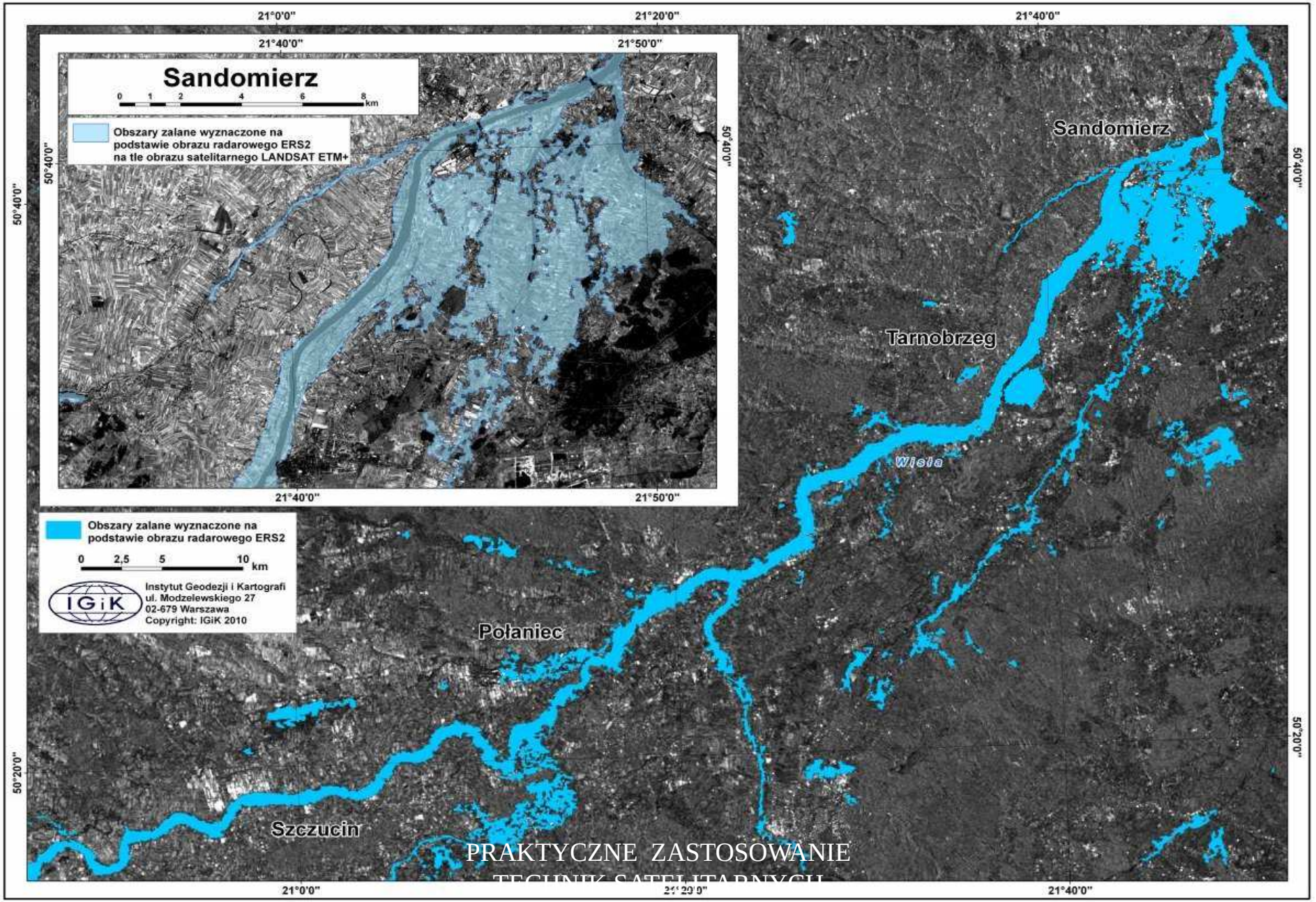




Flood in 2010



Vustula River – Flood in 2010



THE ISSUE Project

- **T**raffic - **H**ealth - **E**nvironment. **I**ntelligent **S**olutions for **S**ustaining **U**rban **E**conomies
- Assessment of the satellite technology application in sustainable transport
- Joint Action Plan addressing societal challenges
- Special Interest Groups established in regions

Downstream Observatory organised by Regions active in Space - Network
DORIS_Net

Copernicus for Regions

- DORIS-Net – NEREUS based project
- DORIS-Net Project in Mazovia Region
- Development of Regional Contact Offices
- IGiK recommended UNEP/GRID-Warsaw as a RCO for Mazovia
- A good example of research support to dissemination activities

ENERGIC OD Project

- **E**uropean **NE**twork for **R**edistributing **G**eospatial **I**nformation to user **C**ommunities **O**pen **D**ata
- Establishment of Virtual Hubs with spatial data
- Open applications for various user-groups
  - Crop yield prediction for farmers based on satellite data modelling

- Research community is well prepared to support **Copernicus** Programme
- Lessons learned and experience gained earlier can be directly implemented in Copernicus products and services development
- Strong need for a broader involvement in shaping a **Copernicus** users community