

Land use and land cover changes in the Carpathian Basin

Experiences in the vectorisation of the archive maps



Géza Király¹

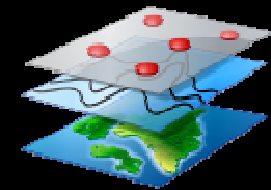
Éva Konkoly-Gyuró²

Zita Hallósy-Sereg¹

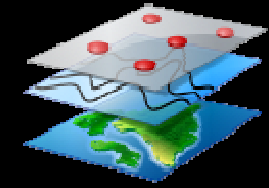
University of West Hungary Faculty of Forestry

¹Department of Surveying and Remote Sensing

²Department of Landscape Science and Rural Development



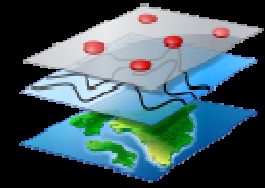
Our Department



- University of West Hungary
 - Faculty of Forestry
 - Institute of Geomatics, Forest Opening-Up and Water Management
 - Department of Surveying and Remote Sensing

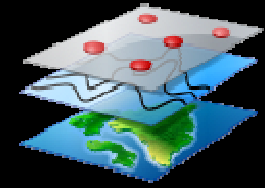


Background



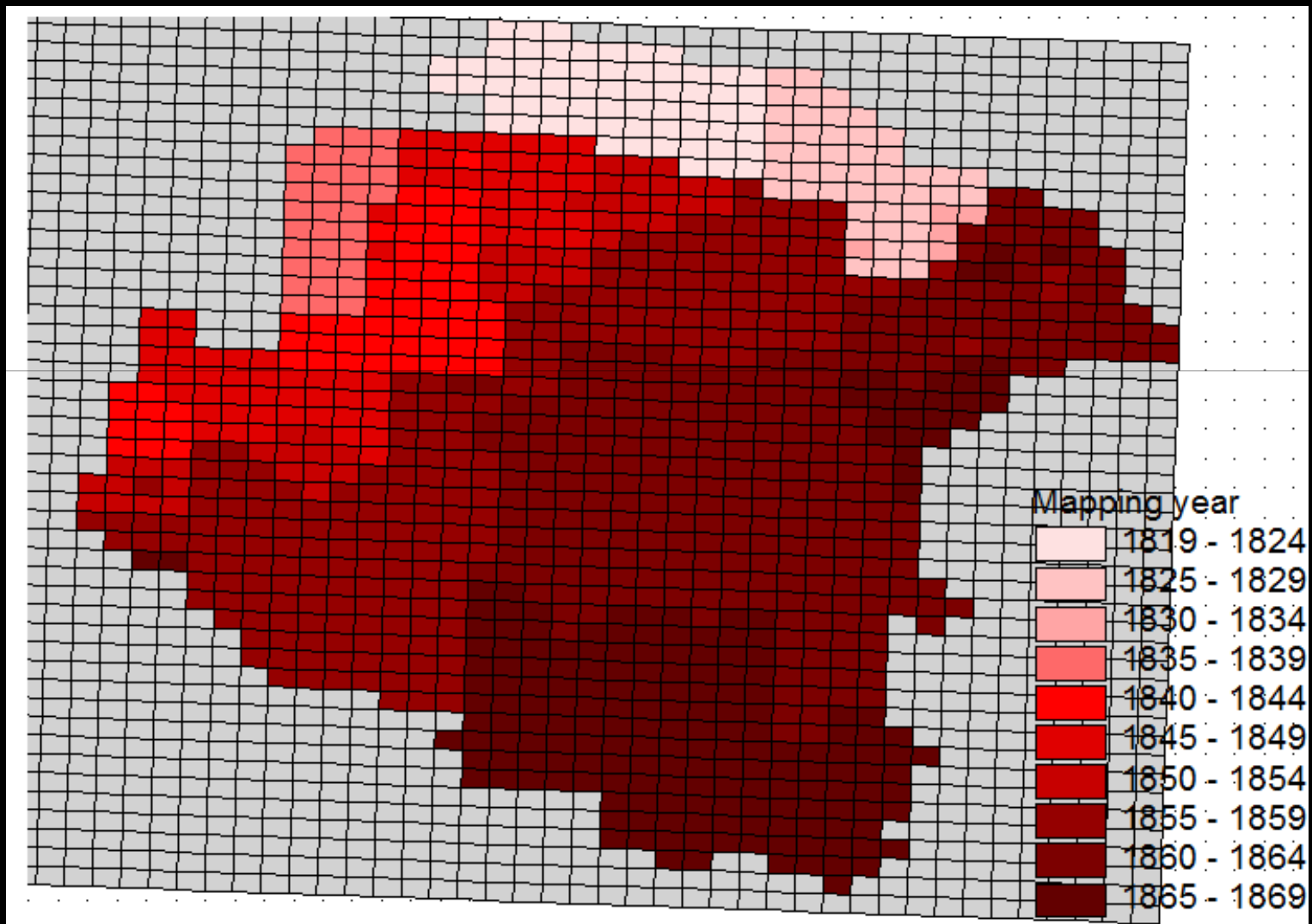
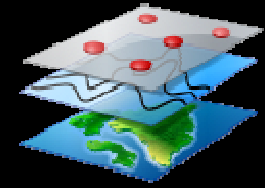
- NASA supported project: '200 years of land use and land cover changes and their driving forces in the Carpathian Basin'
- Archive maps
 - II. Military Survey
 - Bedř Forest Map
 - Interwar period
 - New Survey

II. Military Survey Data Sources



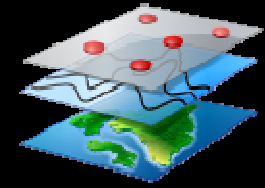
- Hungarian Kingdom (HK): The Second Military Survey (Georeferenced). Published: October 2006. ISBN 963 7374 35 3
- Transylvania: First and Second Military Survey: Grossfürstenthum Siebenbürgen, 1:28.800 - georeferenced, synchronized. Published: November 2007. ISBN 978 963 7374 60 9

II. Military Survey Mapping year



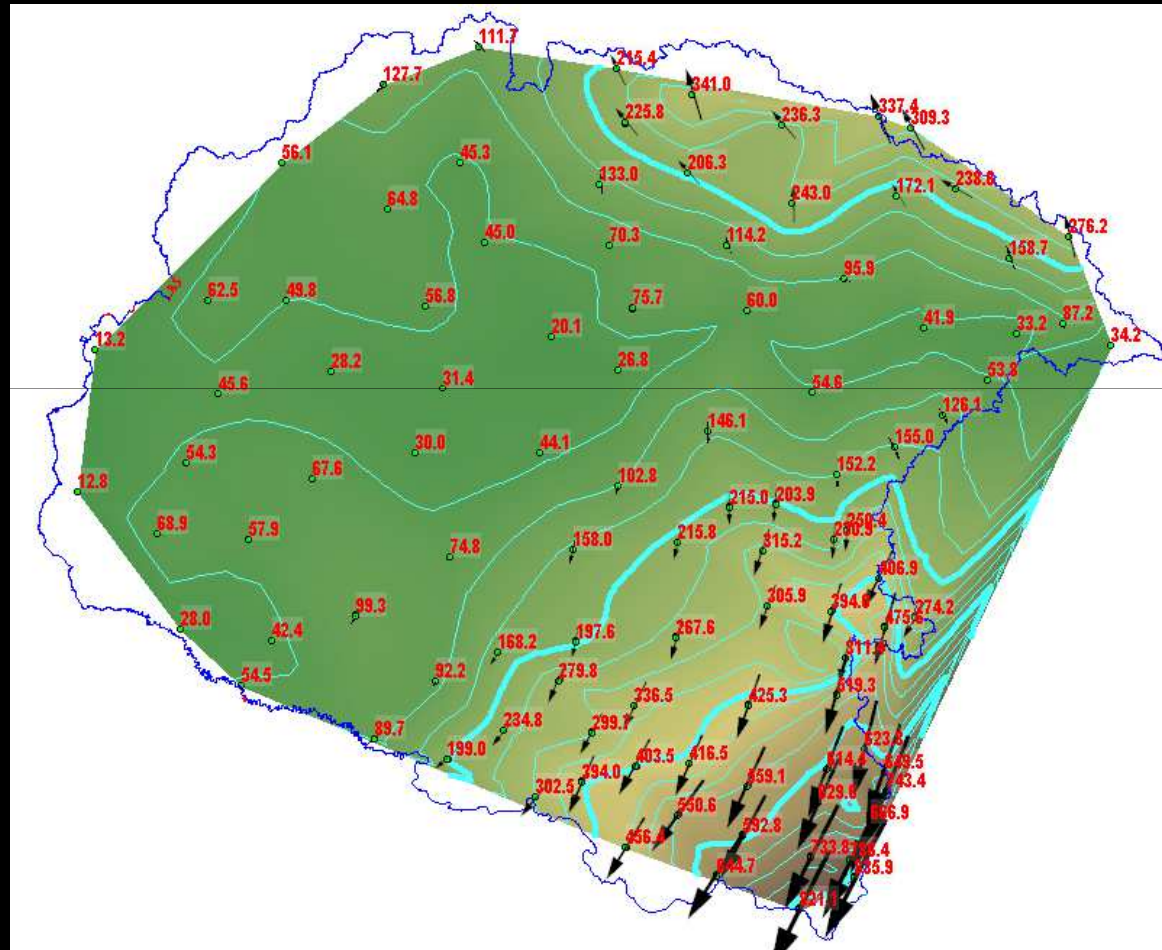
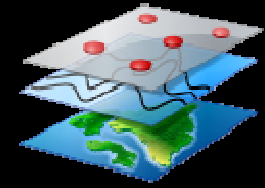
II. Military Survey

Method suggested / used

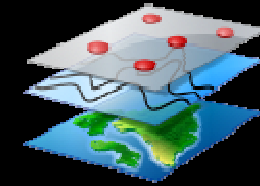


1. Select an appropriate projection system
2. Export the raster images (practically into several sheets) from the DVD into the selected projection system
3. Check the geometric accuracy of the results
4. Reproject the LAEA Grid points into the selected system
5. Make the coding of the points in Your favourite GIS software according to the legend

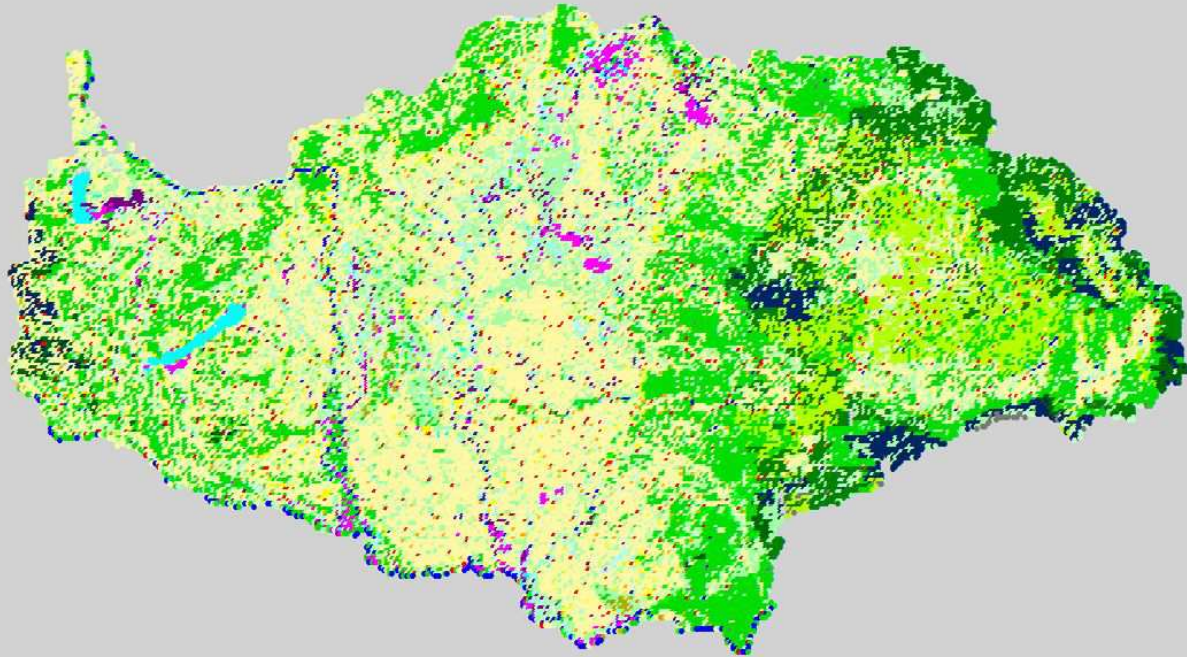
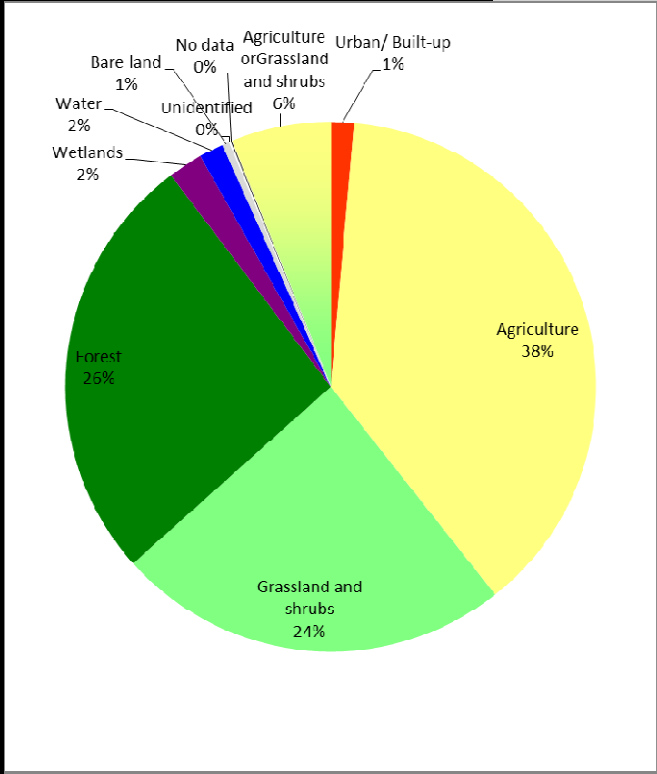
II. Military Survey Map accuracy



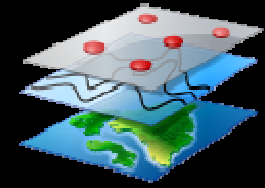
II. Military Survey Results



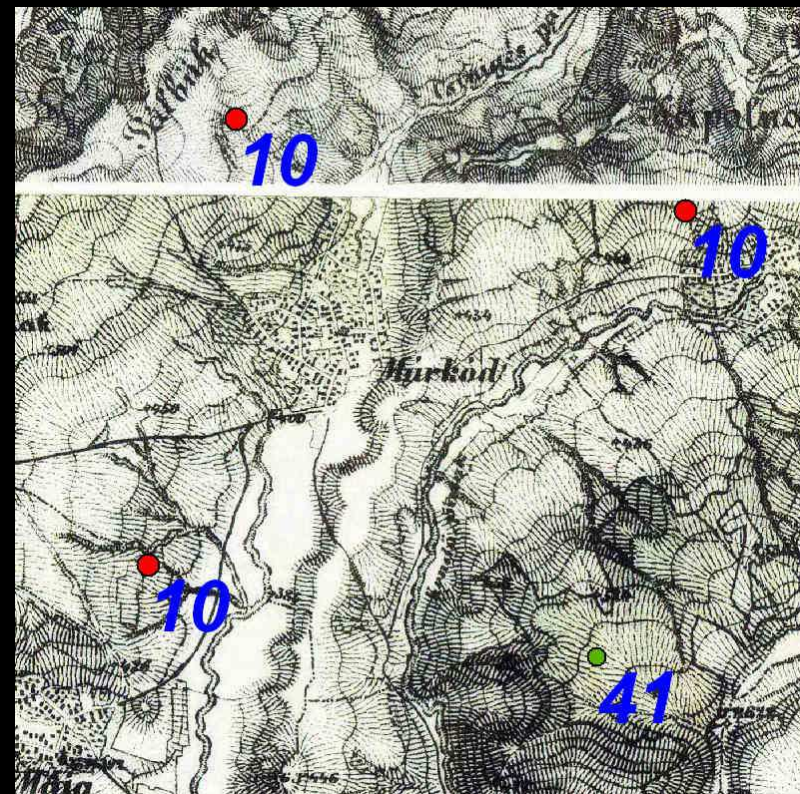
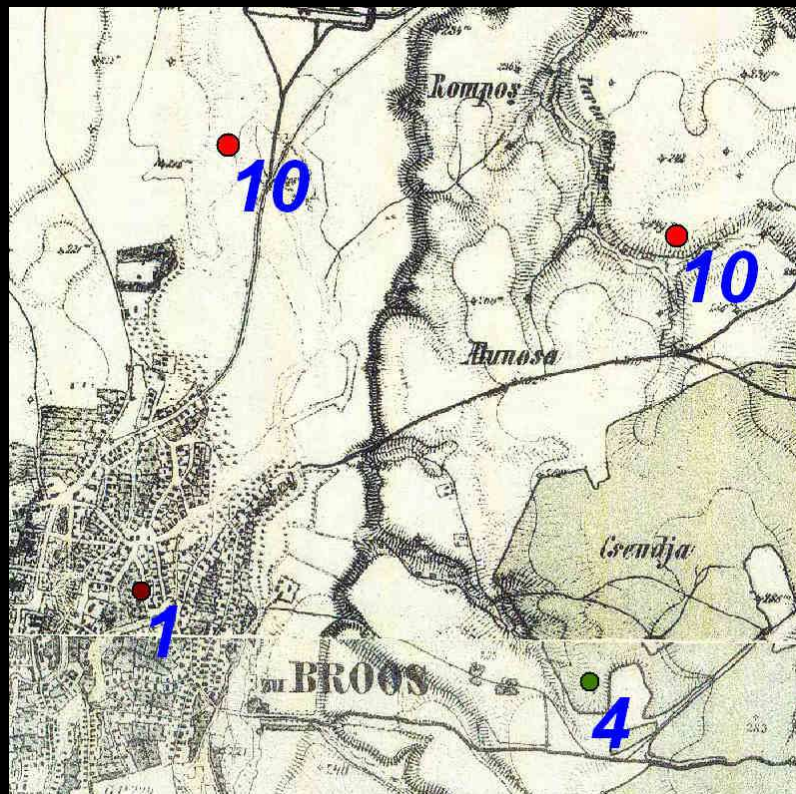
225 060 km²



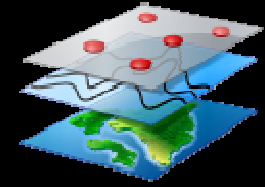
Legend



- Code 10
Agriculture OR Grasslands and shrubs

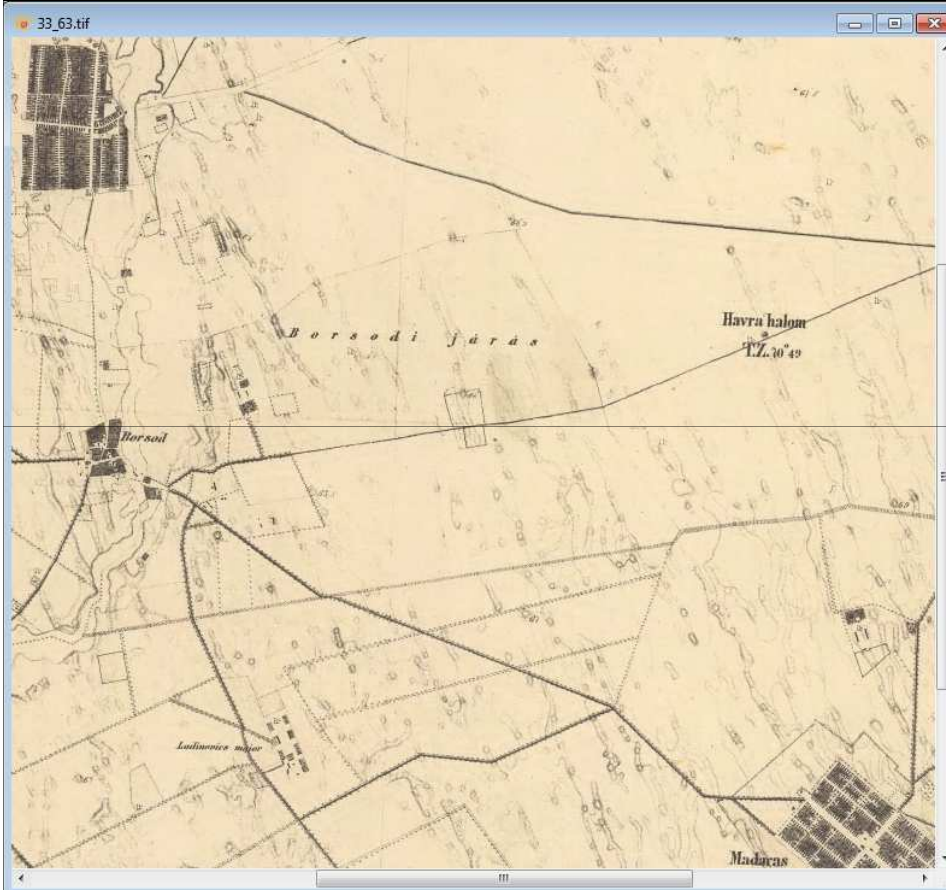
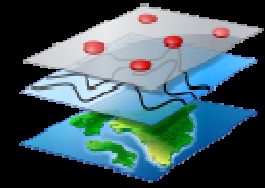


Kriegsarchiv Wien

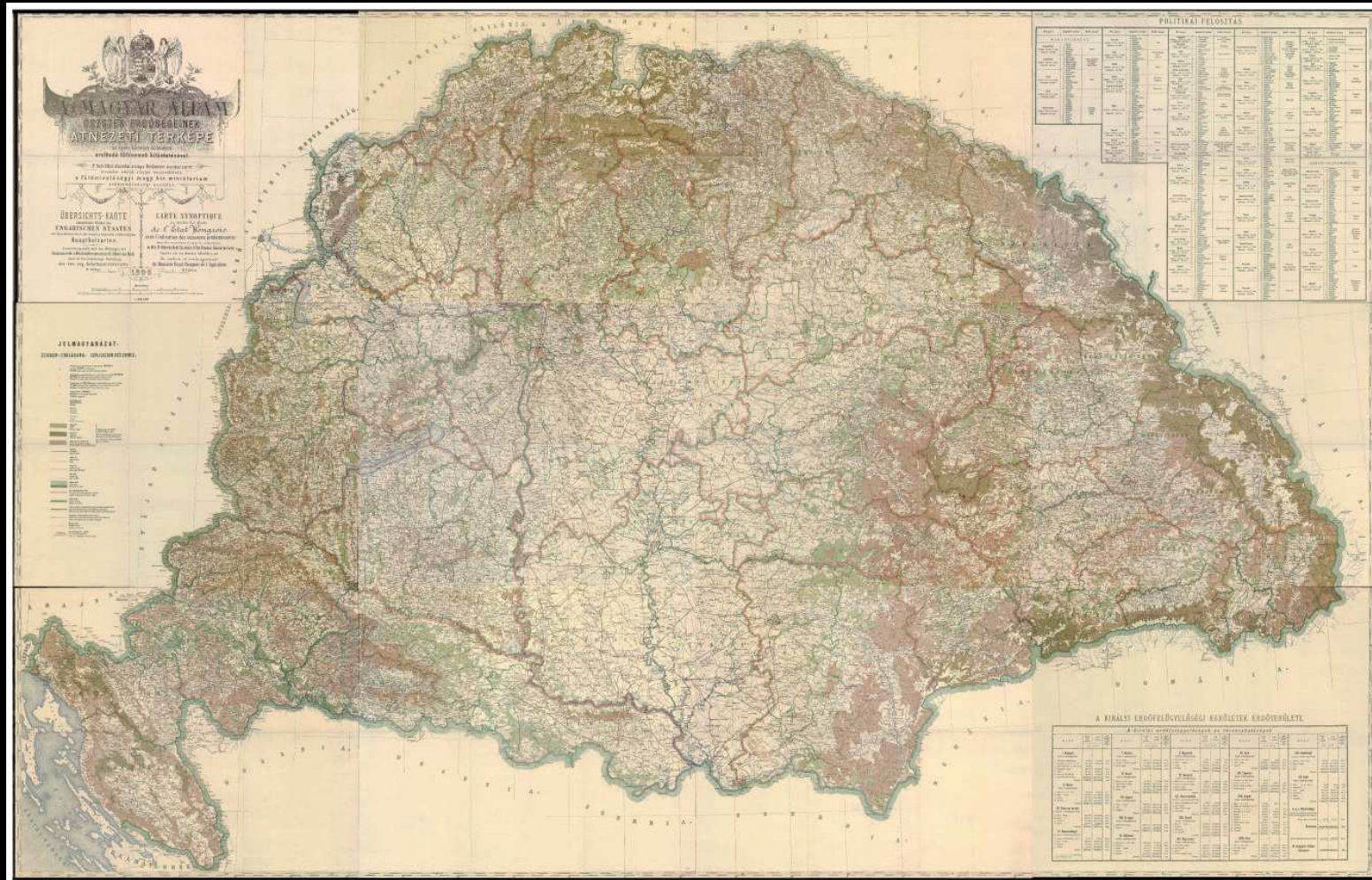
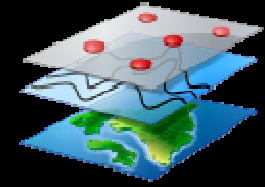


- 7 new sheets
 - 6 from Hungarian Kingdom
 - 1 from Transylvania
- Very high quality
- Approx. 200 points can be coded / improved

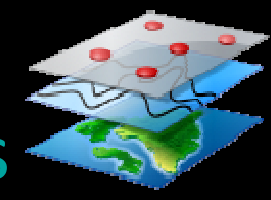
Kriegsarchiv Wien



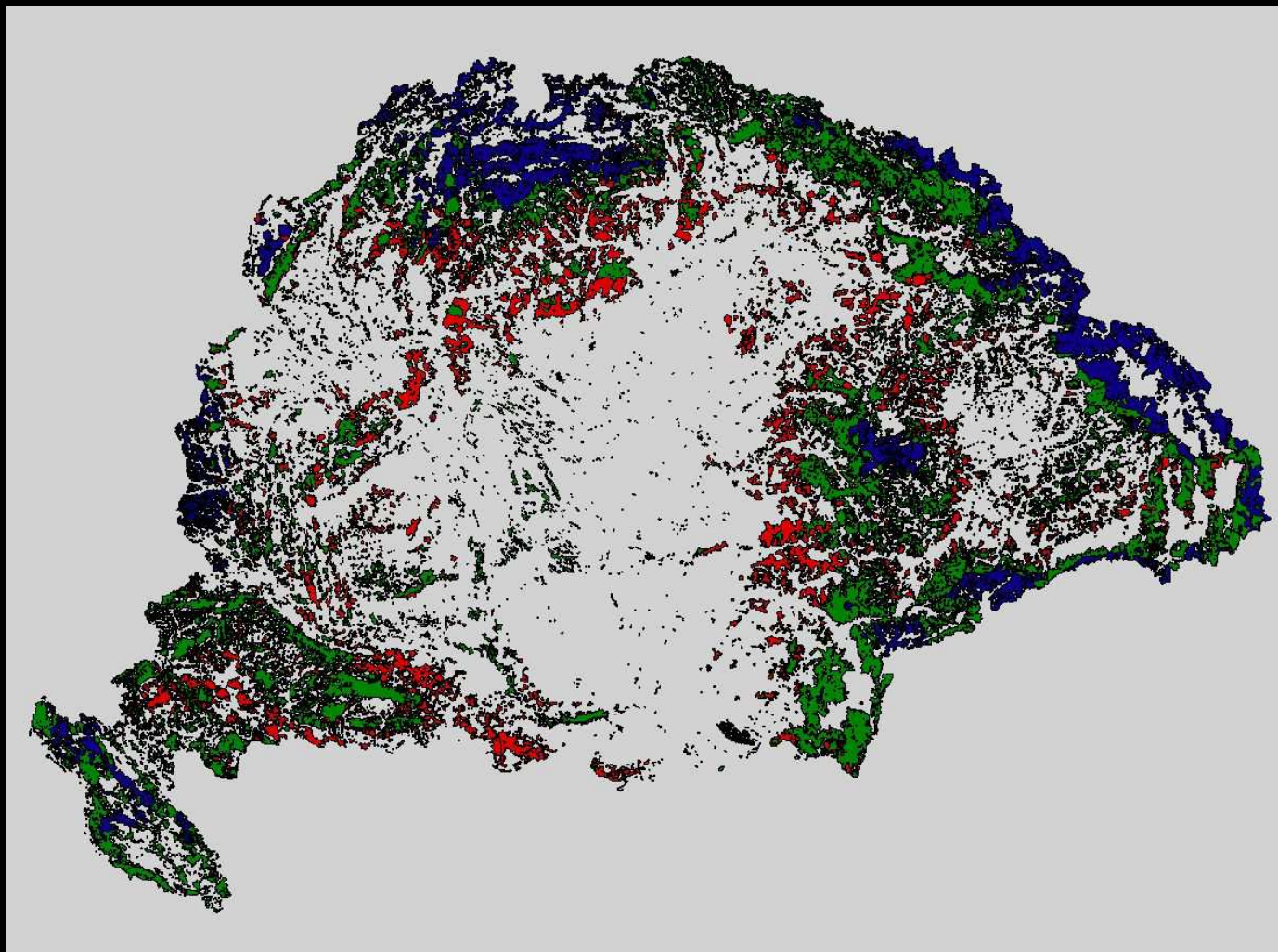
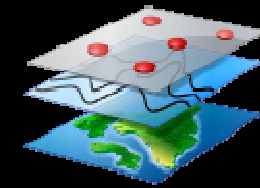
Overview forestry map of Hungary, with main tree types – 1896, Albert Bedő



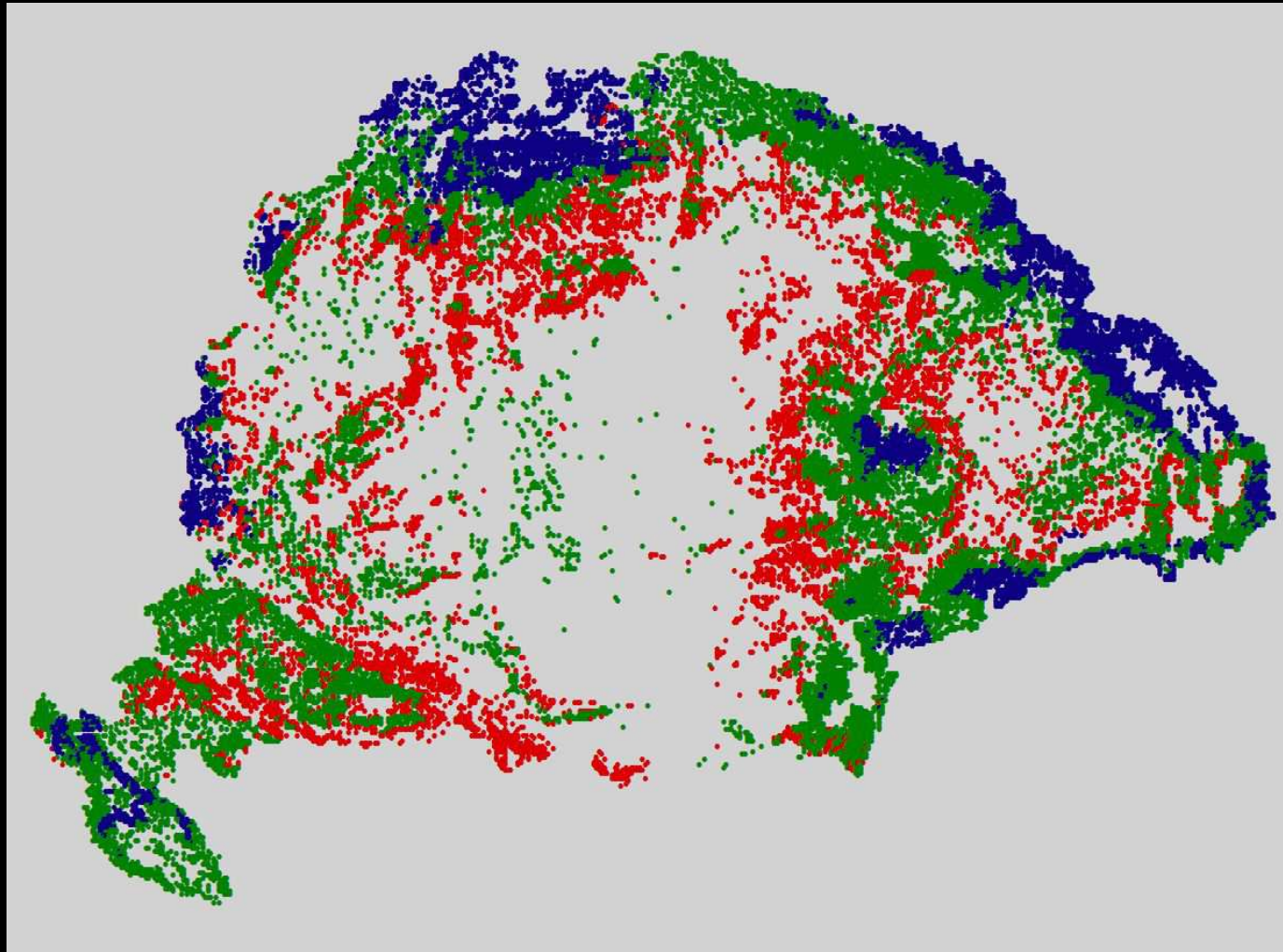
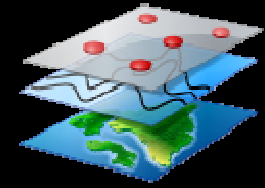
Overview Forestry map of Hungary relief, created for the World Expo, 1900 Paris



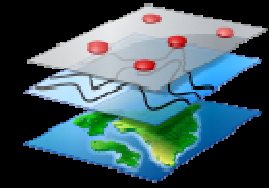
Vectorised polygon of the Bedő's Map



Coded points based on the Bedő's Map



Comparison of polygon vs points our sampling method

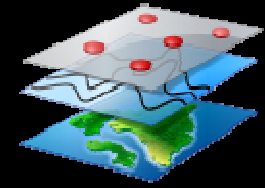


- ~28% Forest cover

Class	Area (km ²)	
	Polygon	Points
Oak	28 804	28 776
Beech and o HW	51 856	51 532
Conifers	22 183	22 068
Sum	102 844	102 376

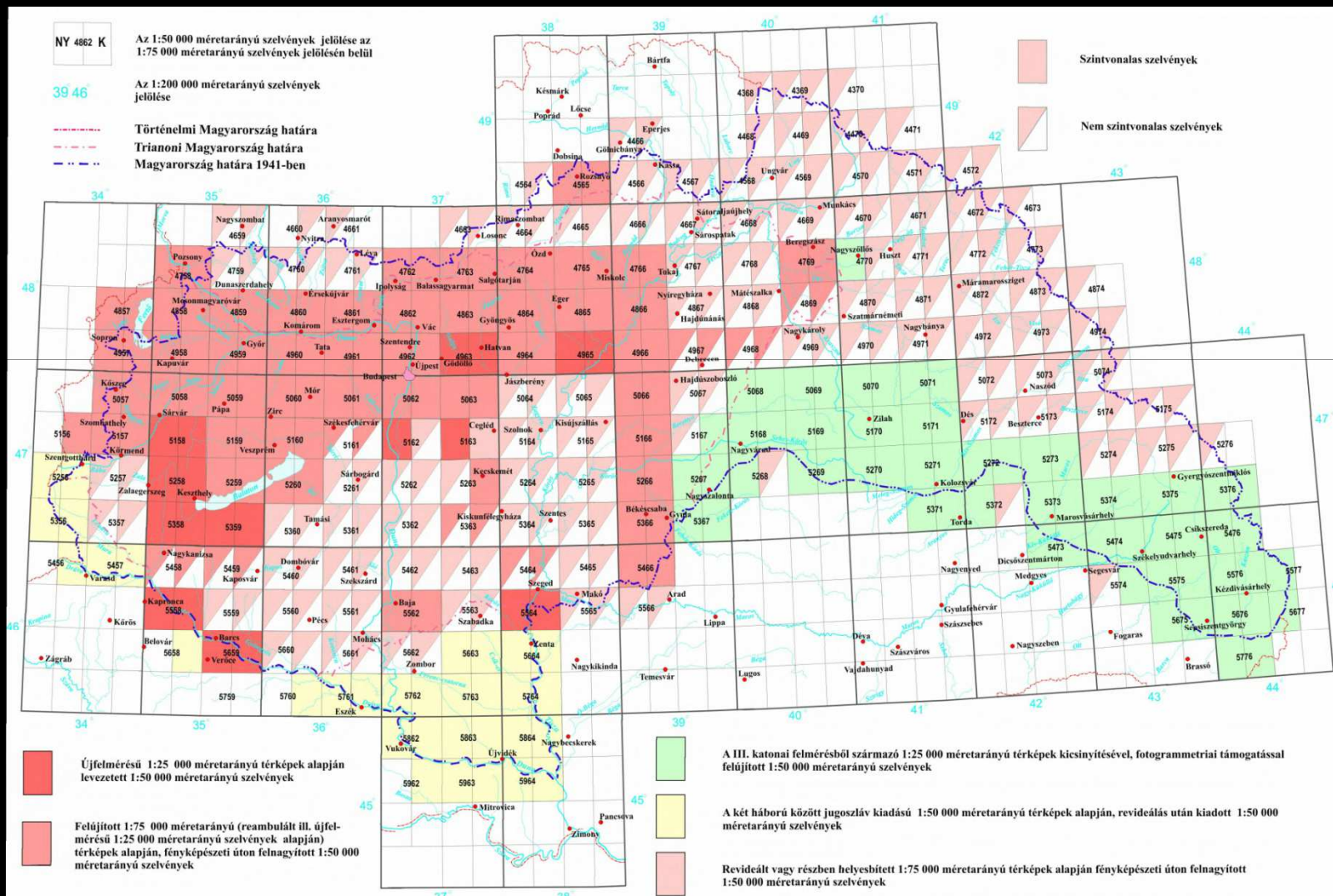
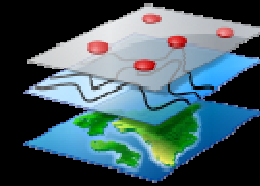
Interwar periode

Data source

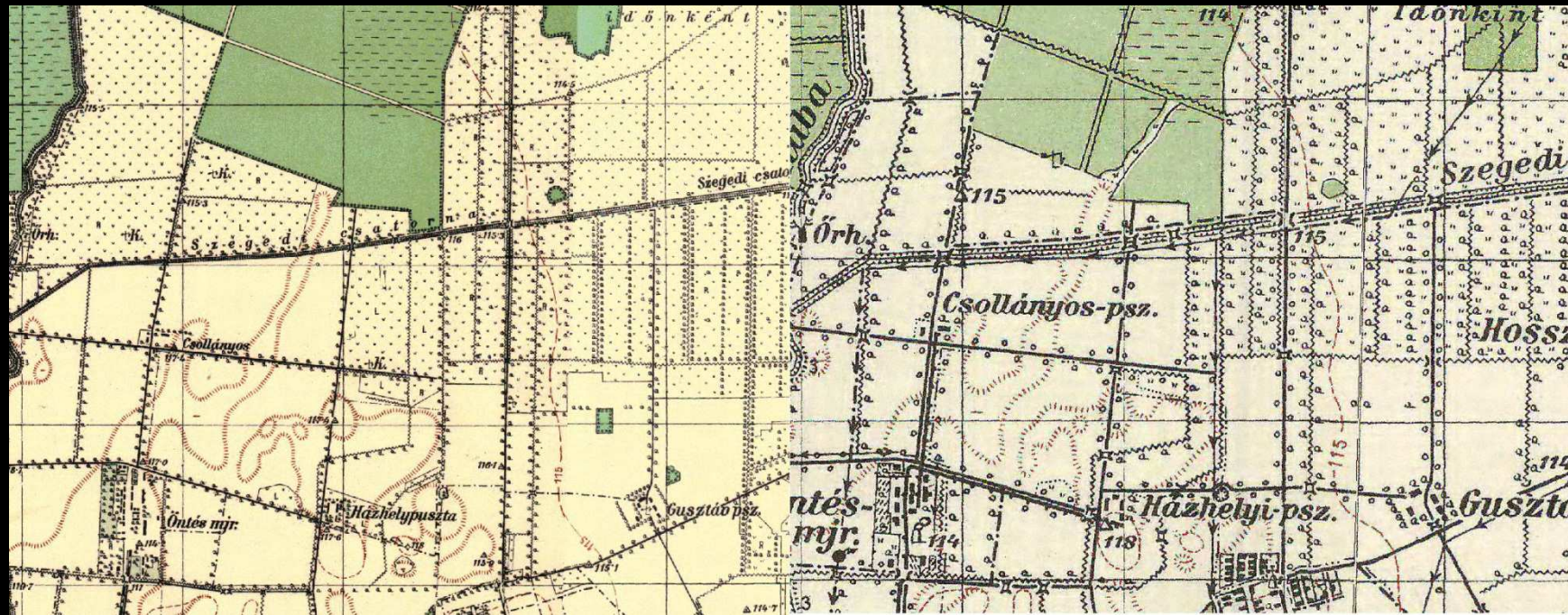
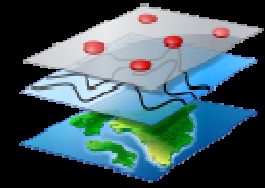


- Magyarország topográfiai térképei a második világháború időszakából (Topographic Maps of Hungary in the Period of WWII), 1:50.000 (Georeferenced). Published: June 2008. ISBN 978 963 7374 71 5

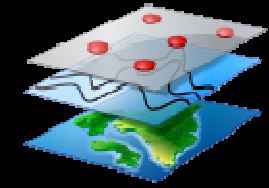
Interwar periode Differences



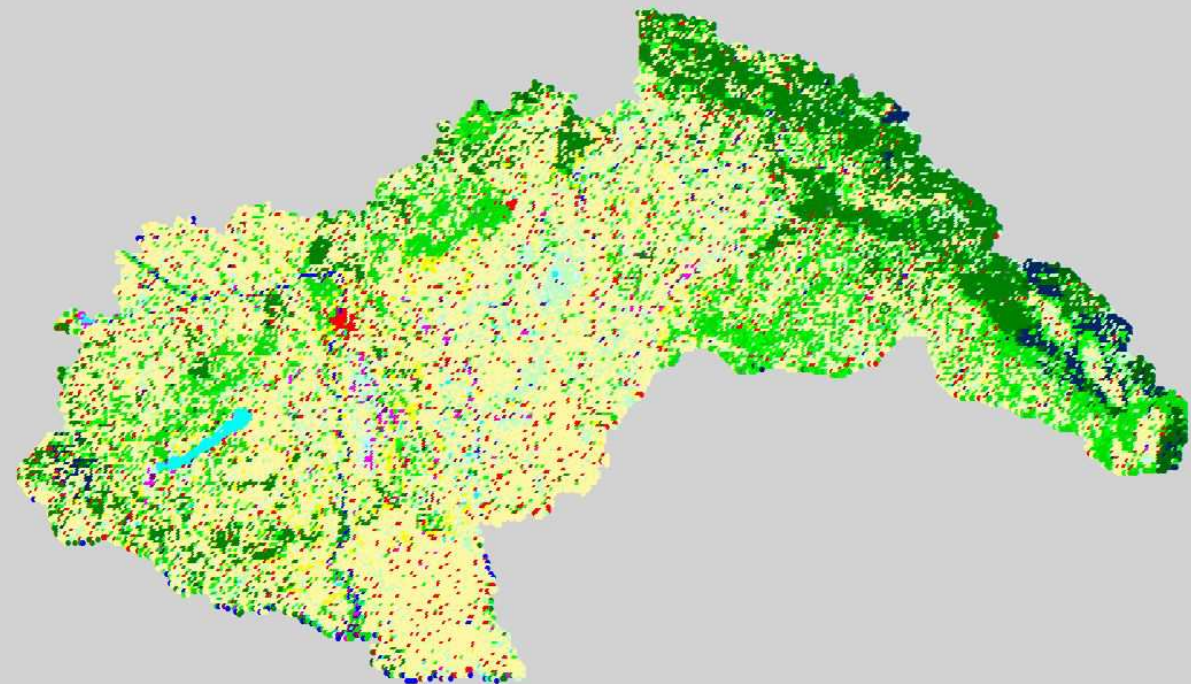
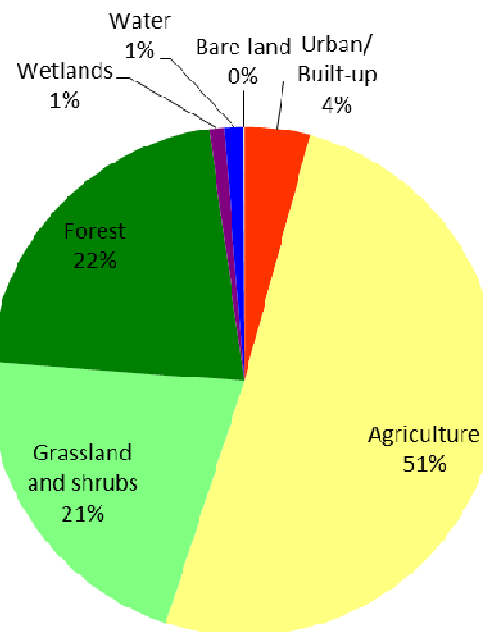
Interwar periode Differences



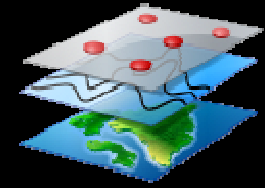
Interwar period Results



171 160 km²

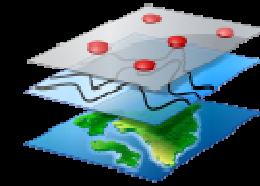


„New Survey” Data source

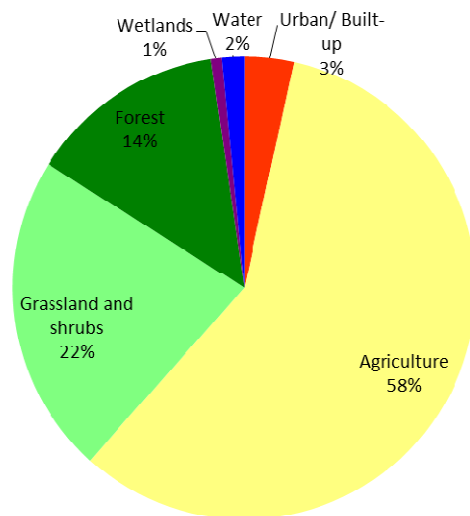
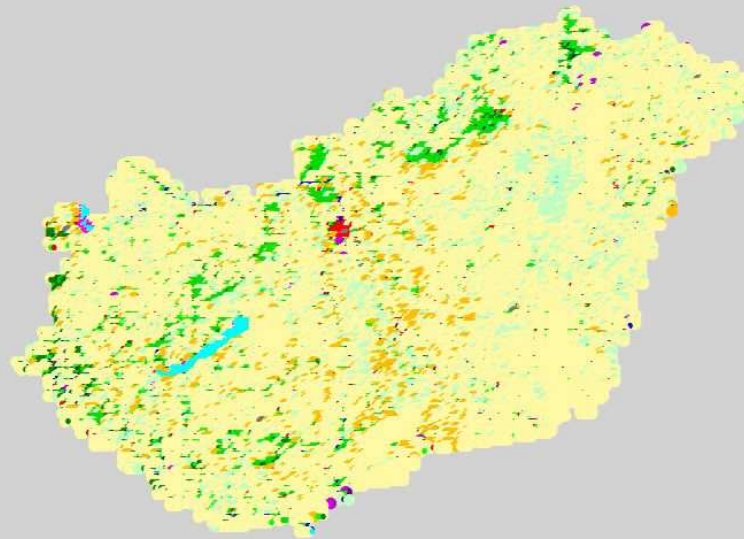


- Ordered by USSR
- 1953-59
- 1 : 25 000
- Gauss-Krüger, S-42
- Military archiv, Budapest
 - Scanned and already rectified in EOVS

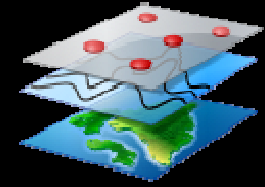
„New Survey” Results



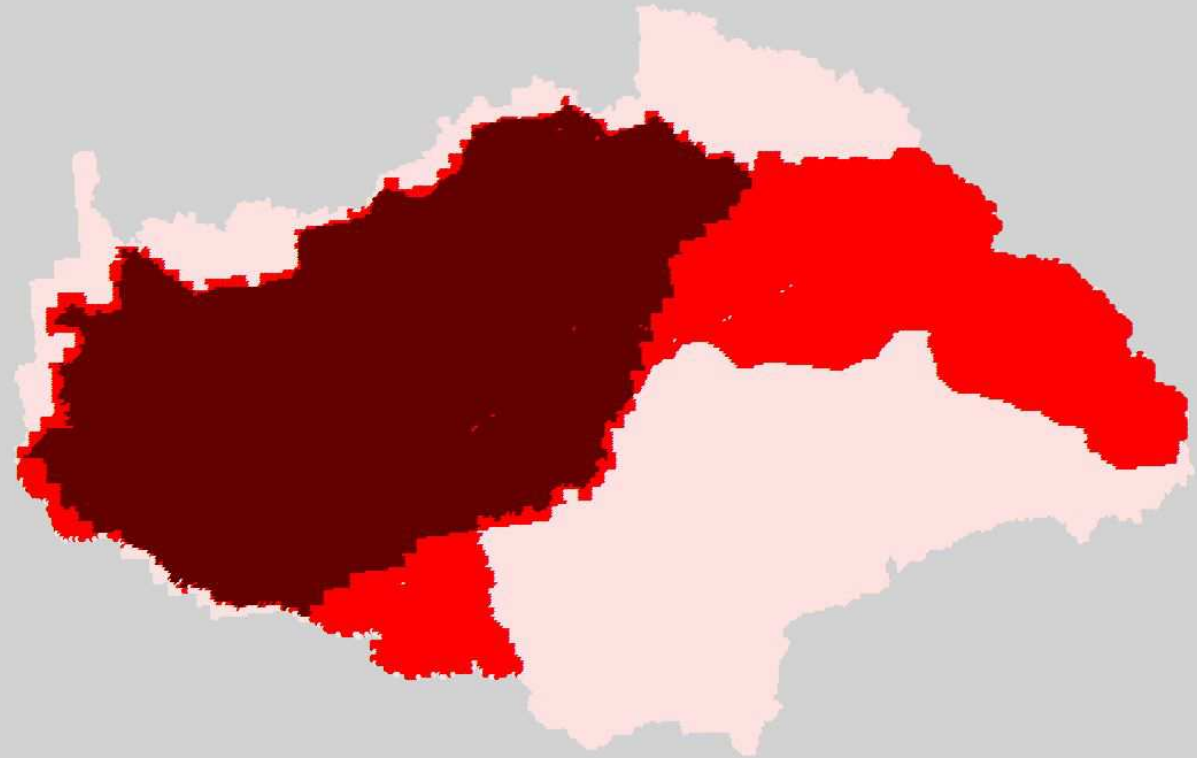
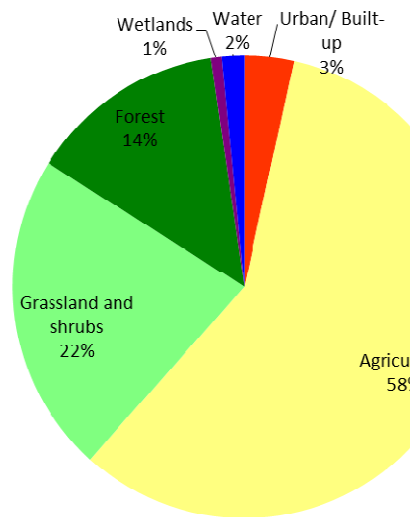
102 424 km²



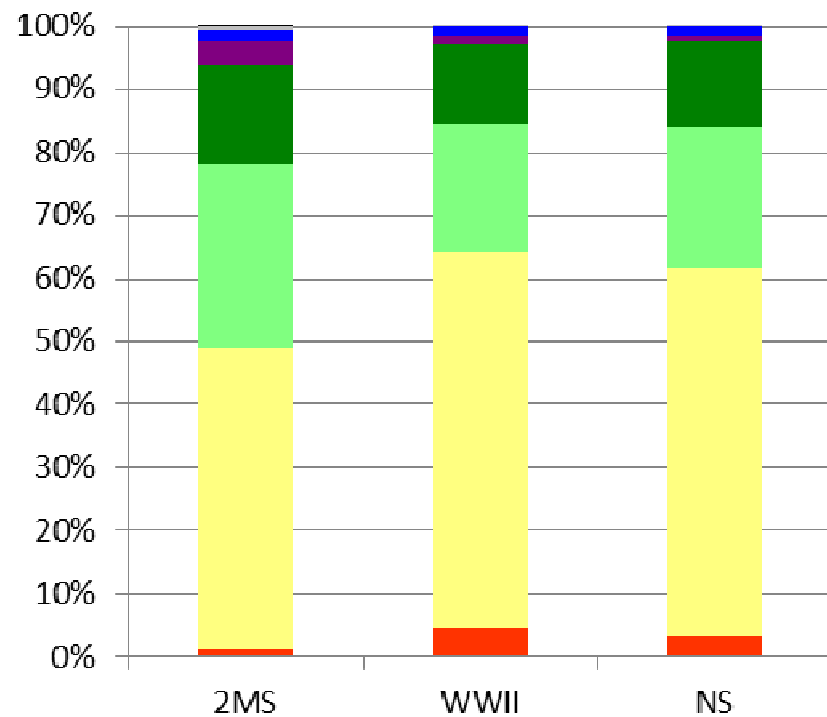
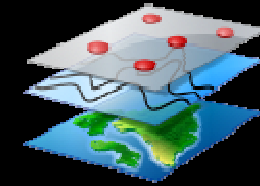
Overlaps of the Surveys



97 256 km²

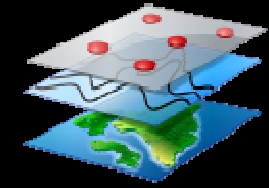


Transitions of the land cover



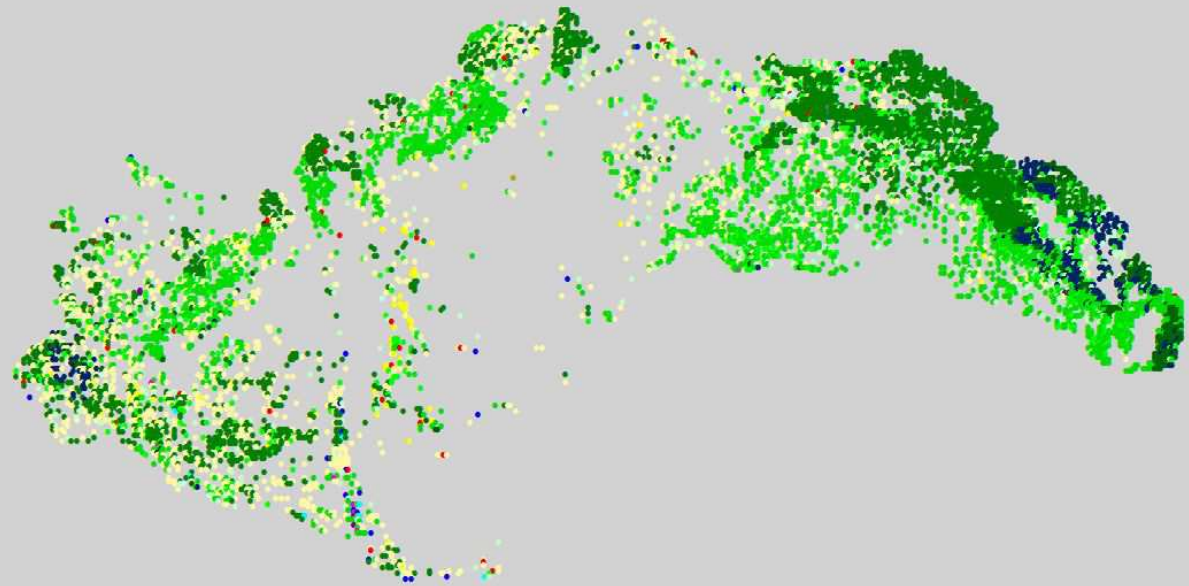
Categories	2MS	WWII	NS
Urban/ Built-up	1.4%	4.5%	3.5%
Agriculture	47.7%	59.8%	58.1%
Grassland and shrubs	29.0%	20.3%	22.5%
Forest	15.9%	12.5%	13.7%
Wetlands	3.7%	1.3%	0.7%
Water	2.0%	1.6%	1.5%
Bare land	0.4%	0.0%	0.0%
Unidentified	0.0%	0.0%	0.0%
No data	0.0%	0.0%	0.0%

Transition of forests 2MS -> WWII



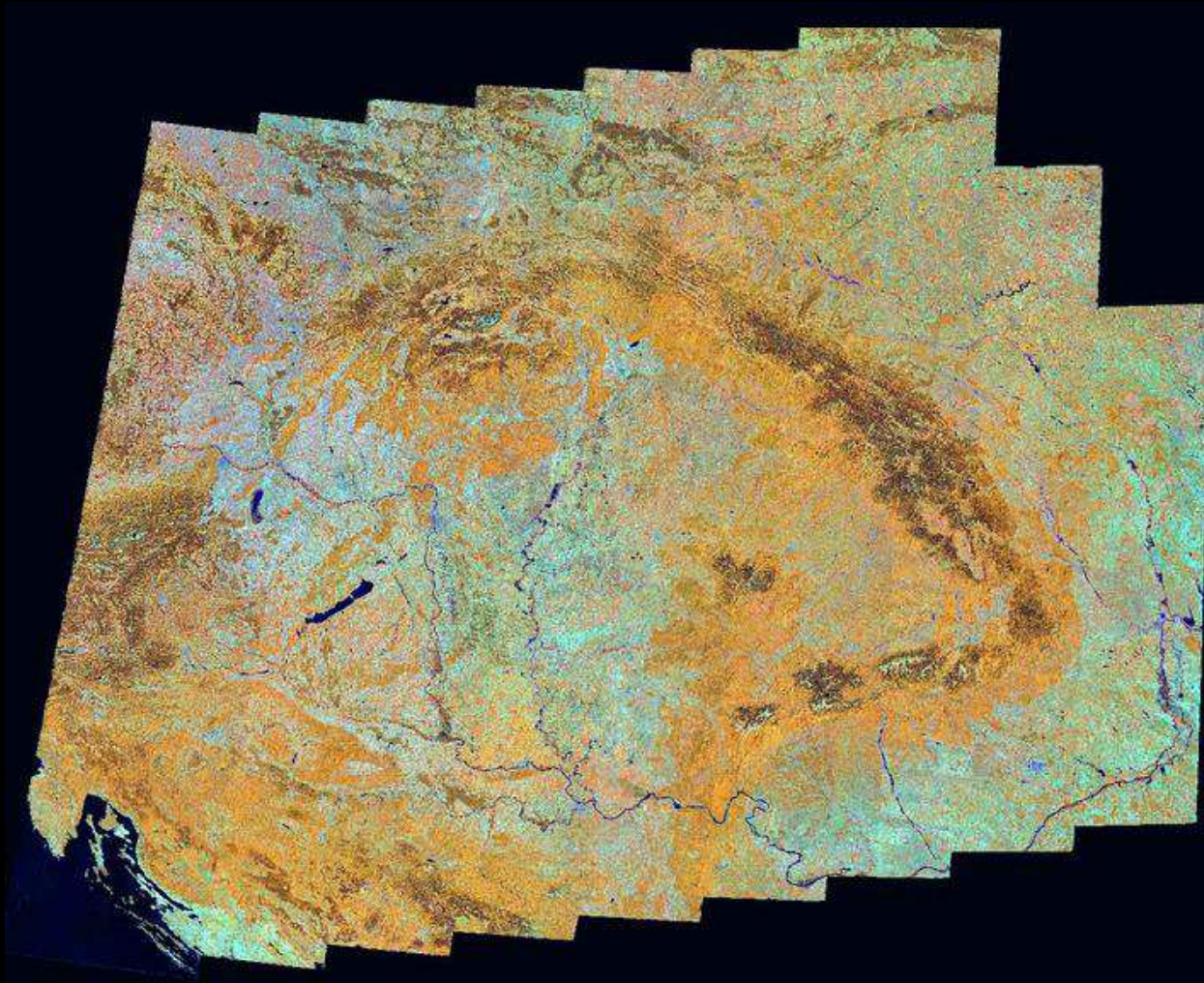
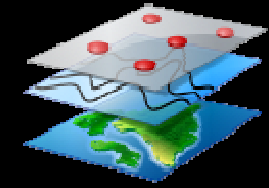
15 488 km²

Categories	2MS	WWII
Urban/ Built-up		0.7%
Agriculture		30.1%
Grassland and shrubs		10.4%
Forest	15 488	58.1%
Wetlands		0.2%
Water		0.5%
Bare land		0.1%
Unidentified		0.0%
No data		0.0%
	15 488	100.0%

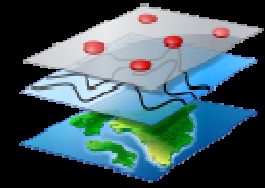


Mosaicing Landsat Scenes

Patrick Griffiths et al.



Already available Landsat 8 Scenes



USGS Global Visualization Viewer

Collection Resolution Map Layers Tools File Help

Downloadable

WRS-2 Path / Row: 189 27 Go

Lat/Long: 47.4 17.2 Go

Max Cloud: 100%

Scene Information:
ID: LC81890272013114LGN01
CC: 2% Date: 2013/4/24
Qlty: 9 Product: OLI_TIRS_L1T

Apr 2013 Go

Prev Scene Next Scene

Landsat 8 OLI Scene List

LC81890272013114LGN01

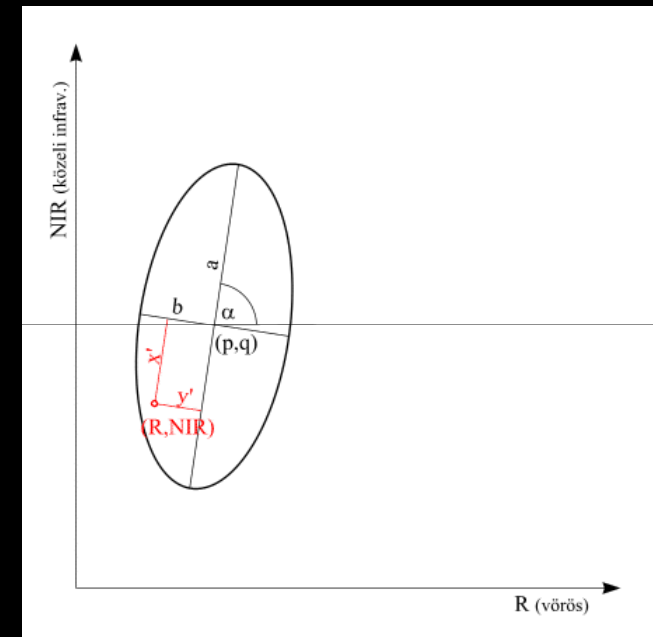
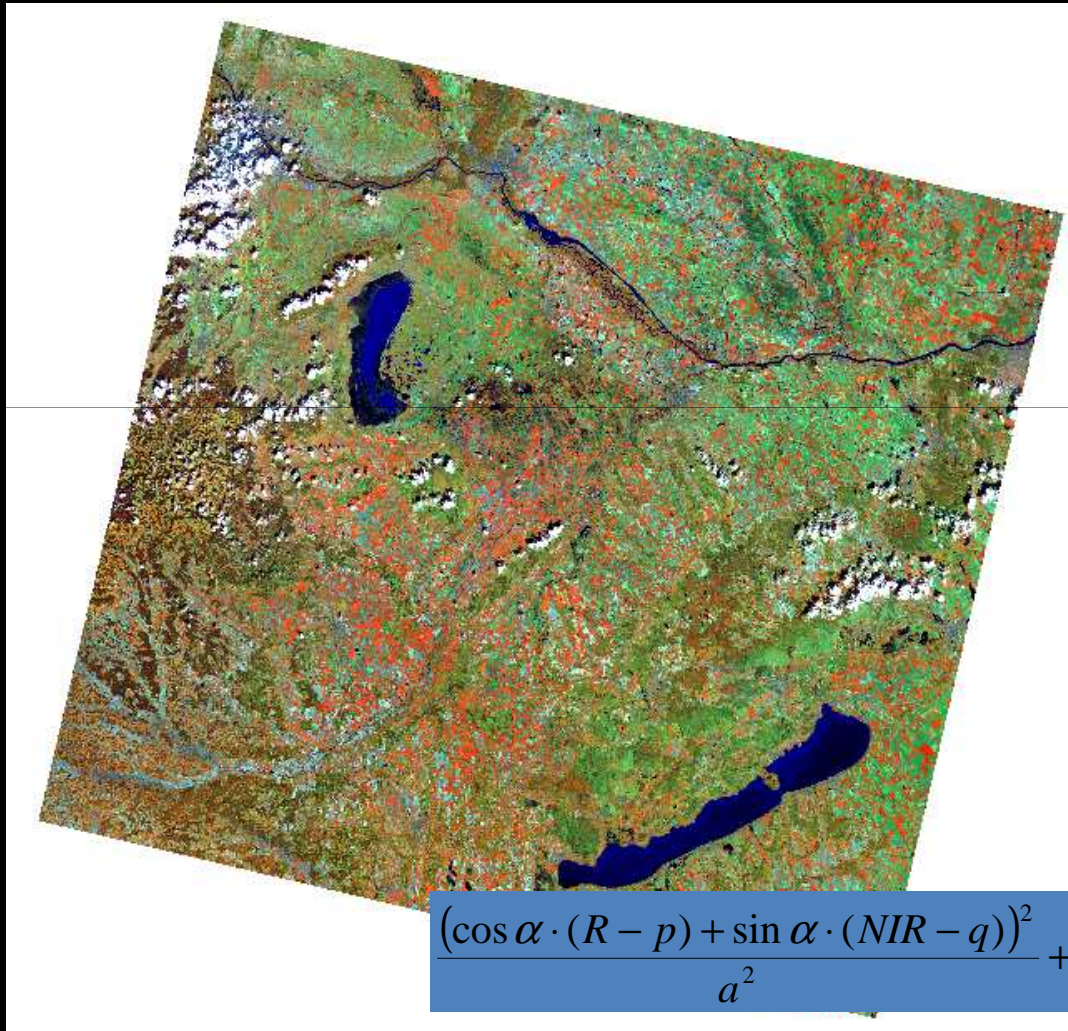
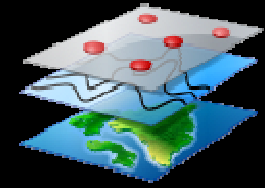
Add Delete Send to Cart

1000m No Limits Set Lat/Long: 49,062770, 15,700164 degrees

USGS

One Landsat 8 Scene

Ellipse based classifier



$$\frac{(\cos \alpha \cdot (R - p) + \sin \alpha \cdot (NIR - q))^2}{a^2} + \frac{(-\sin \alpha \cdot (R - p) + \cos \alpha \cdot (NIR - q))^2}{b^2} < 1$$

More information: kiraly.geza@emk.nyme.hu

THANK YOU FOR THE ATTENTION!

