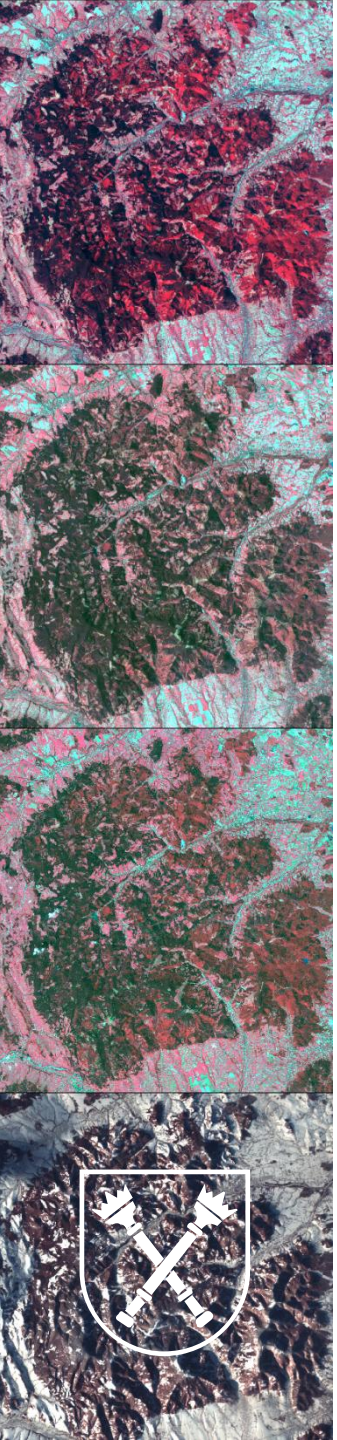
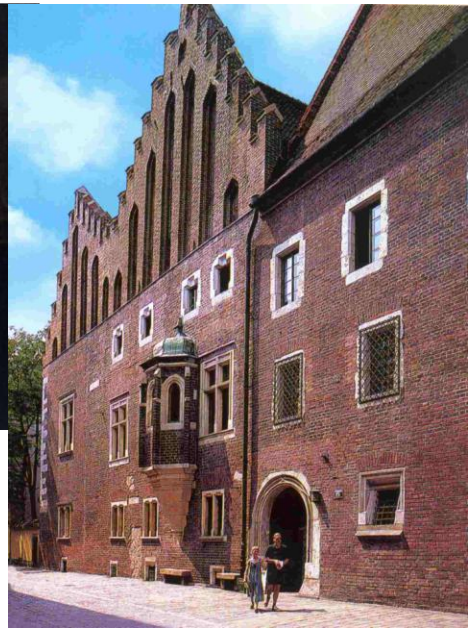
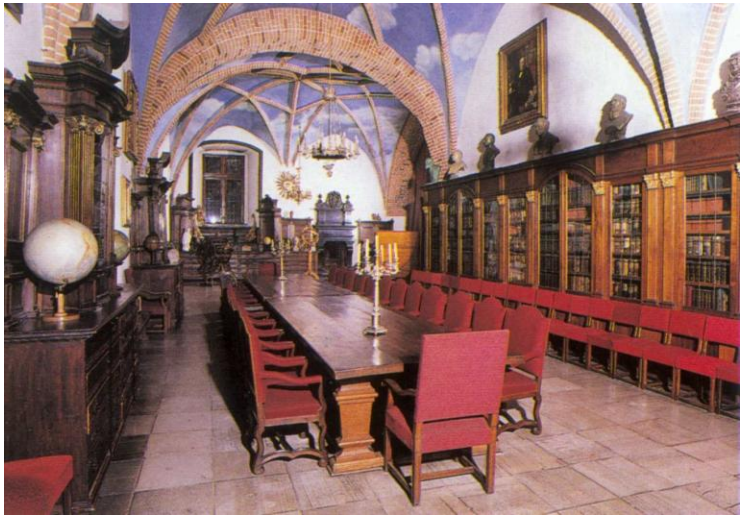


Land cover and land use change and its consequences: detection and simulation

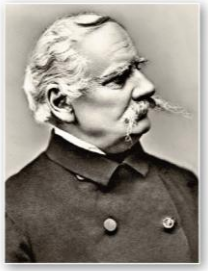
Katarzyna Ostapowicz

Department of GIS, Cartography and Remote Sensing
Institute of Geography and Spatial Management
Jagiellonian University





Jagiellonian University founded in 1364

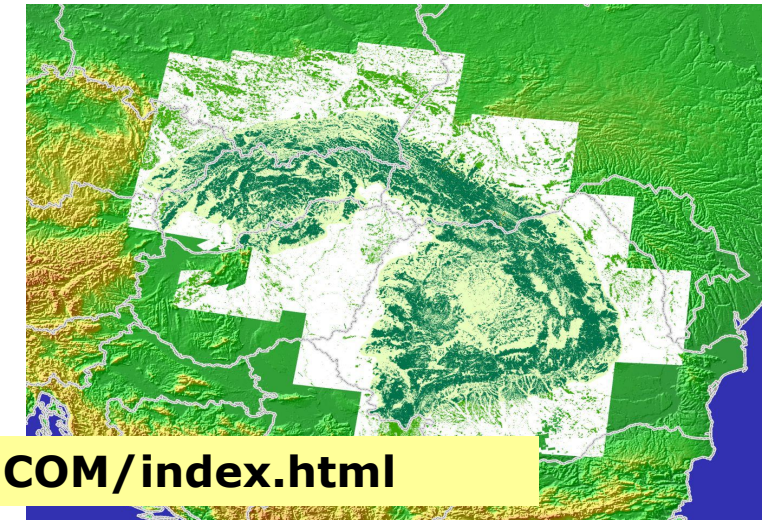


Institute of Geography and Spatial Management
(founded at the JU in 1849)
about 60 academics (human and physical geography)
PhD, MSc and BSc students

Department of GIS, Cartography and RS

- founded in 2007 (combining two departments)
  - Department of Cartography and Remote Sensing - 1979
  - Department of GIS – 1993
- 7 researchers, 3 admin / technical staff, 10+ PhD students
- GIS&T; LULCC detection and modeling, forest cover change (long-term, forest transition)
- mountain community oriented projects (Science for the Carpathians (S4C) network; mountainTRIP project)
- GIS&T studies (UNIGIS, e-learning, CEEPUS network, summer schools like „*ESA Advanced training course in land remote sensing*", Kraków, 2011)

Department of GIS, Cartography and RS



FORECOM has started

JULY 16, 2012

FORECOM (PSPB 008/2010) – a project awarded in the "Environment" pillar of the Polish Swiss Research Programme – aims therefore to improve understanding of past, present and future forest cover changes in the Swiss Alps and the Polish Carpathians in the context of land use and climate changes. The project will be carried out by research teams from the Institute of Geography and Spatial Management, Jagiellonian University, Poland, and Swiss Federal Research Institute for Forest, Snow and Landscape Research (WSL), Research Unit Land Use Dynamics. It started in June, 2012, and will end in May 2016.

http://www.gis.geo.uj.edu.pl/FORECOM/index.html

Project supported by a grant from Switzerland through the Swiss Contribution to the enlarged European Union.

- Swiss Contribution to Poland

SWISS CONTRIBUTION

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Project has just started - find out more!

October 24, 2012

http://www.gis.geo.uj.edu.pl/LIMProject/index.html

Integration of categorical- and gradient-based approaches in landscape fragmentation and connectivity modelling using GIS&T (2011/03/D/ST10/05568) - a project supported by a grant from the National Science Centre - aims to develop new approaches allowing integration categorical- and gradient-based landscape models for more accurate representation of landscape structure (Landscape Integrated Models - LIM) and based on that - a comprehensive description (quantitative and qualitative) of landscape/habitat fragmentation and connectivity. The project will be carried out by a research team from the Institute of Geography and Spatial Management, Jagiellonian University, Poland, in collaboration with international research teams. It started in August, 2012, and will end in December, 2015.

Project supported by a grant from the National Science Centre

NATIONAL SCIENCE CENTRE

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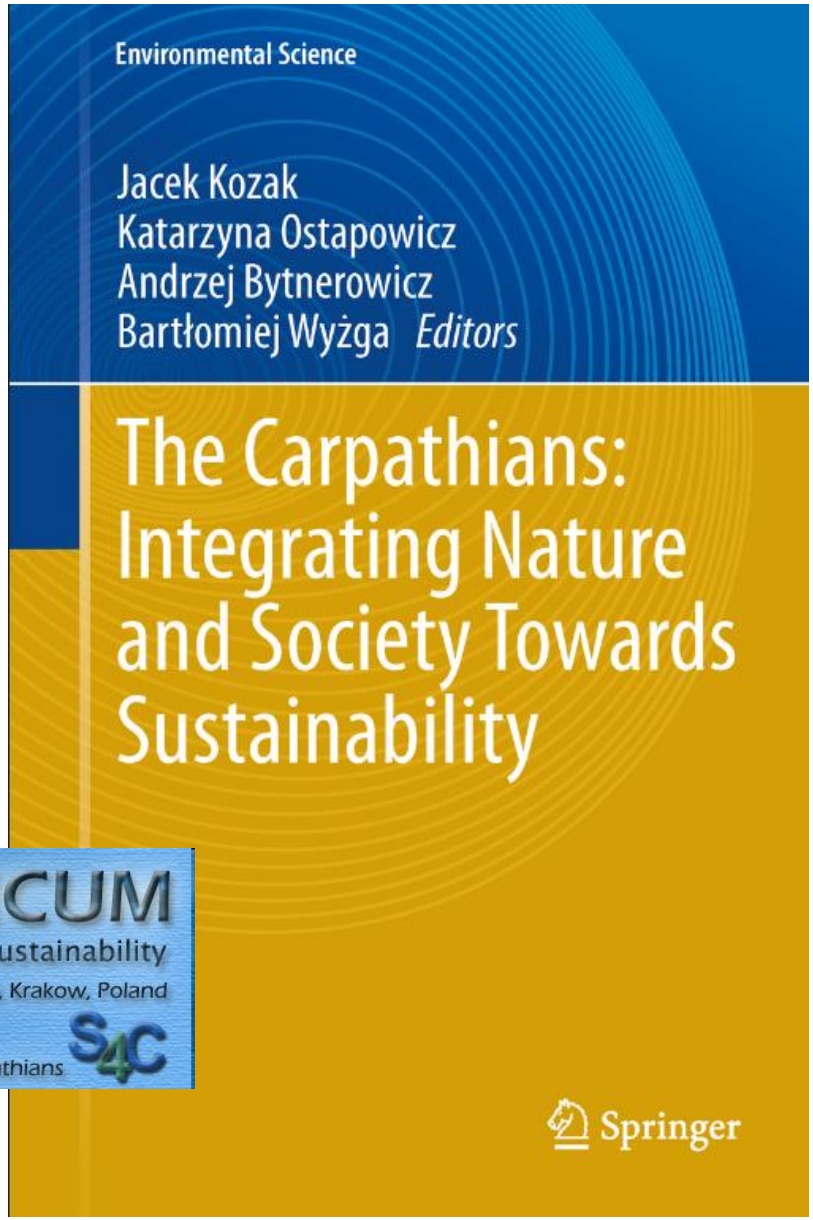
NASA

200 years of land use and land cover changes and their driving forces in the Carpathian Basin

Department of GIS, Cartography and RS



http://www.forumcarpaticum.org/

Where?

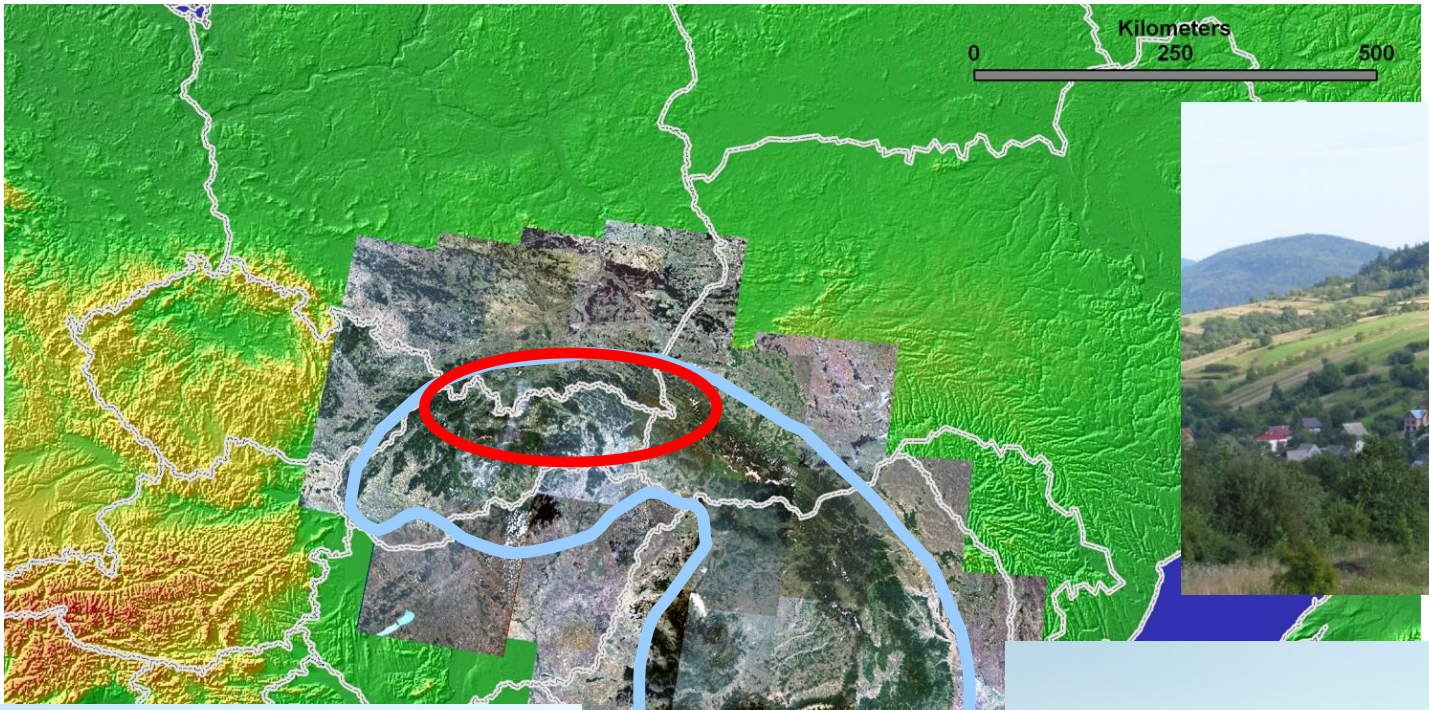
When?

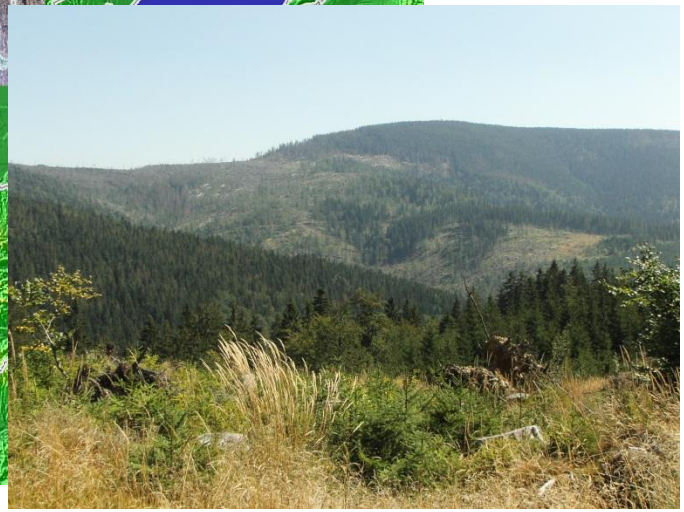
Why?

land cover
&
land use
change
(FORESTS)

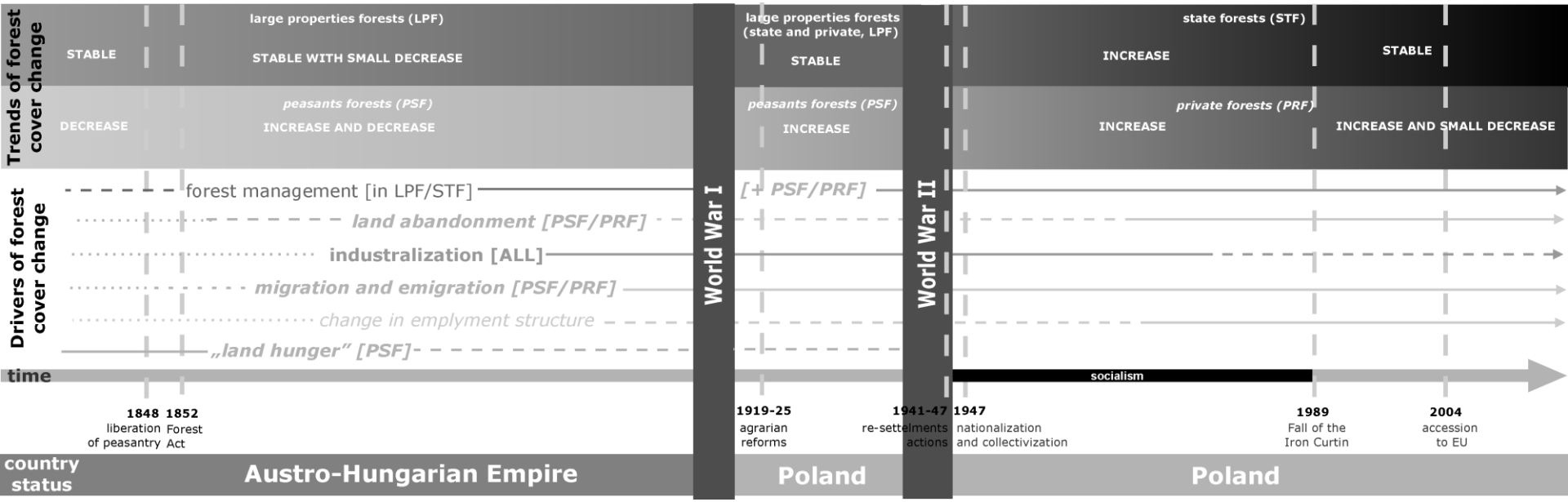
change

www.study area





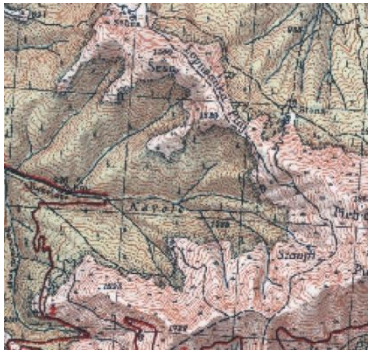
www.study area



w.land cover mapping – source data

- **historical data: topographic maps**

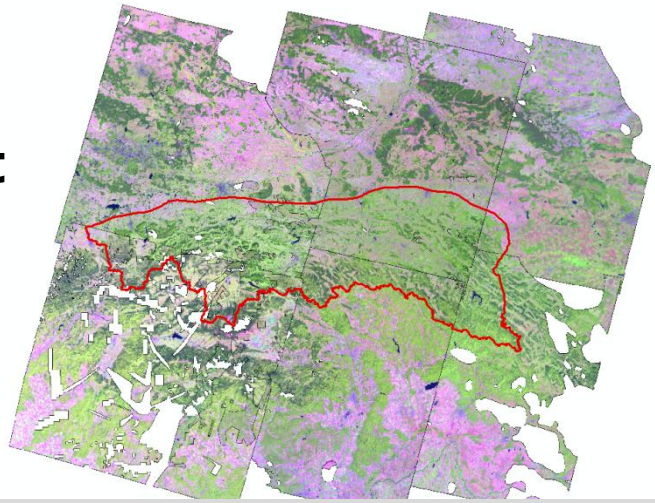
scale 1:115 000
(cadaster generalization; 1840/50)



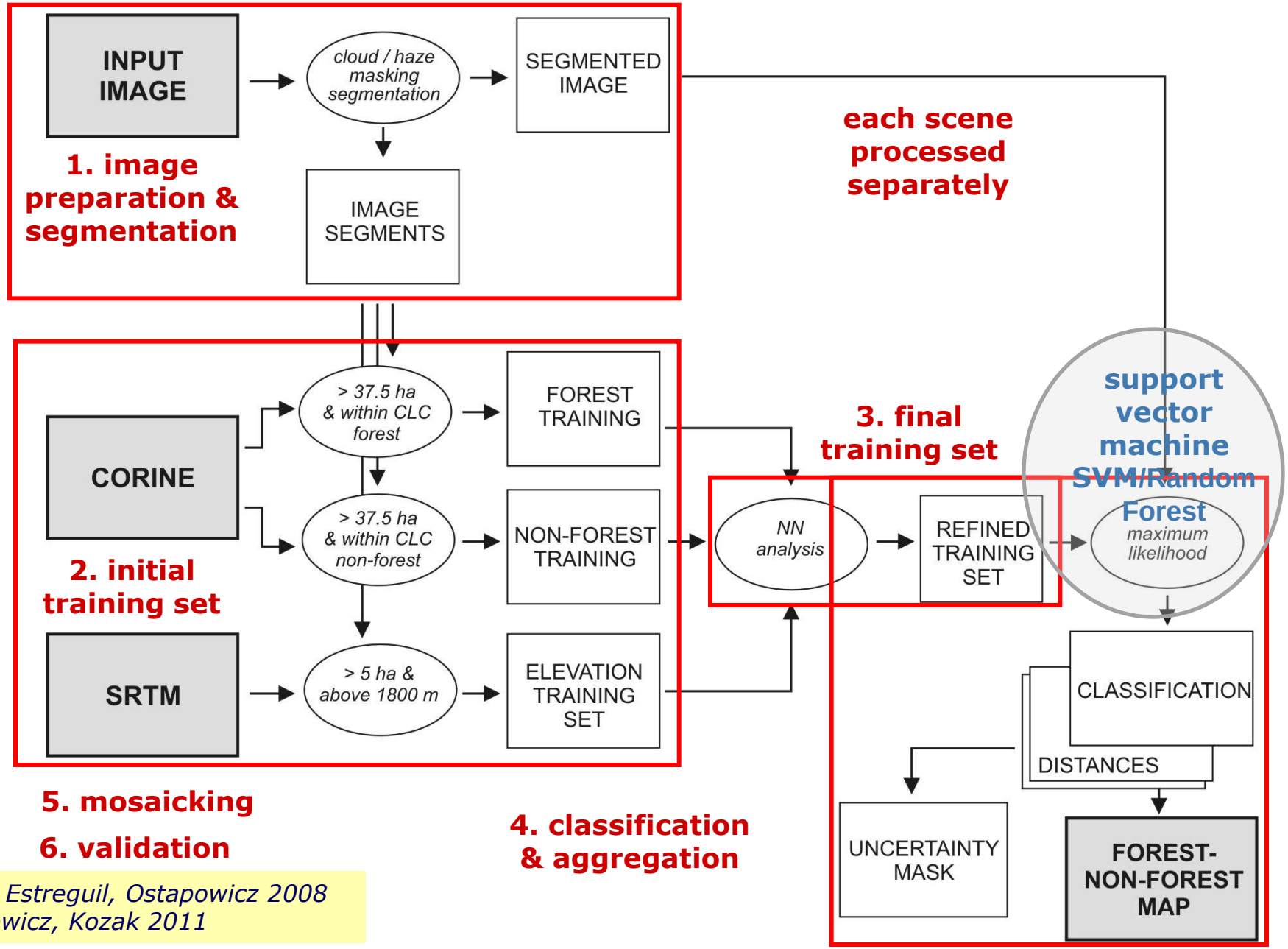
scale 1:28 800
(2nd Austrian survey; **1860s**)

scale 1:100 000
(Polish topographical map; **1930s**)

- **satellite data: Landsat MSS/TM/ETM+**



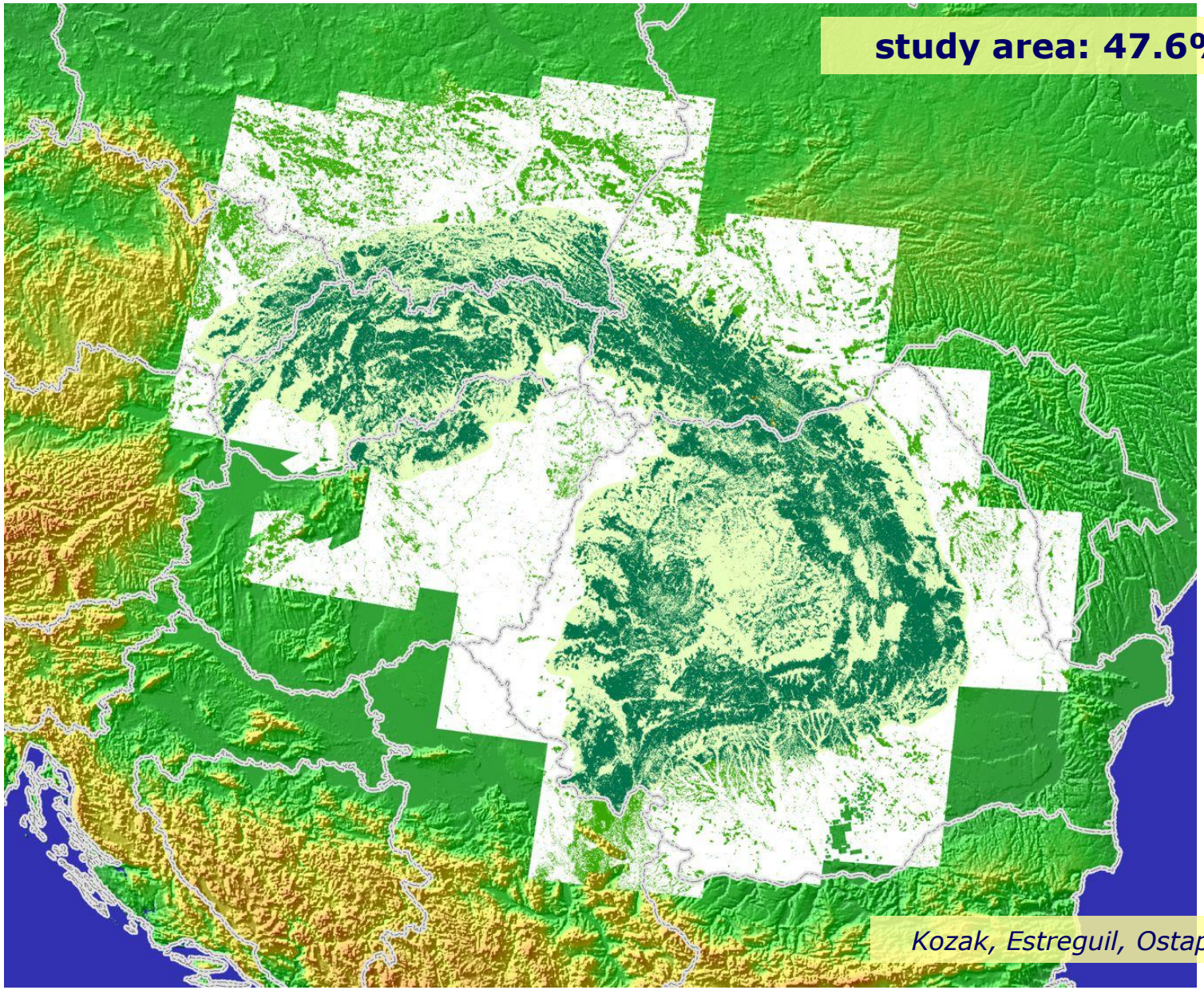
w.land cover mapping - methodology



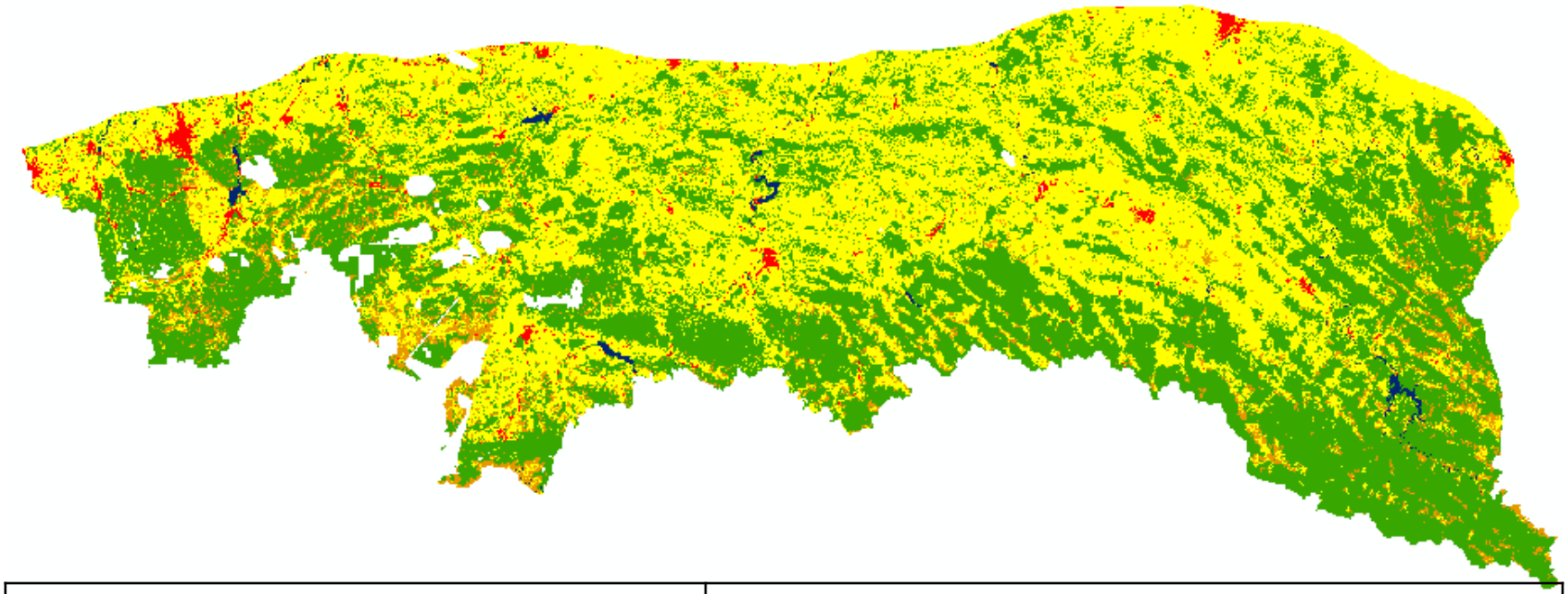
Kozak, Estreguil, Ostapowicz 2008
Ostapowicz, Kozak 2011

ww.land cover mapping

Forest maps of the Carpathians, 2000



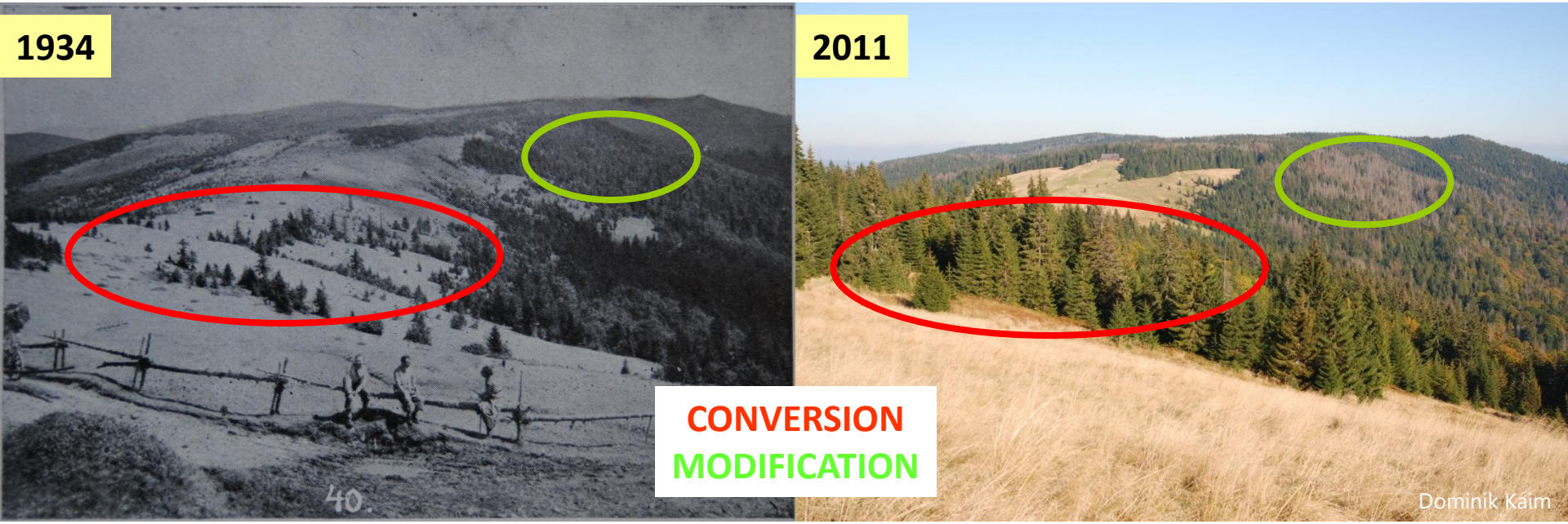
ww.land cover mapping

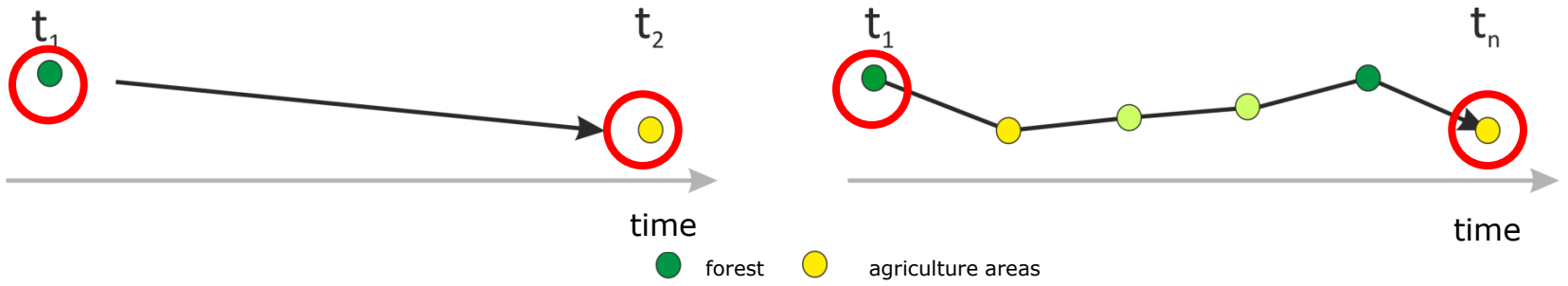


	Area [%]	
Land cover classes	**'80 (20th centry)**	**Years 2005/7**
Artificial areas	2.43	3.11
Agricultural areas	50.10	48.16
Forest areas	42.43	43.03
Non-wooded semi-natural areas	4.64	5.19
Water areas	0.40	0.51

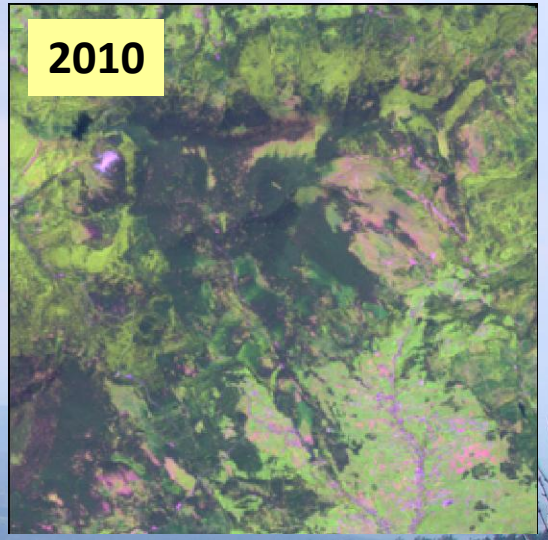
Ostapowicz, Kozak 2011

ww.land cover mapping



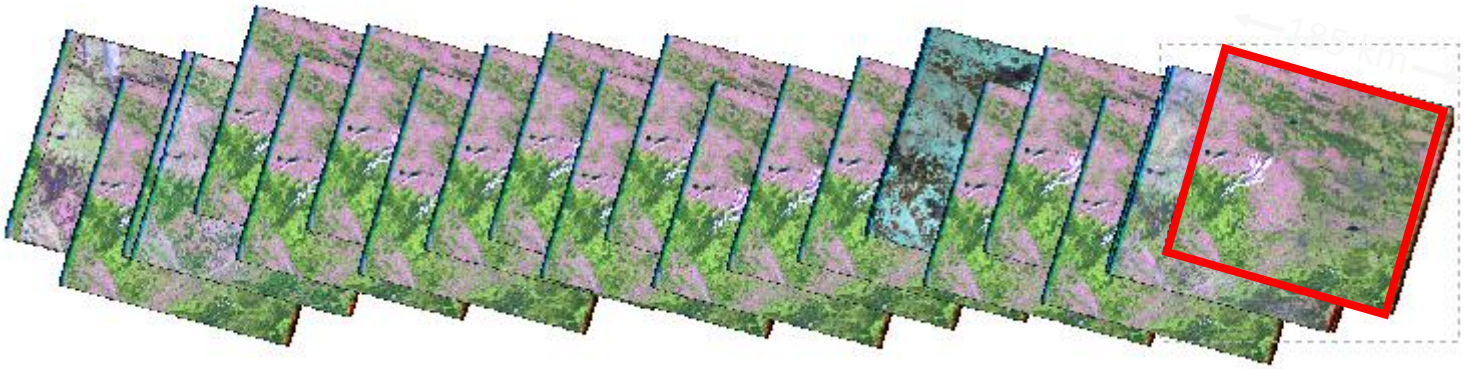



1987

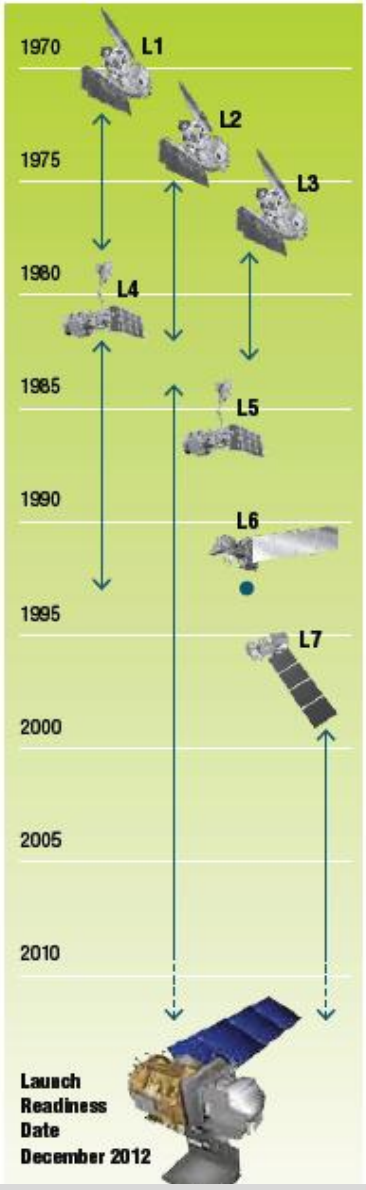

2010

ww.land cover mapping

Landsat MSS (rs: 60 m),
Landsat TM (rs: 30 m), **Landsat ETM+** (rs: 30 m)

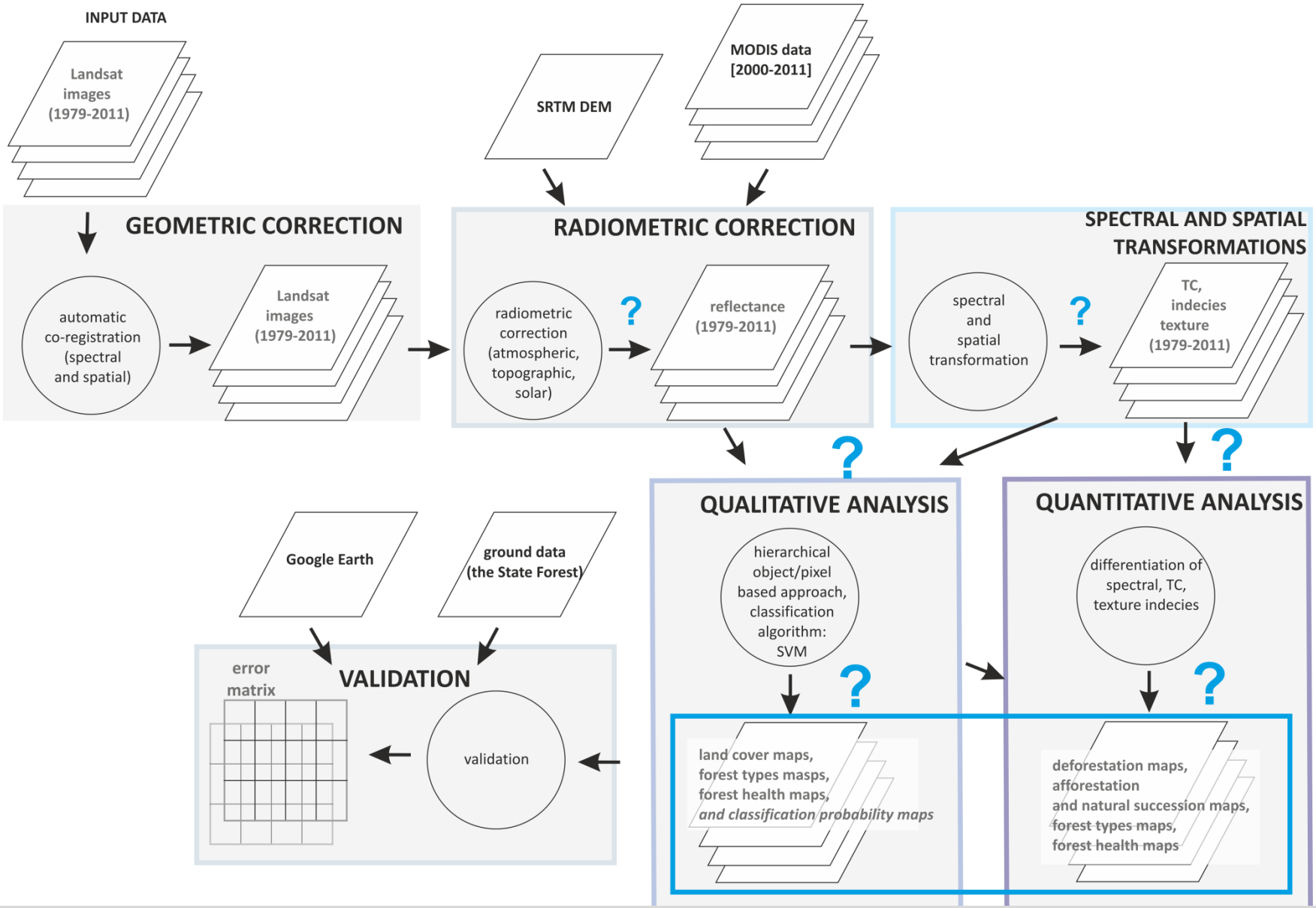


time series: 1979-2011

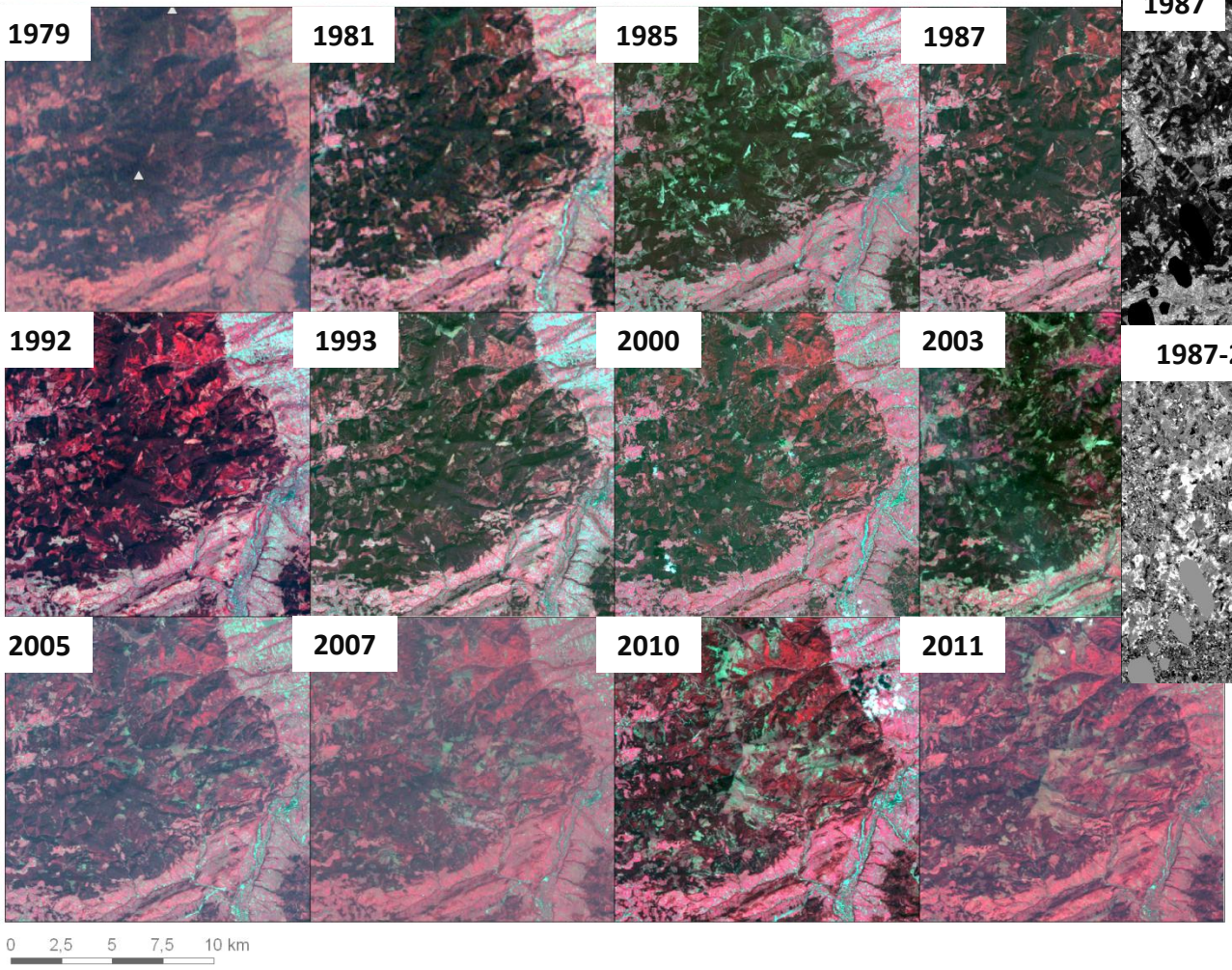


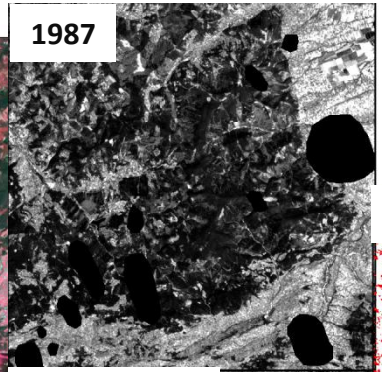
Źródła danych: NASA i ESA

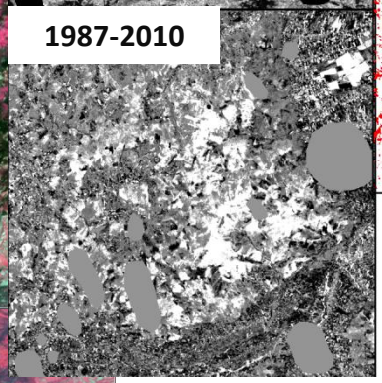
ww.land cover mapping



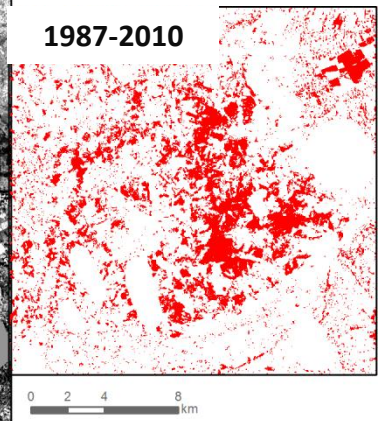
ww.land cover mapping

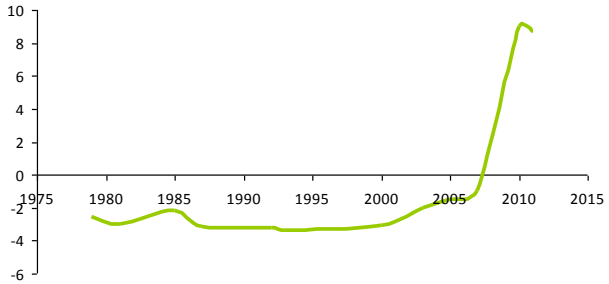




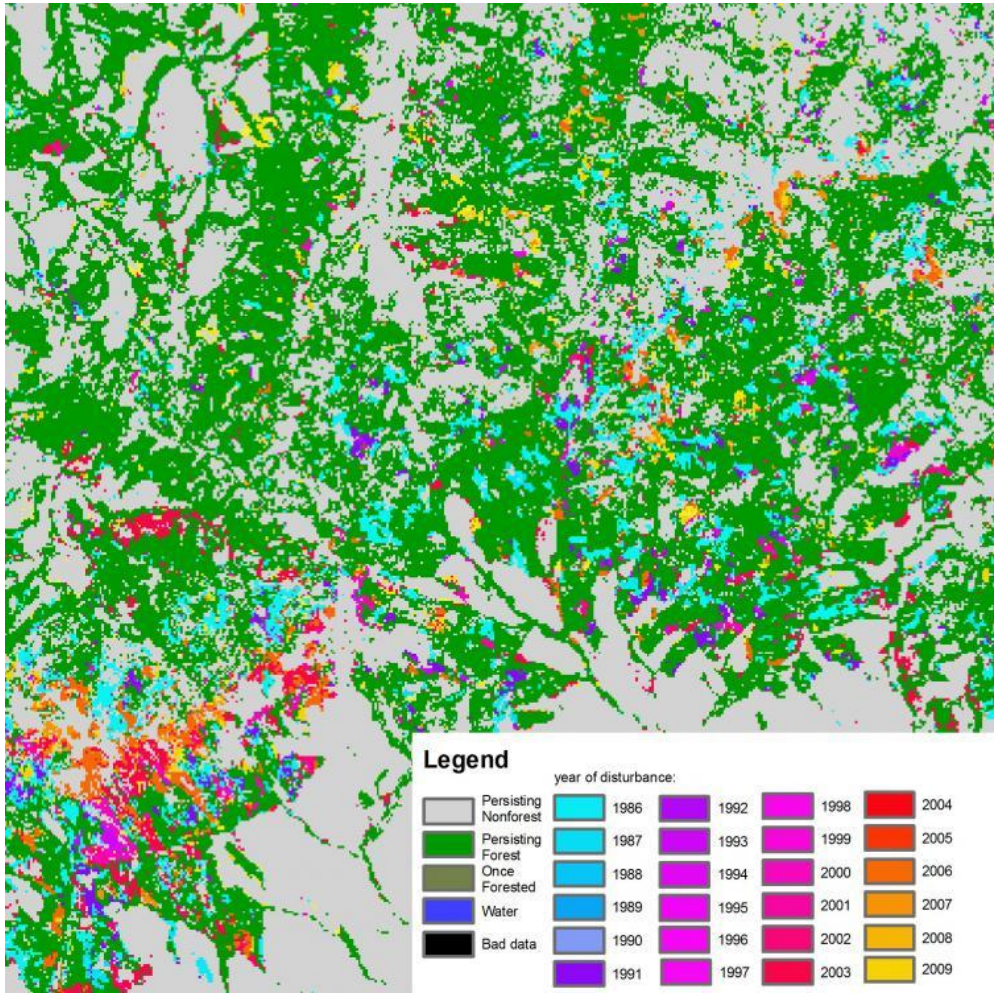


Disturbance index





ww.land cover mapping



Ostapowicz et al. (in preparation)

Monitoring forest disturbance and re-growth
from dense time series of satellite imagery stacks in the Carpathians

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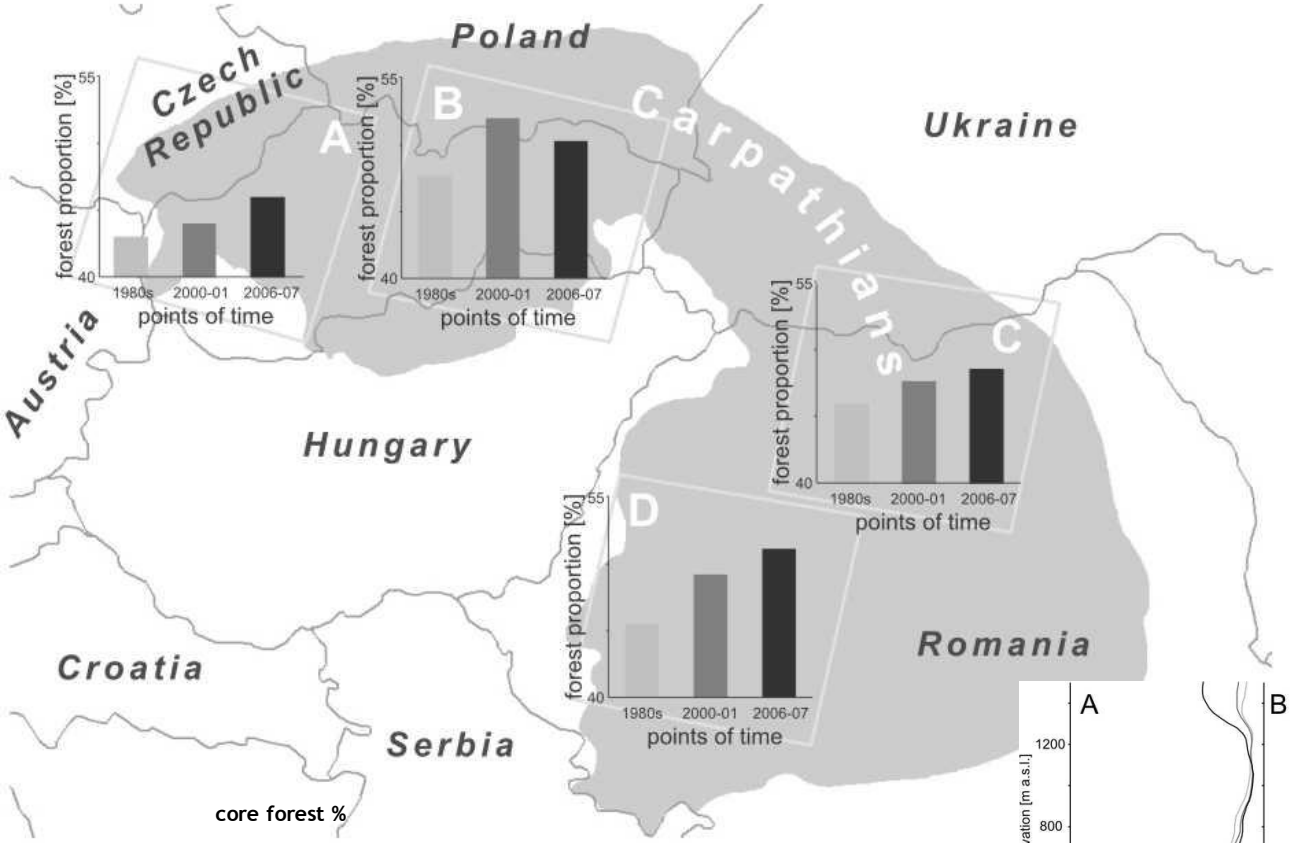
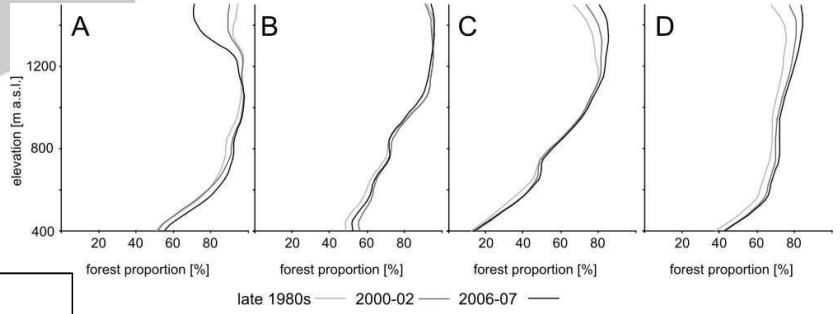
FULBRIGHT

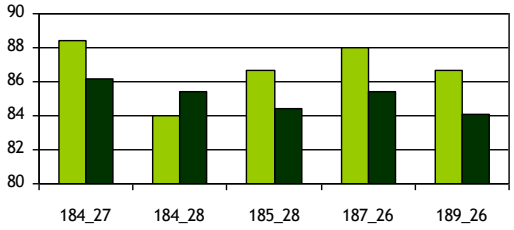
www.short term land cover change analysis



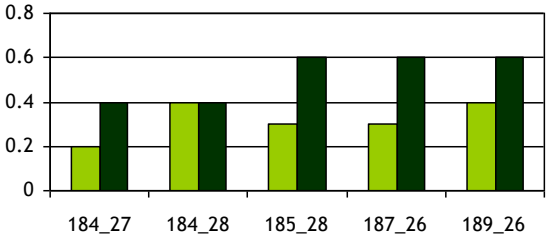


Ostapowicz, Kozak 2009

core forest %

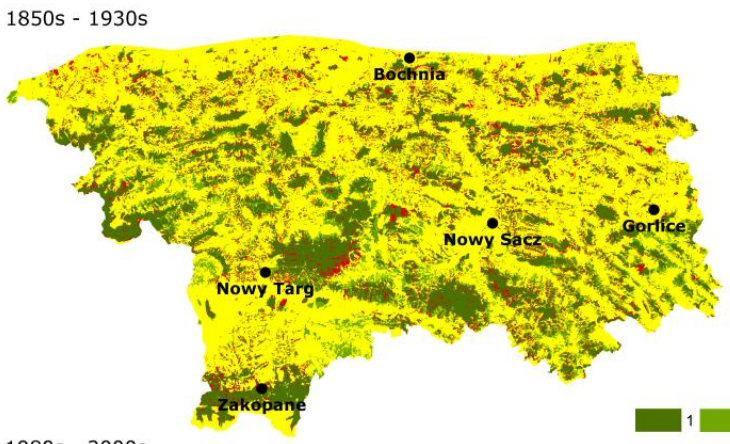


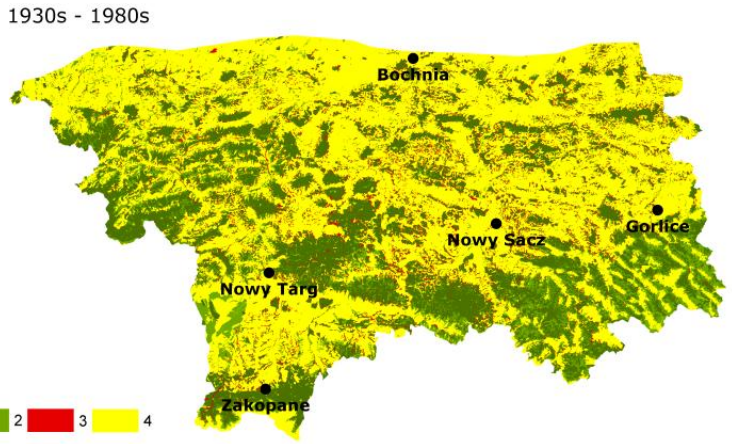
corridors %

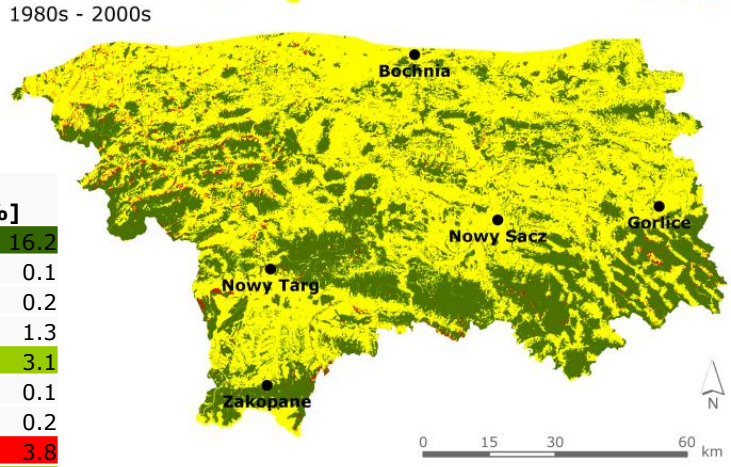


Ostapowicz, Estreguil, Vogt, Kozak, 2006

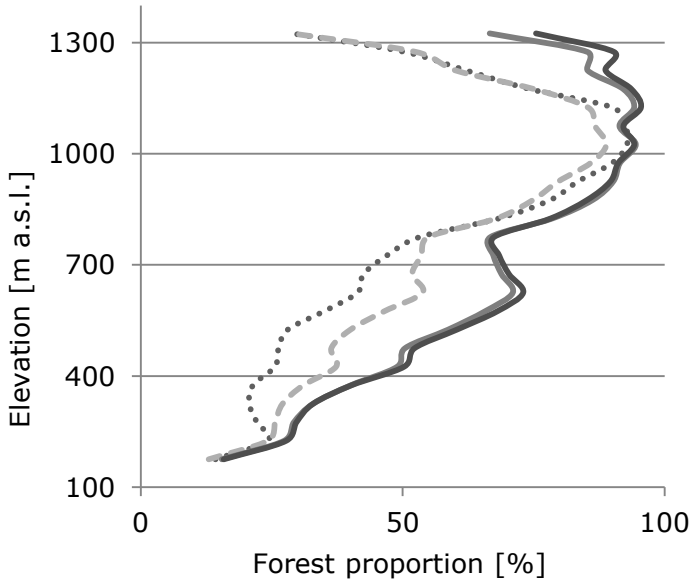
www.long term land cover change analysis





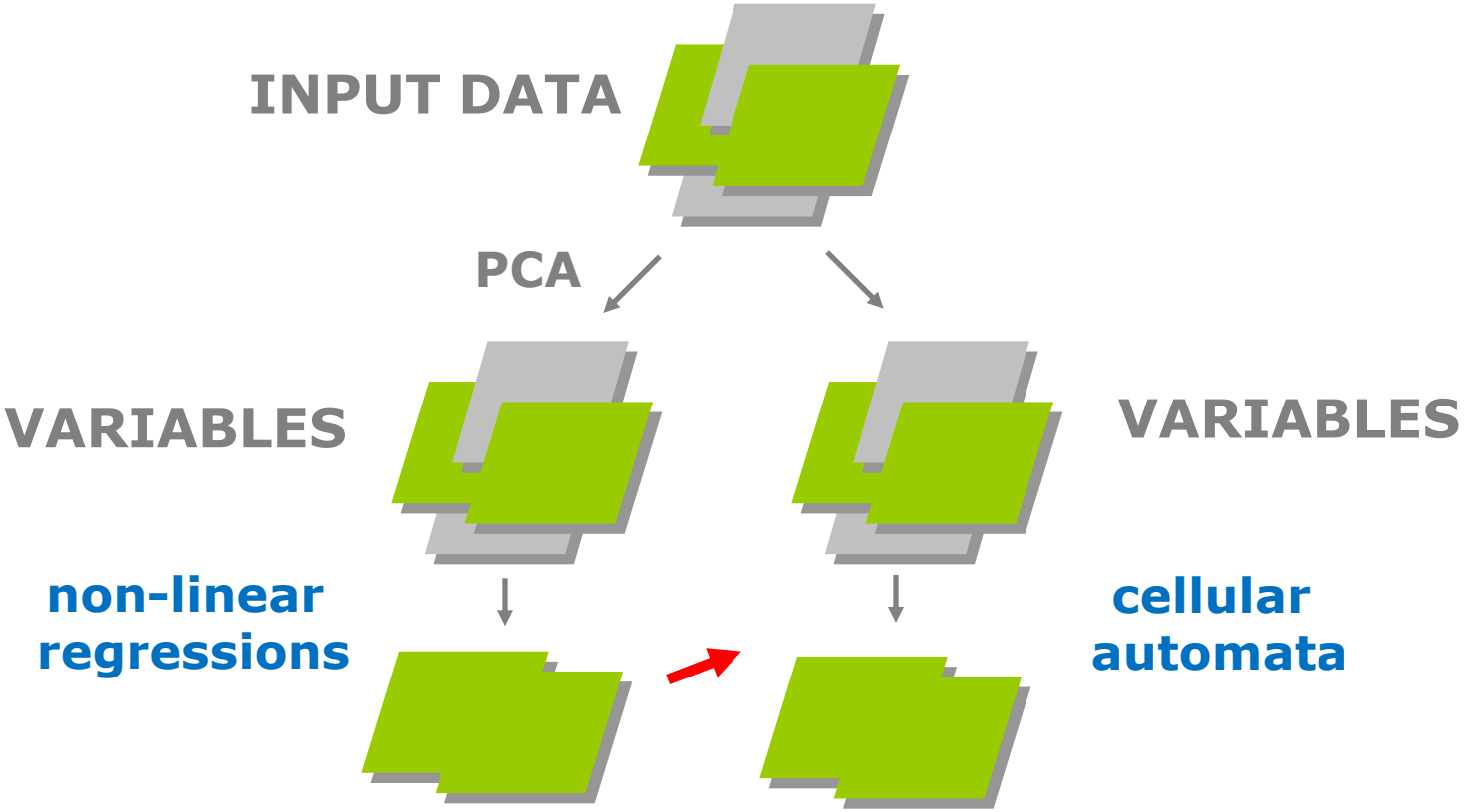


change classes	[%]
f-f-f-f	16.2
f-f-f-n	0.1
f-f-n-f	0.2
f-f-n-n	1.3
f-n-f-f	3.1
f-n-f-n	0.1
f-n-n-f	0.2
f-n-n-n	3.8
n-f-f-f	7.9
n-f-f-n	0.2
n-f-n-f	0.4
n-f-n-n	3.1
n-n-f-f	8.7
n-n-f-n	1.0
n-n-n-f	1.4
n-n-n-n	52.3

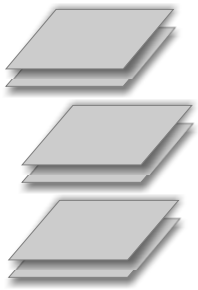


Ostapowicz, Ostafin (in preparation)

www.land cover change analysis and modelling



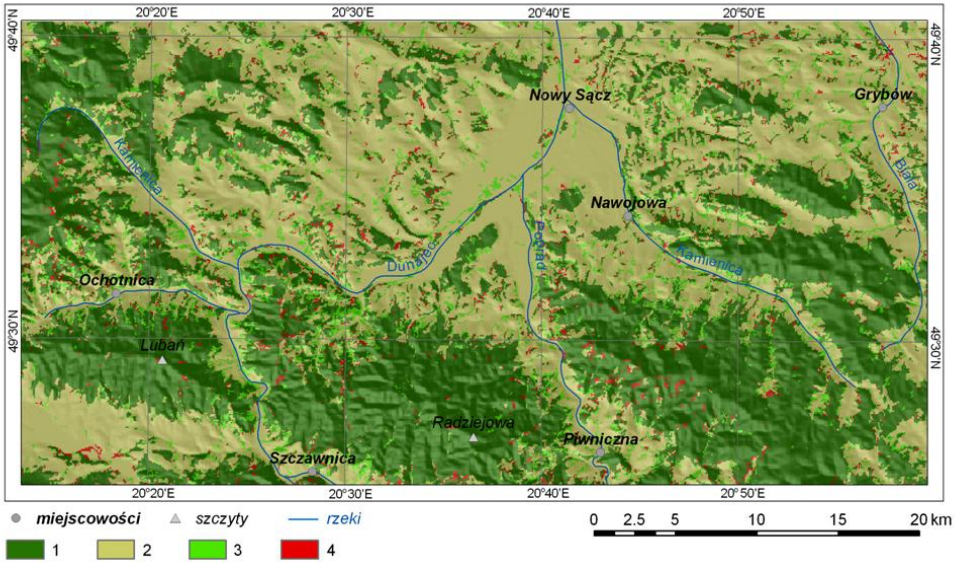
Variables



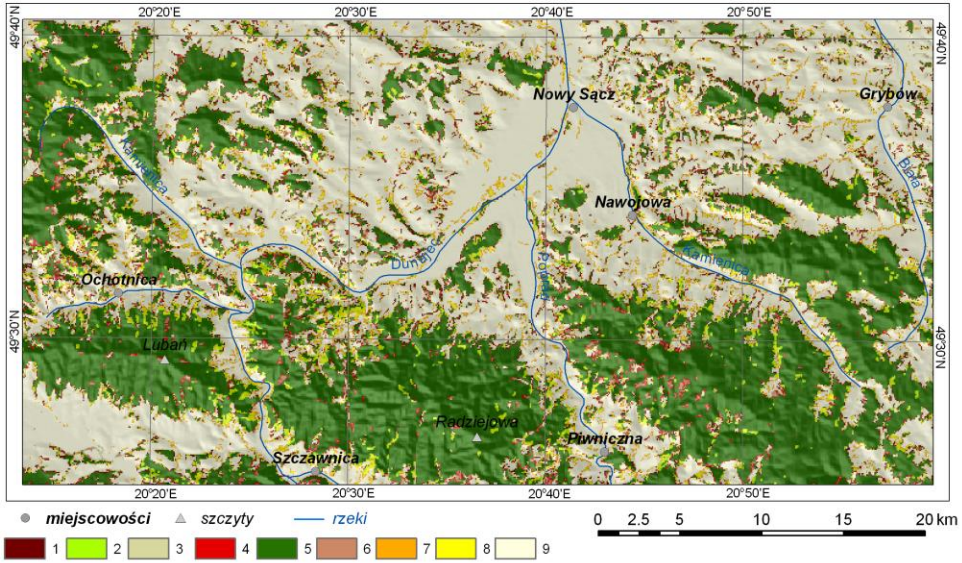
- Elevation and slope (source: STRM DEM, spatial resolution 90 m)
- Distance to artificial areas (source: land cover map 2006; distance operation)
- Migration, NUTS type (urban/rural), distace to urban NUTS (source: GUS)
- Ownership: state/private forest (source: state forest)

Ostapowicz 2007

www.short term land cover change analysis and modelling



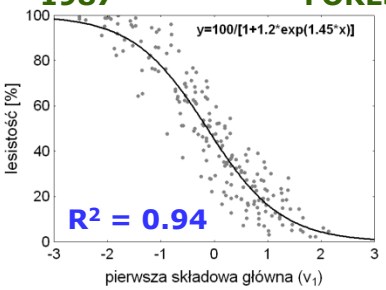
Forest cover: 46% (1987) → 51% (2000)

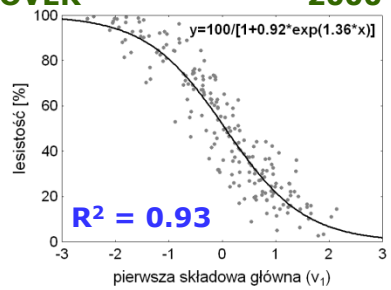


Forest spatial pattern index: 22% (1987) → 27% (2000)

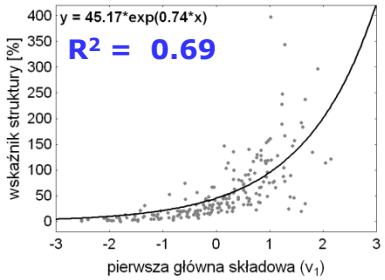
Ostapowicz 2007

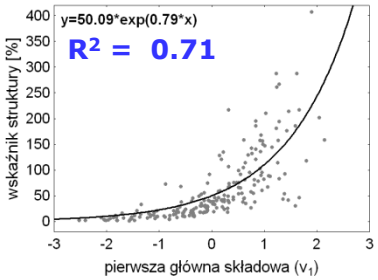
FOREST COVER



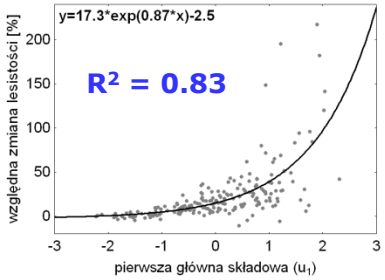


FOREST SPATIAL PATTERN

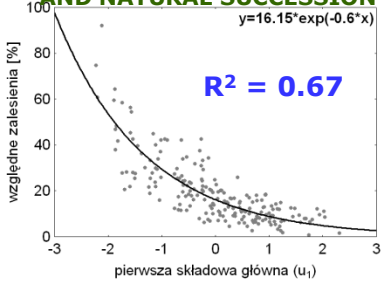




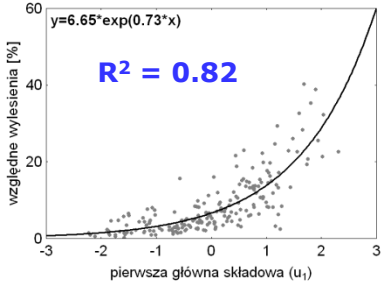
FOREST CHANGE



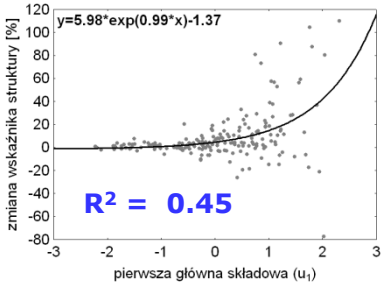
AFORESTATION AND NATURAL SUCCESSION

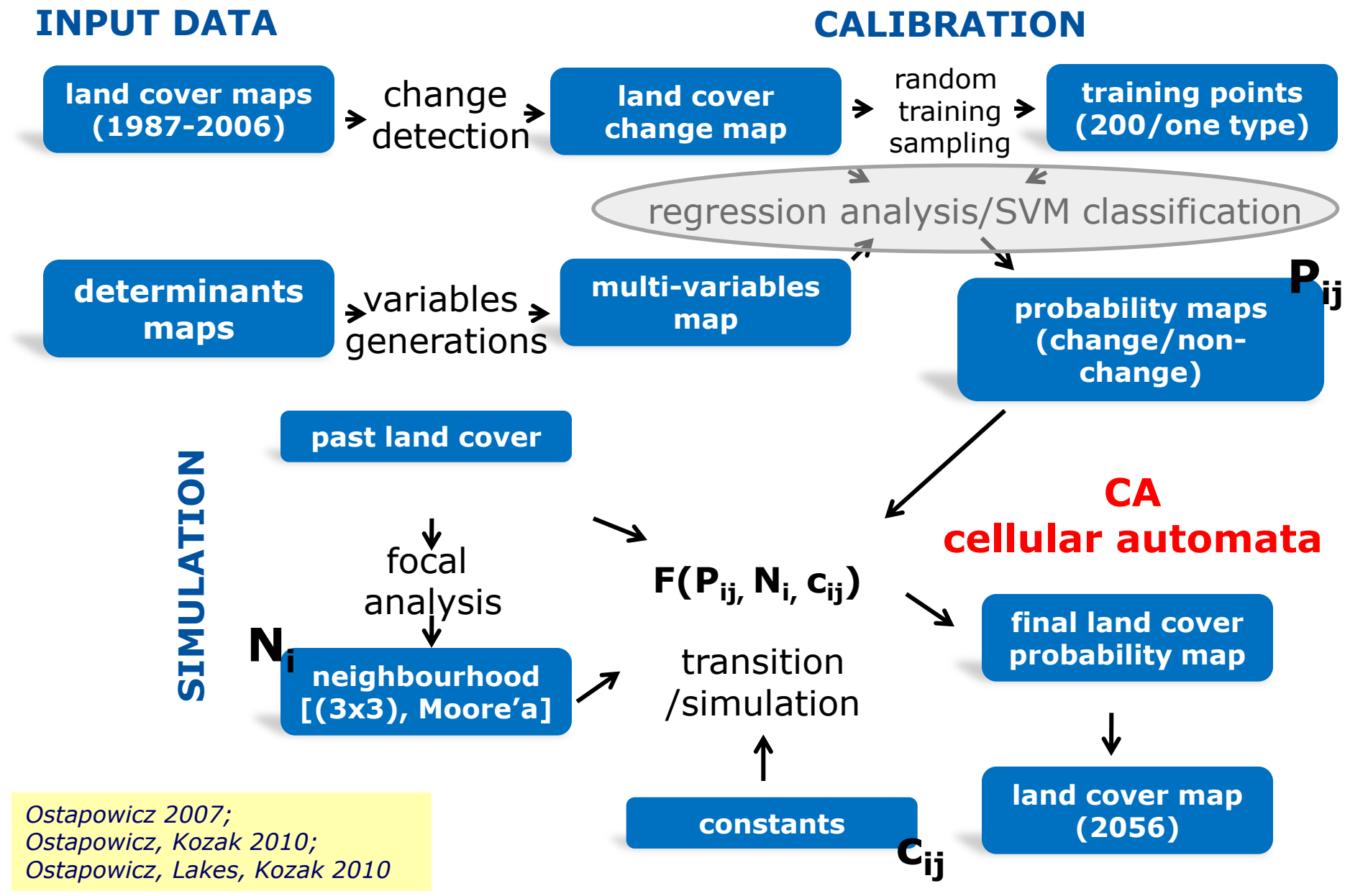


DEFORESTATION



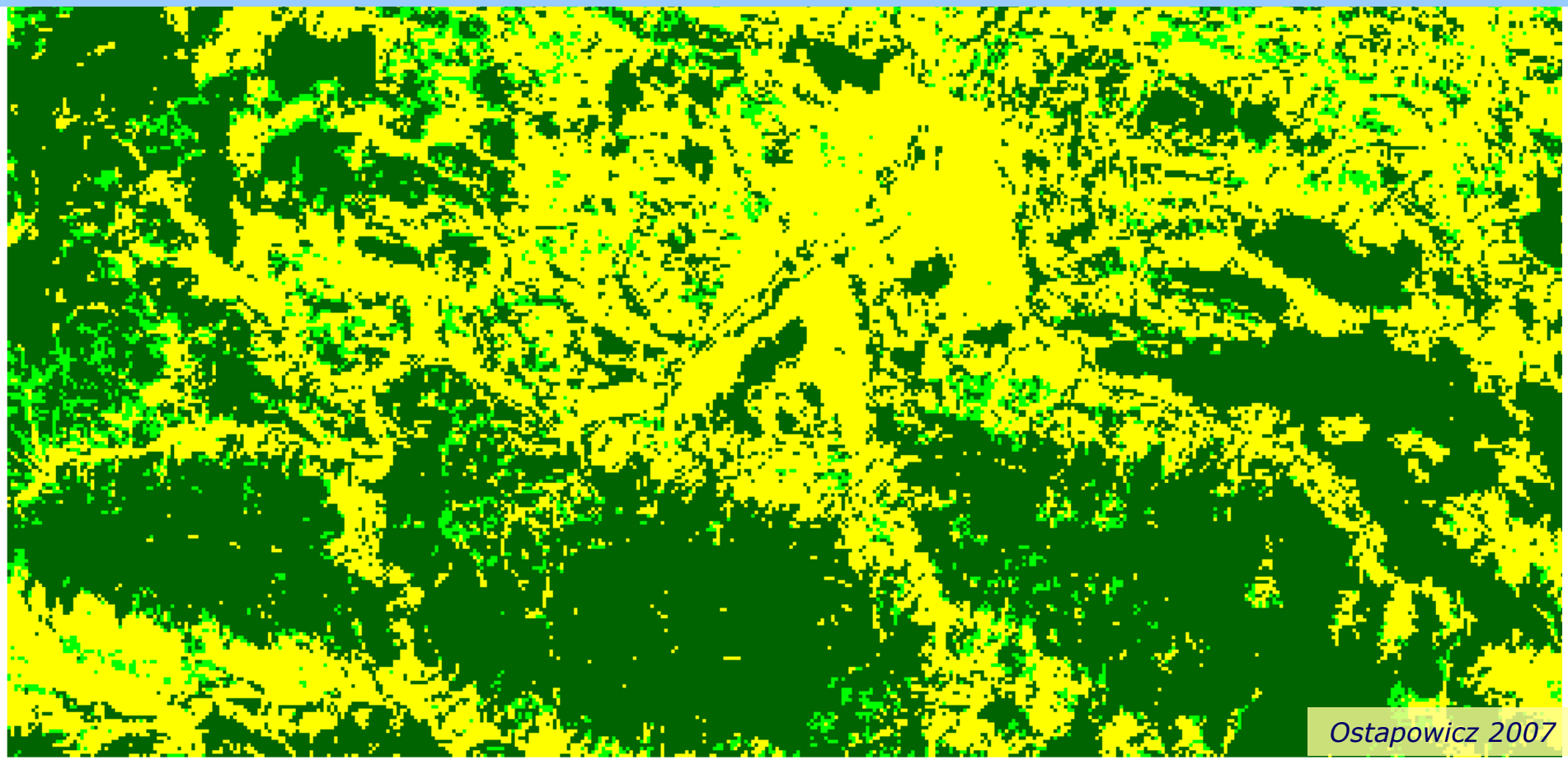
CHANGE IN SPATIAL PATTERN





Ostapowicz 2007;
Ostapowicz, Kozak 2010;
Ostapowicz, Lakes, Kozak 2010

www.land cover change modelling



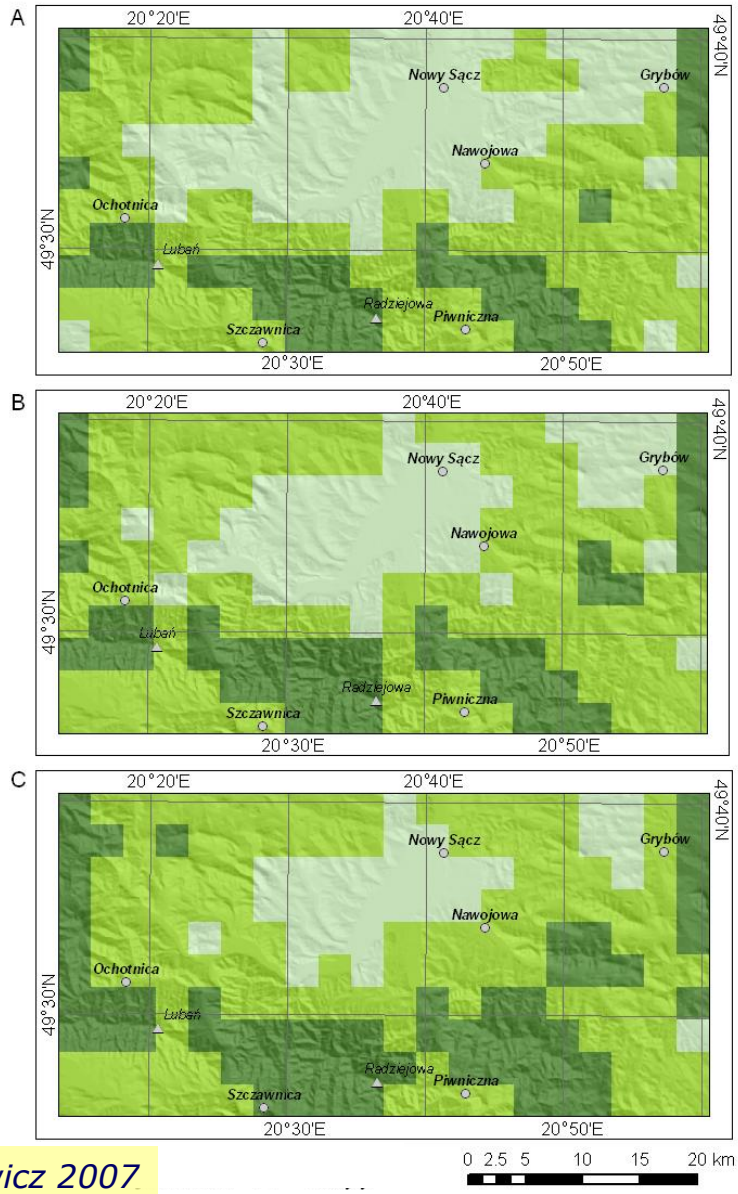
year	forest cover [%]	spatial pattern [edge to core index]	year	forest cover [%]	spatial pattern [edge to core index]
2000	50,98	26,64	**2030**	54,54	24,70
2010	52,16	26,44	**2040**	55,79	23,67
2020	53,27	25,67	**2050**	57,06	22,72

www.land cover change modelling

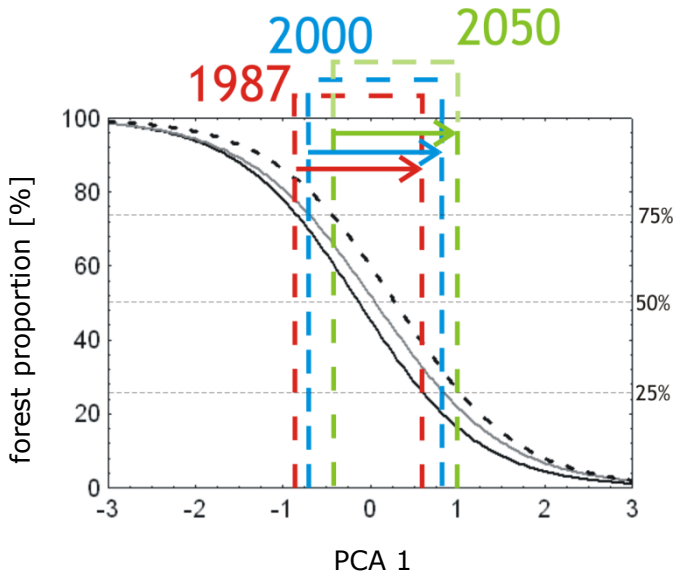
1987

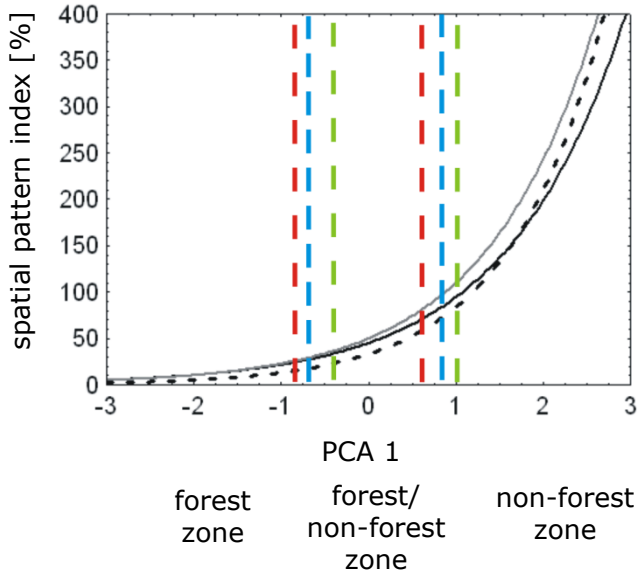
2000

2050



Ostapowicz 2007

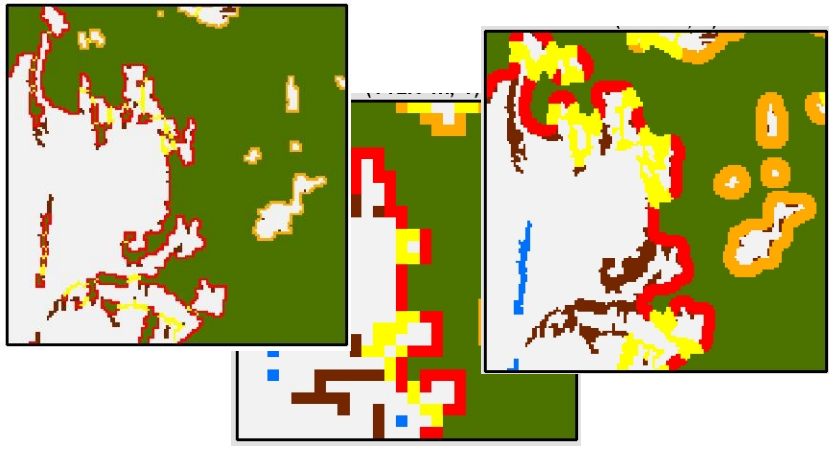




[1] – forest zone; [2] – forest-non-forest zone; [3] – non-forest zone

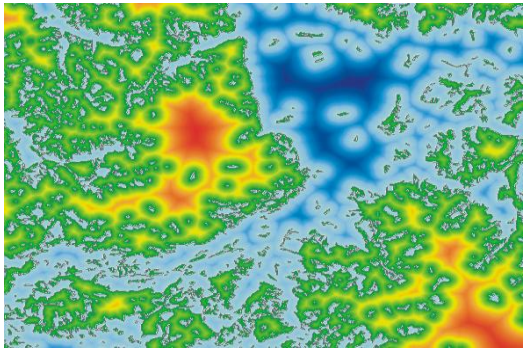
Biodiversity – fragmentation and connectivity assessment

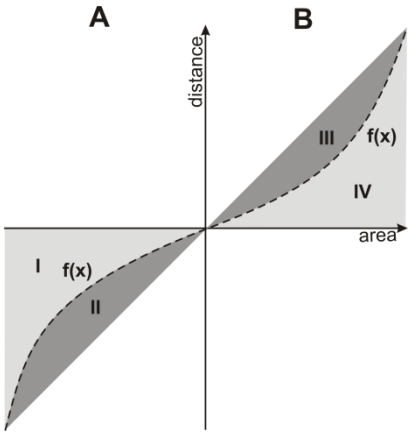
Morphological spatial pattern analysis (MSPA)



Ostapowicz, Vogt, Riitters, Kozak, Estreguil 2008

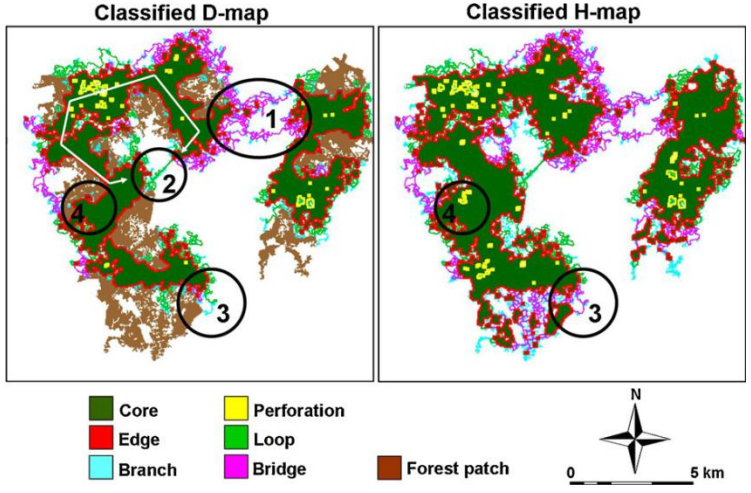
Landscape hypsometric curve (LHC)





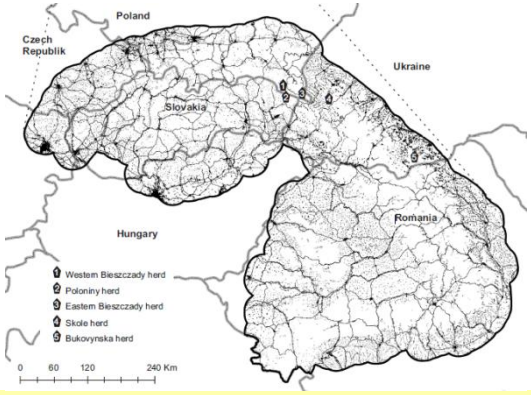
Ostapowicz, Kozak, Vogt, Ziółkowska (in preparation)

Mapping Functional Connectivity



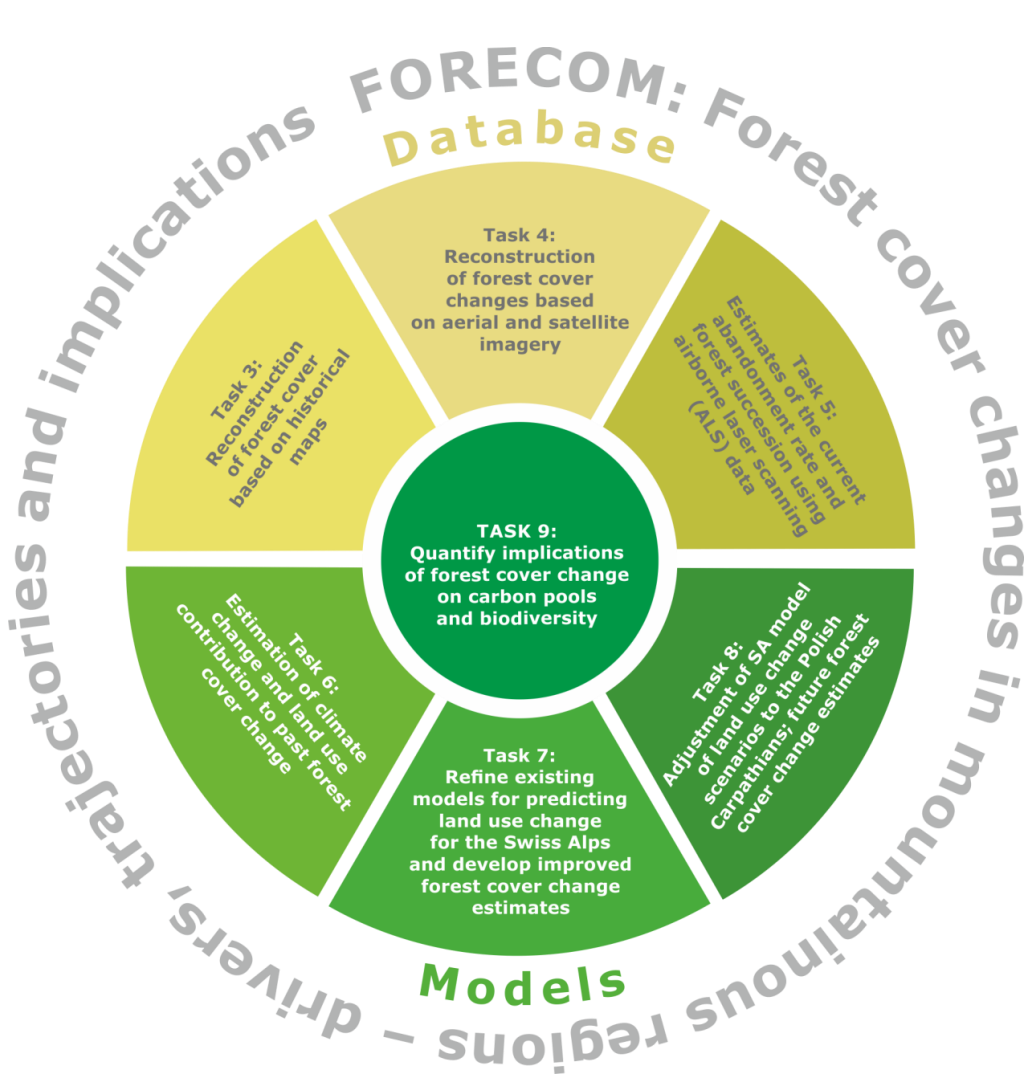
Vogt, Lookingbill, Gardner, Ferrari, Riitters, Ostapowicz 2009

Potential habitat connectivity of European bison (Bison bonasus)

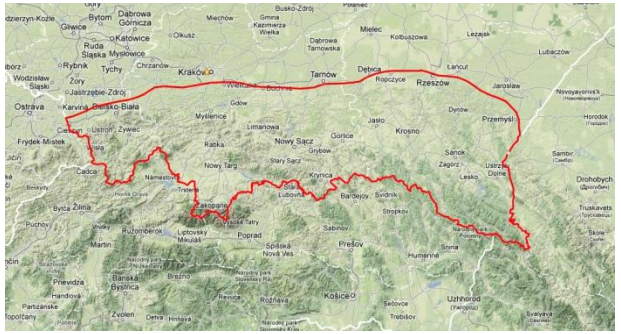


Ziółkowska, Ostapowicz, Kuemmerle, Perzanowski, Radeloff, Kozak 2012

www.land cover change modelling



the Polish Carpathians



the Swiss Alps

http://www.gis.geo.uj.edu.pl/FORECOM/index.html

SWISS CONTRIBUTION

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Thank you for listening!

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