



**Structural / morphological
analysis of field boundaries and
parcel structure derived from
IMAGE 2000**

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The “parcelisation index” here presented gives a qualitative estimate of field size variations across Europe. The methodology is based on a segmentation approach that identifies objects having a distinctive spectral behaviour, being characterised by a homogeneous surface bordered by a spectrally significant edge.

The images are analysed without a preceding atmospheric correction that would convert the digital numbers into reflectance. For this reason the methodology must be robust enough to be applied on different sites and different conditions of the atmosphere at the time of recording of the images.

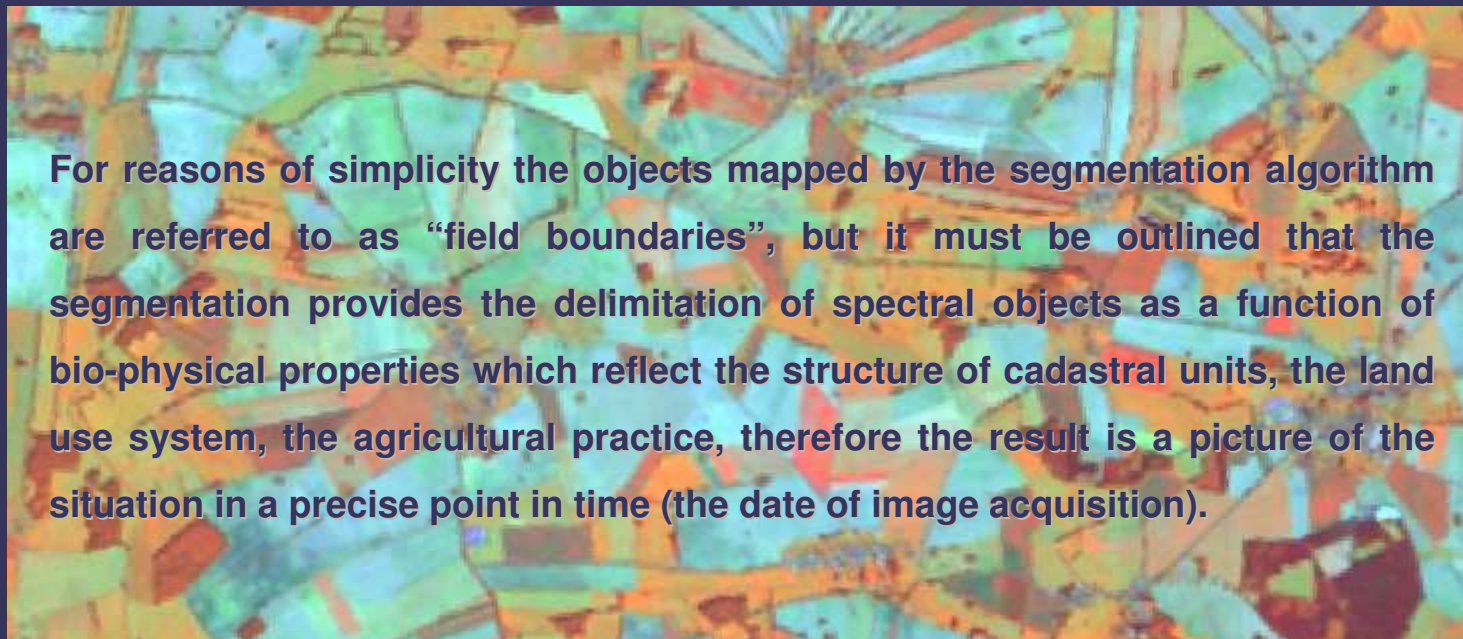




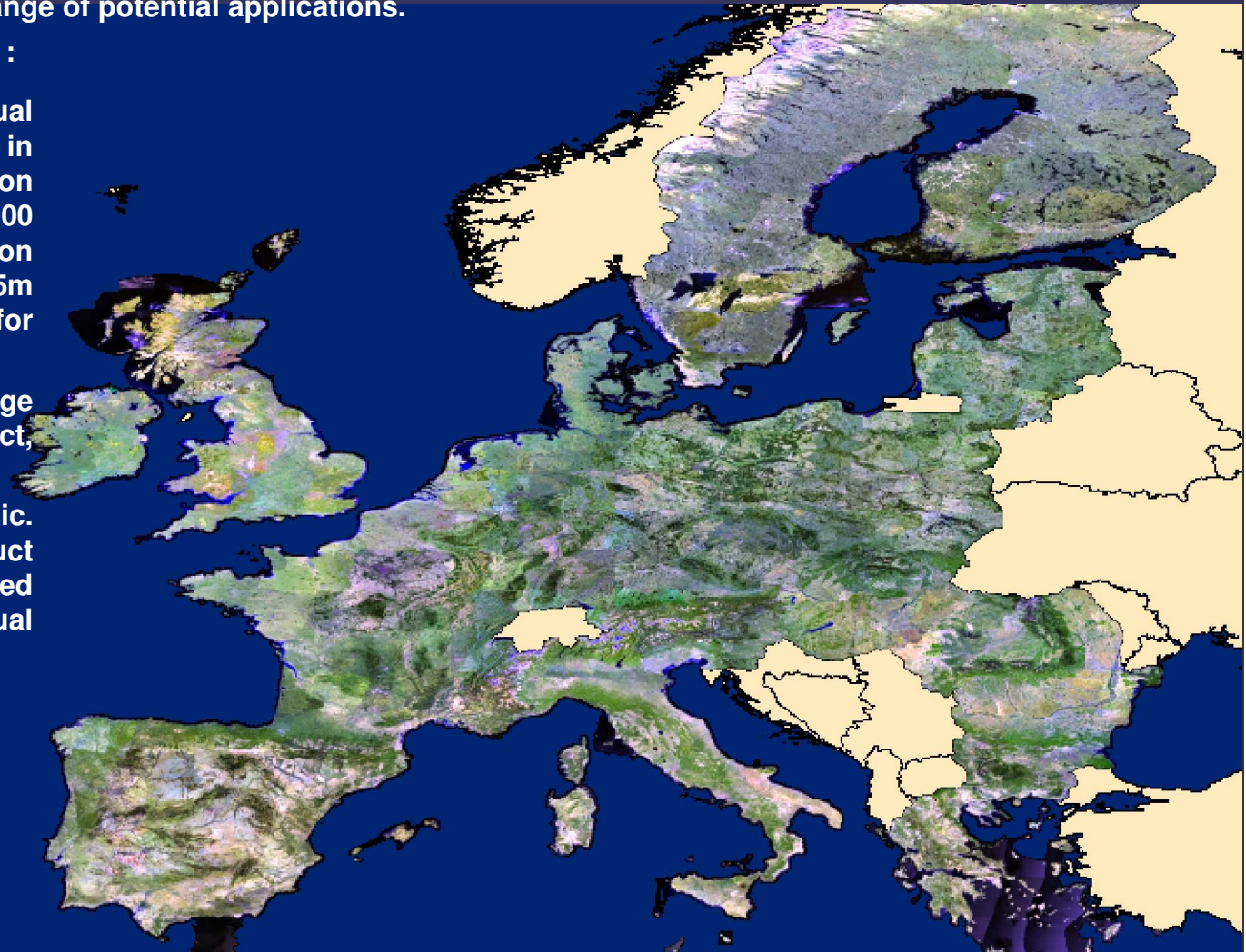
Image 2000 - the Spatial Reference for Europe

Image2000 products are intended to be the main source of data for updating the European Land Cover database (CORINE Land Cover), but are also reference data in themselves. Primarily derived from Landsat 7 Enhanced Thematic Mapper (ETM) 7 imagery, they are georeferenced and orthorectified, resulting in a consistent, high quality product.

Image2000 products cover the entire European Union plus candidate countries. They are multi-user and multi-purpose, covering a wide range of potential applications.

The main product types are :

- Level 1 : Individual orthorectified scenes in national map projection system (approximately 1000 scenes, 25m resolution (multispectral) and 12.5m panchromatic). Available for download.
- Level 2 : National image mosaics. An interim product, not distributed.
- Level 5 : European mosaic. In preparation, this product will provide a harmonised dataset from the individual Level 1 scenes.





The methodology is based on a multispectral scalar gradient

$$[\rho_s(\mathbf{f})](p) = \max \{d_{\mathcal{E}}[\mathbf{f}(p), \mathbf{f}(p_i)] \mid p_i \in N_G(p)\}.$$

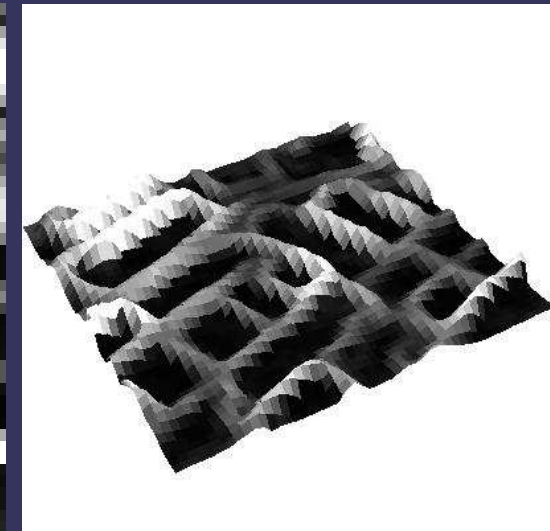
(where ρ_s at a pixel p of a multispectral image f as the largest Euclidean distance $d_{\mathcal{E}}$ separating $f(p)$ from its neighbours $f(p_i)$)



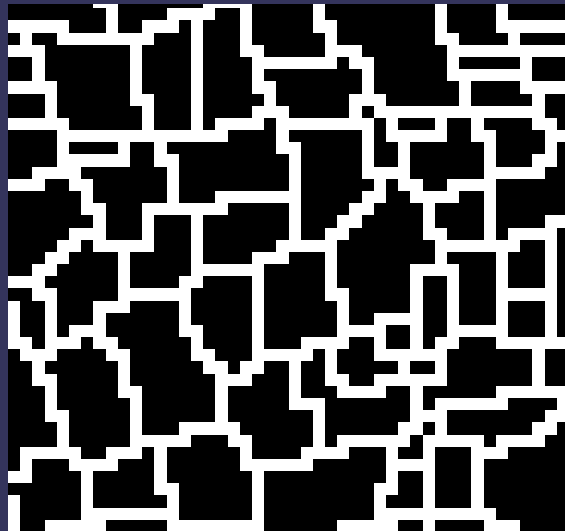
Landsat image (false colour composition bands 4, 5, 3).



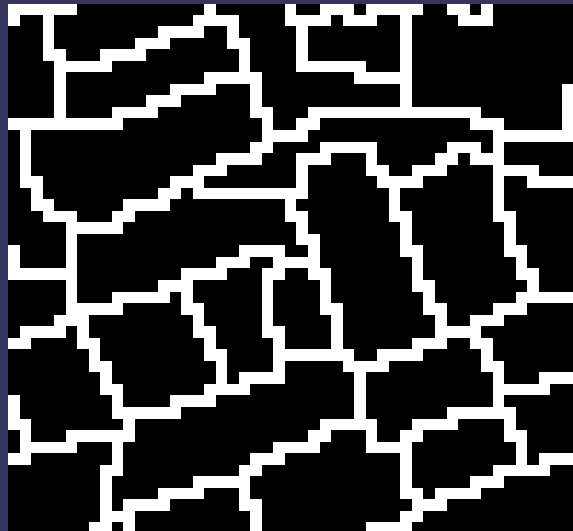
Multispectral gradient according to the eq. above, using a 3 times 3 neighbourhood



Topographic representation of the multispectral gradient



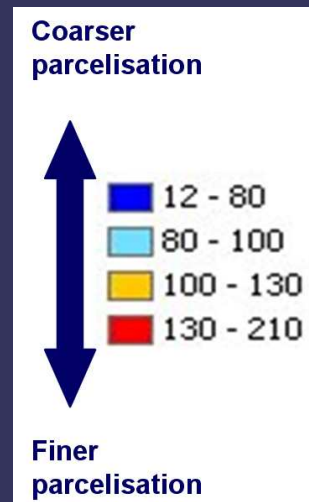
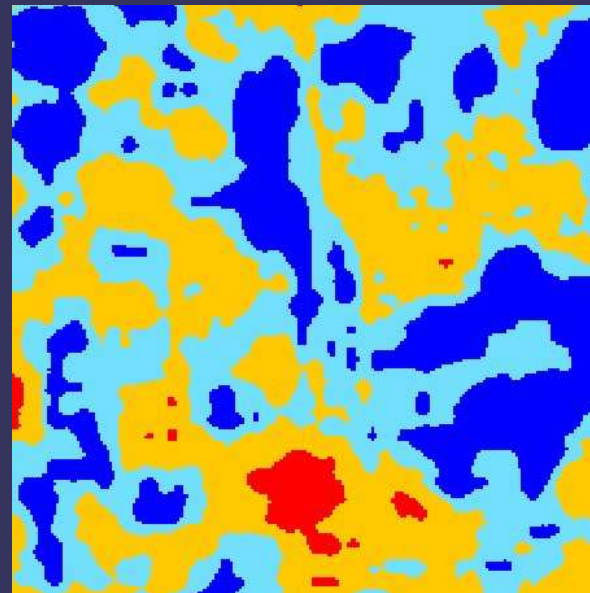
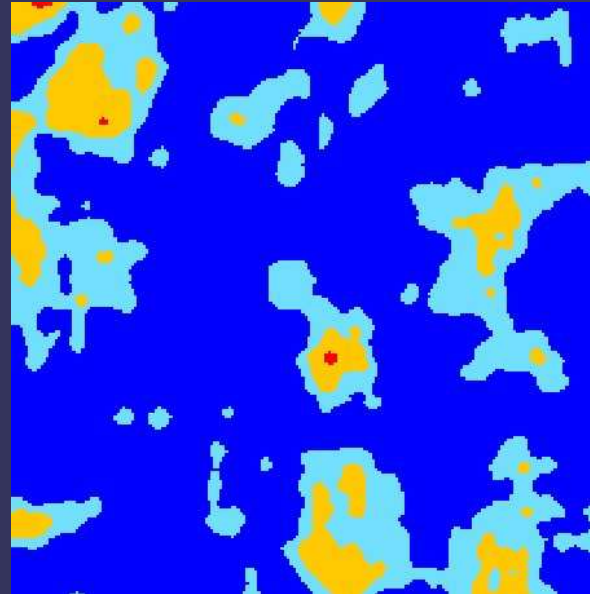
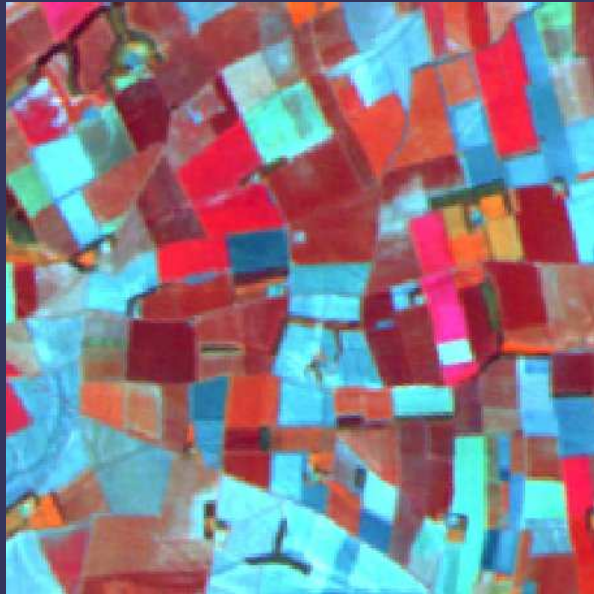
Watersheds of the gradient image without filtering (note the oversegmentation)

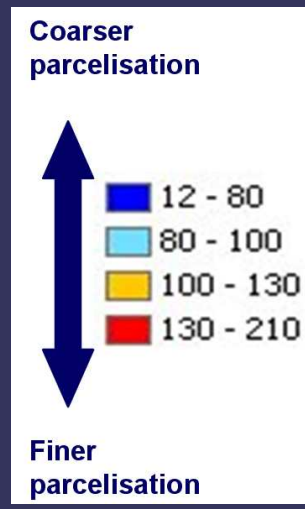
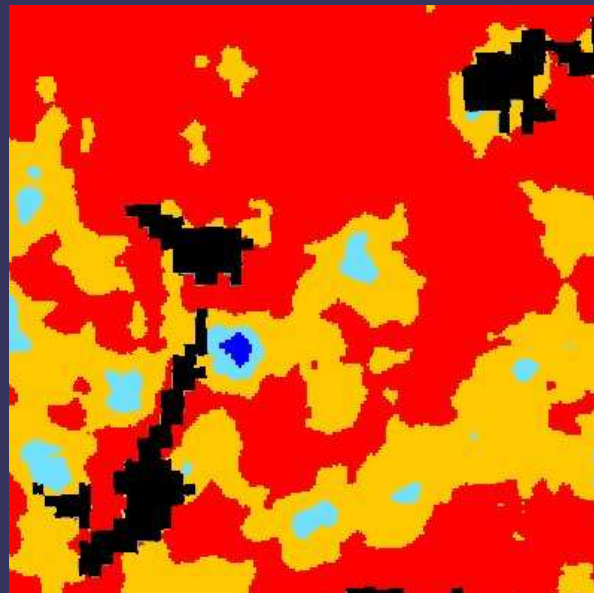
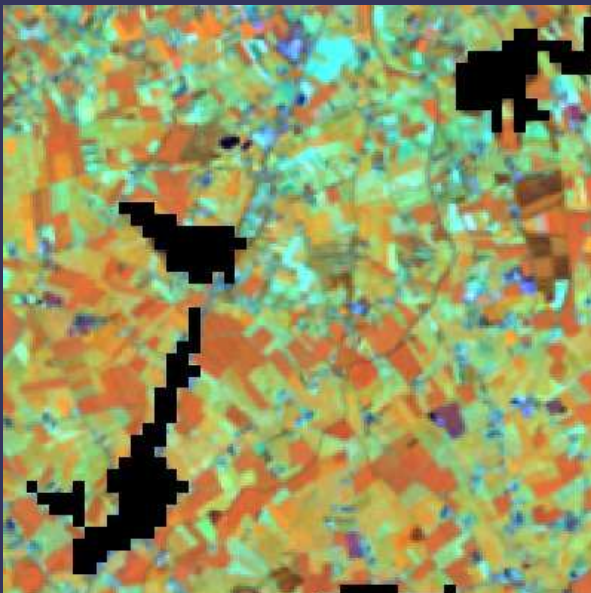
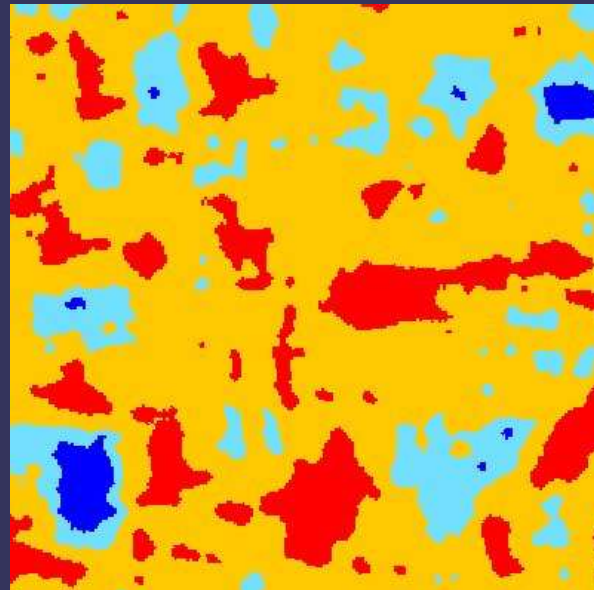
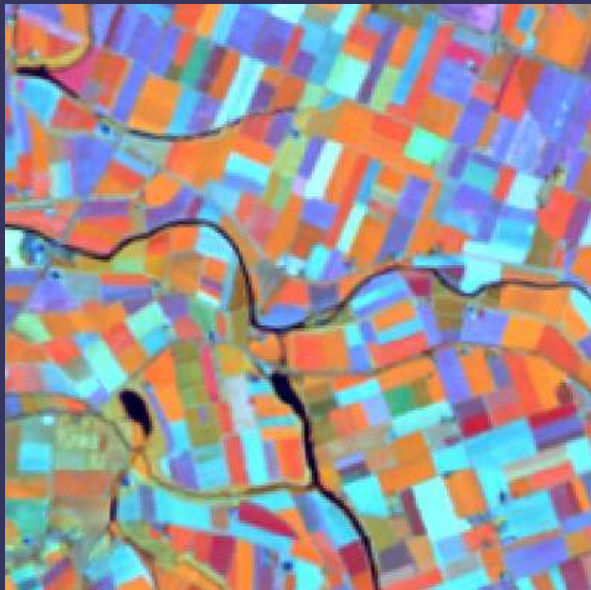


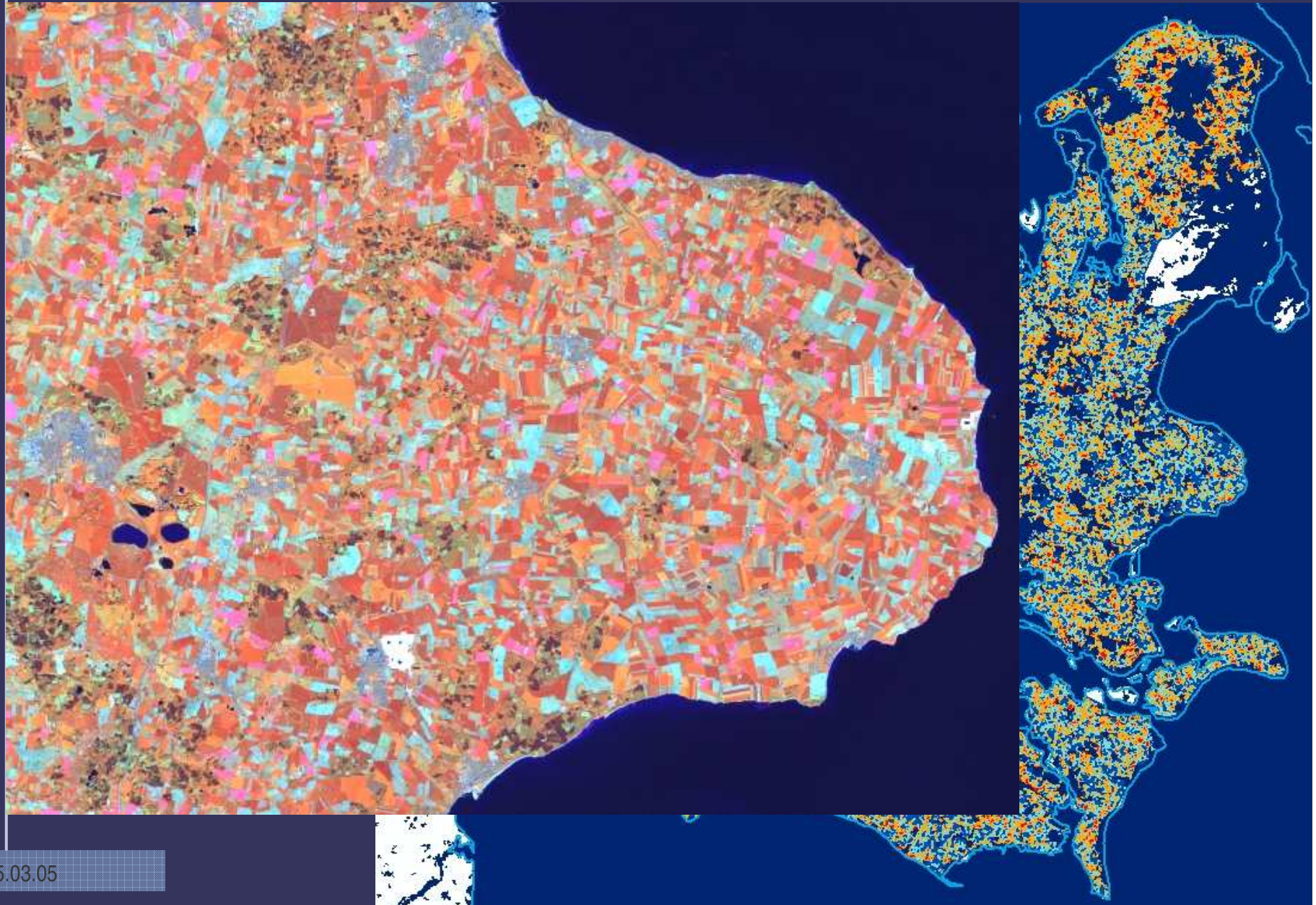
Watersheds on the h-minima transformation of the gradient image using a contrast value of 15 grey levels.



Final parcelisation index by convolving the watershed image with a 21 times 21 kernel

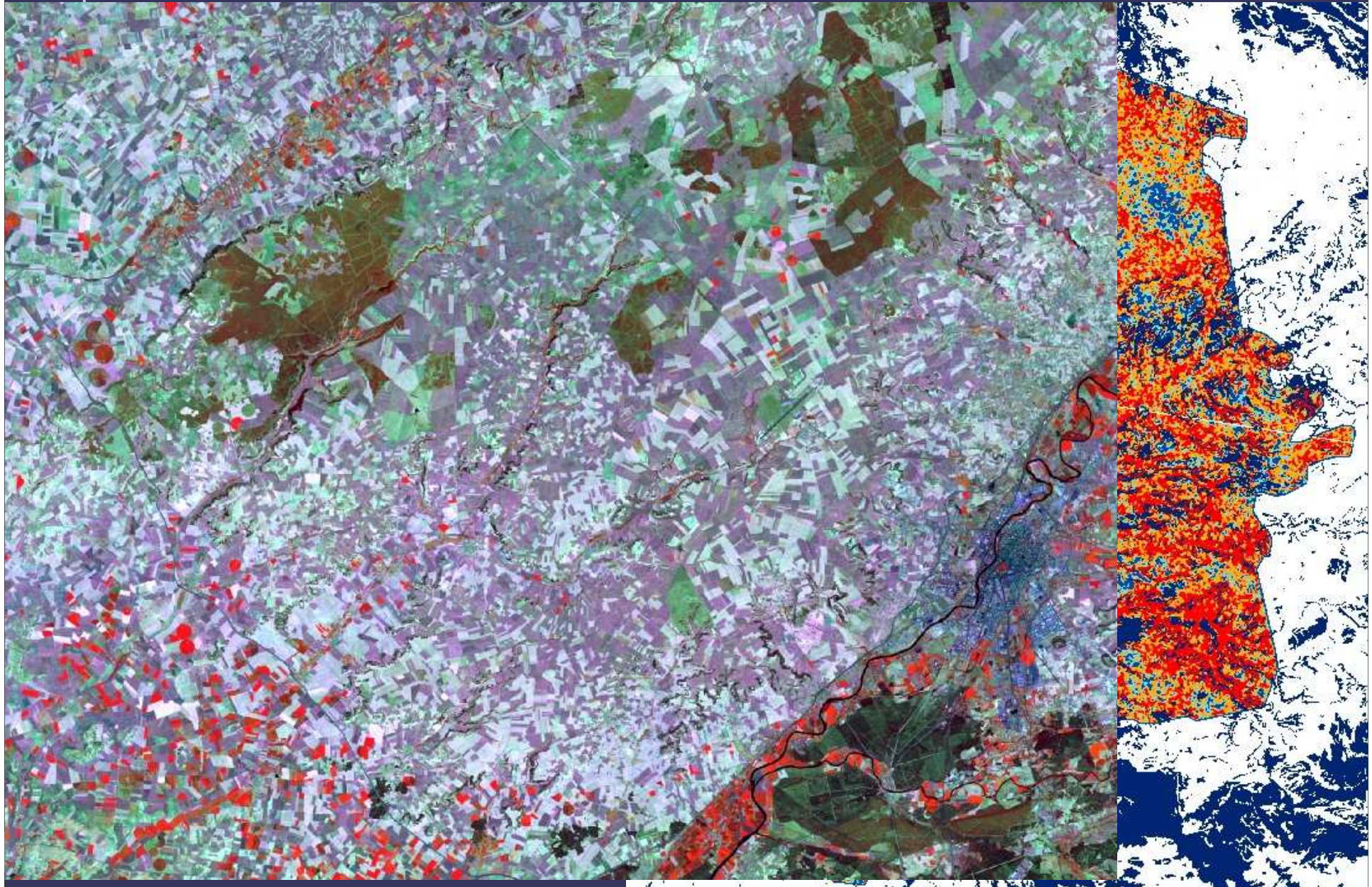


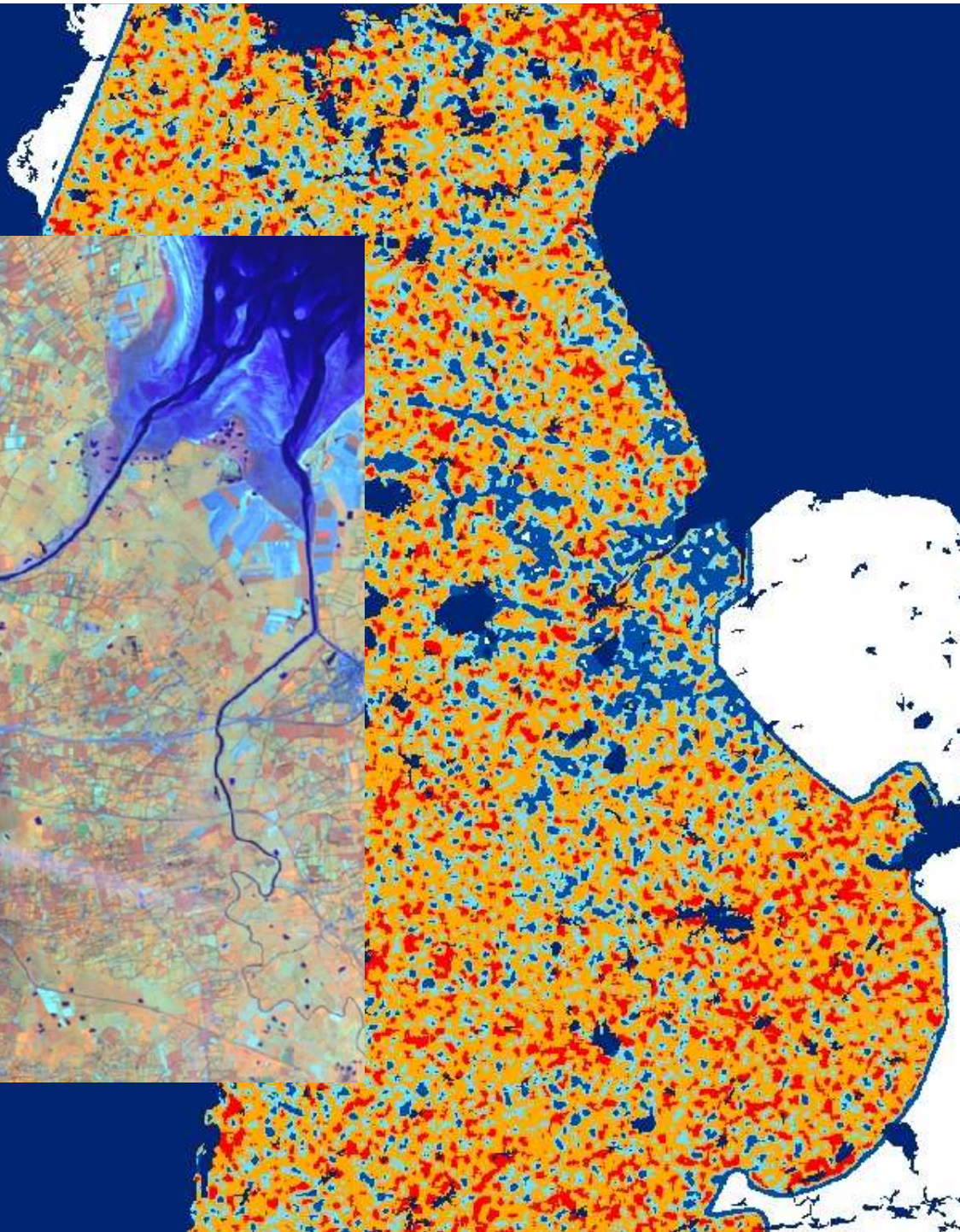
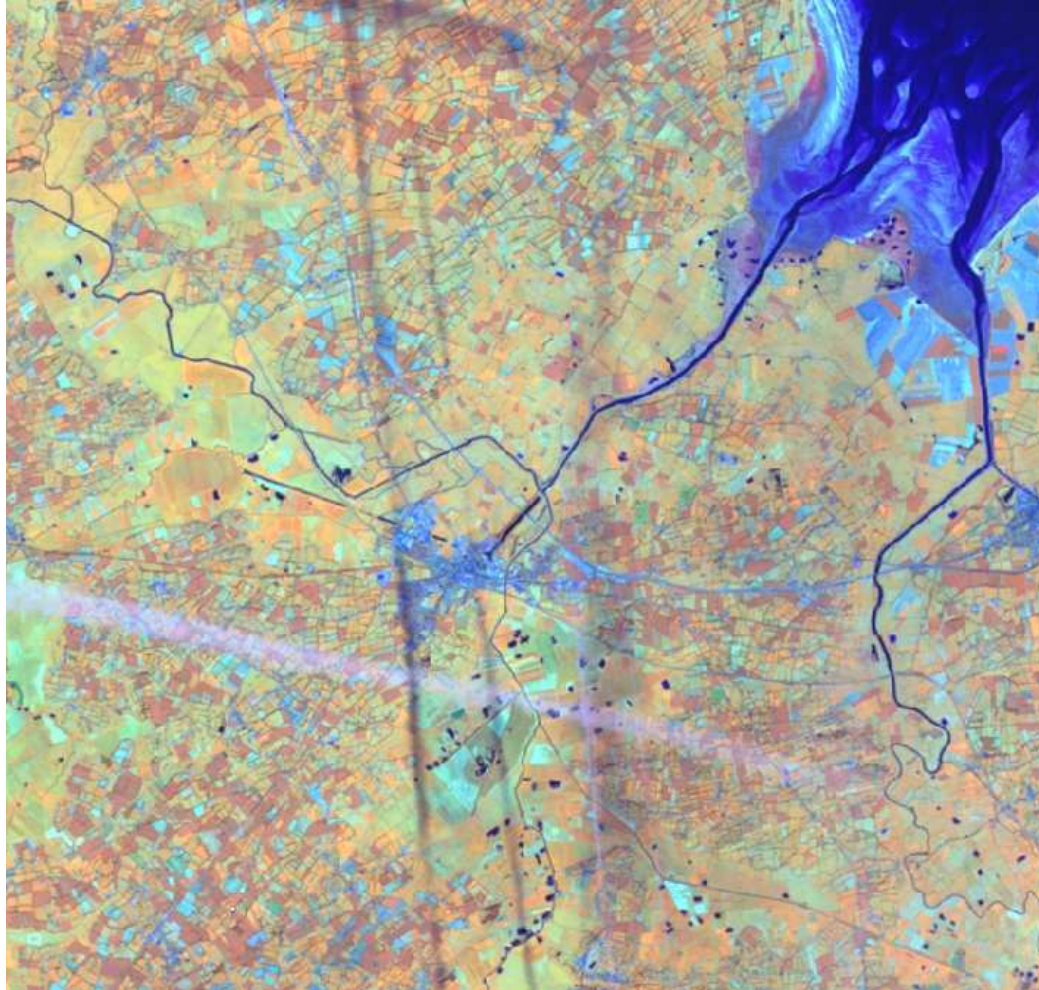


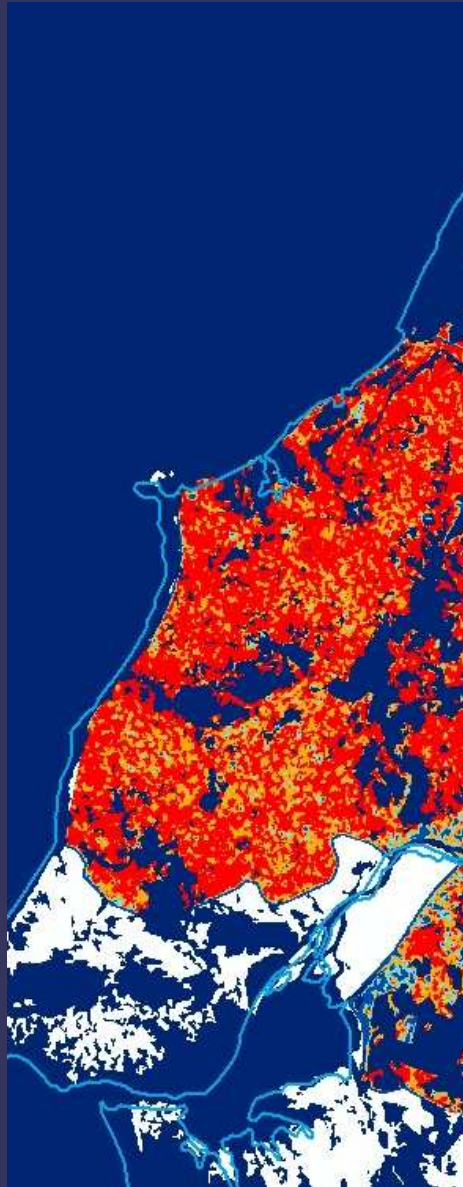




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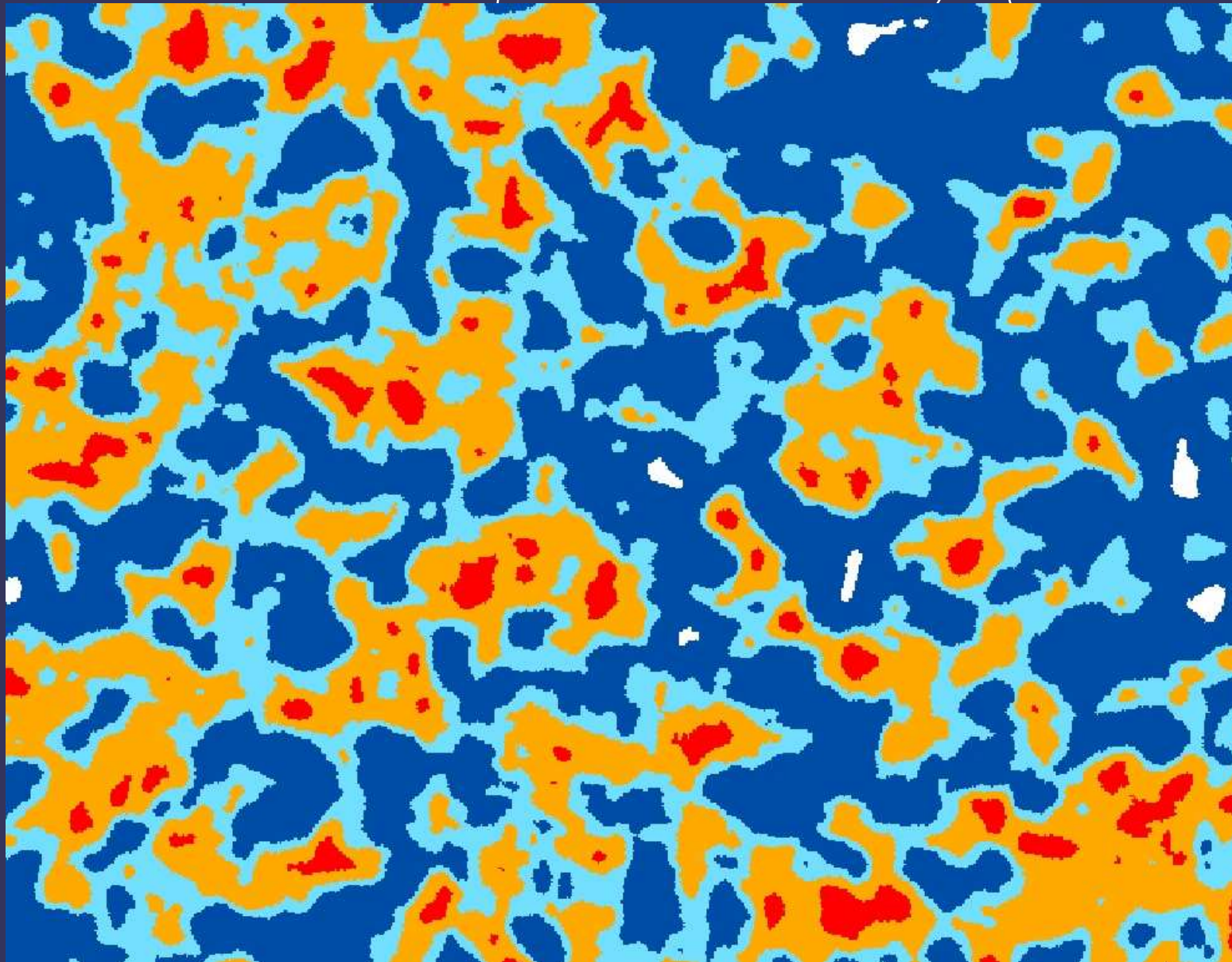




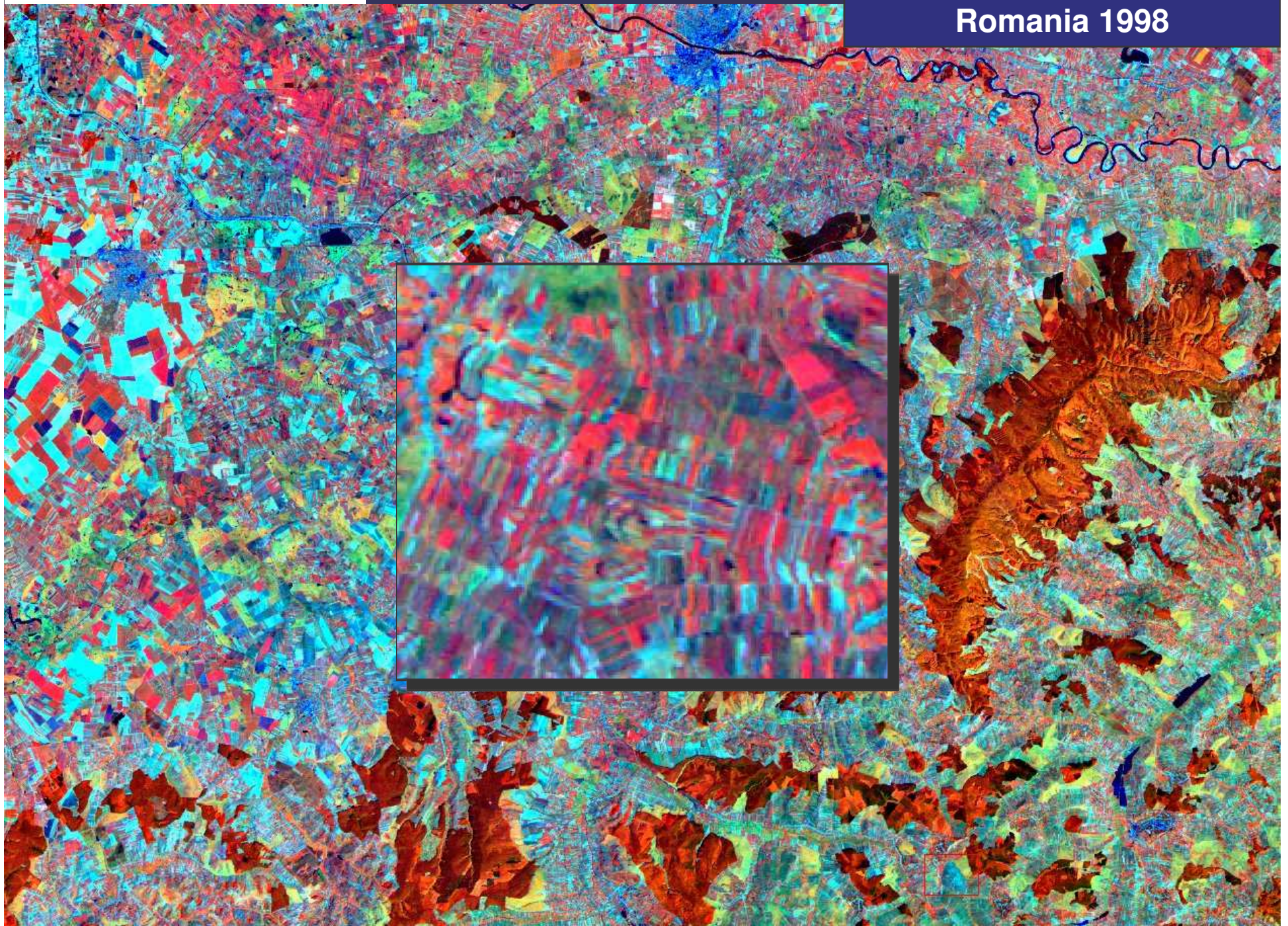
TRANSITIONAL WOODLAND-SHRUB

PEAT BOGS

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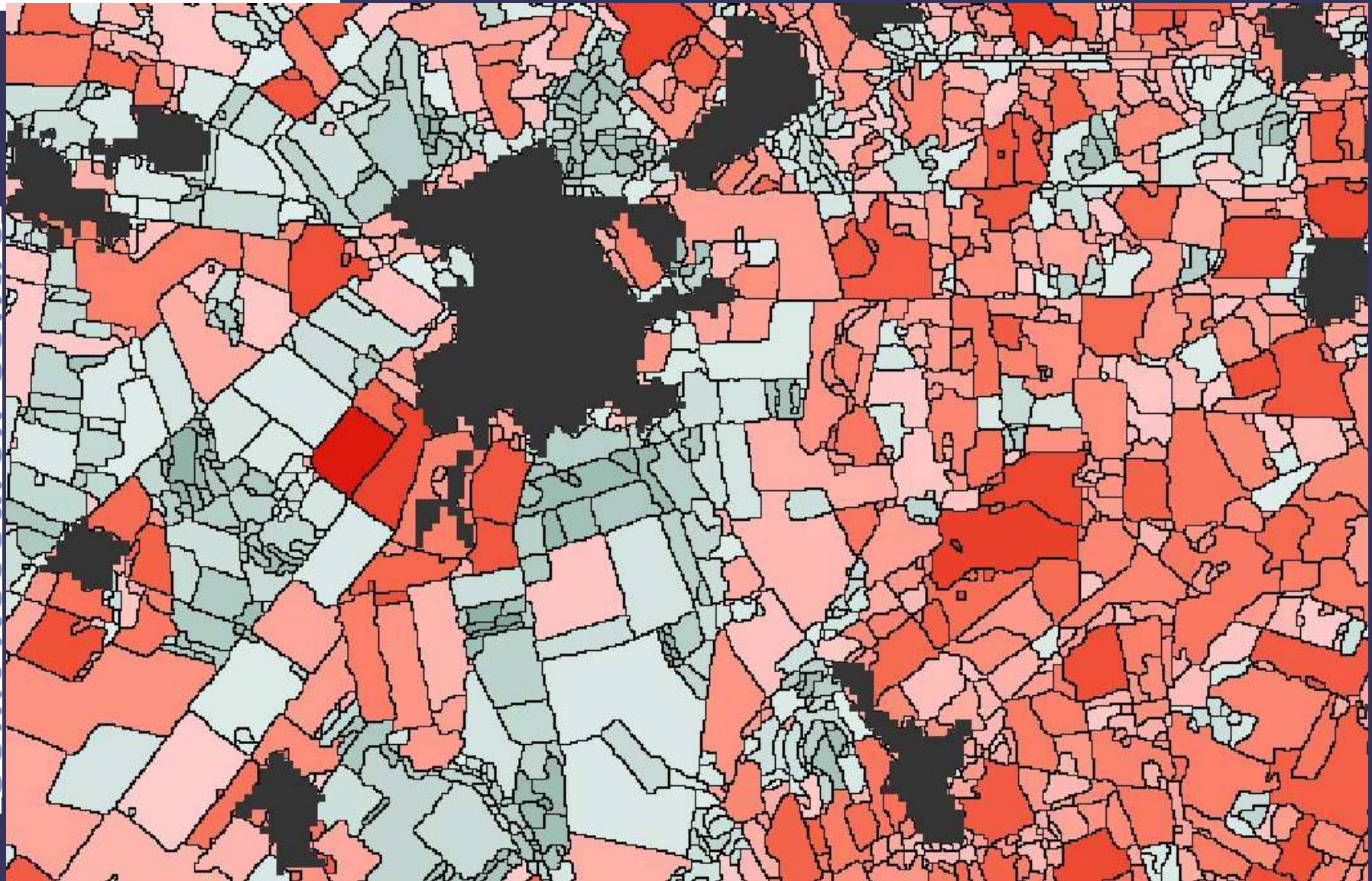
Romania 1998





Parcelisation changes 1988 - 1998

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coarser parcelisation ←

→ finer parcelisation

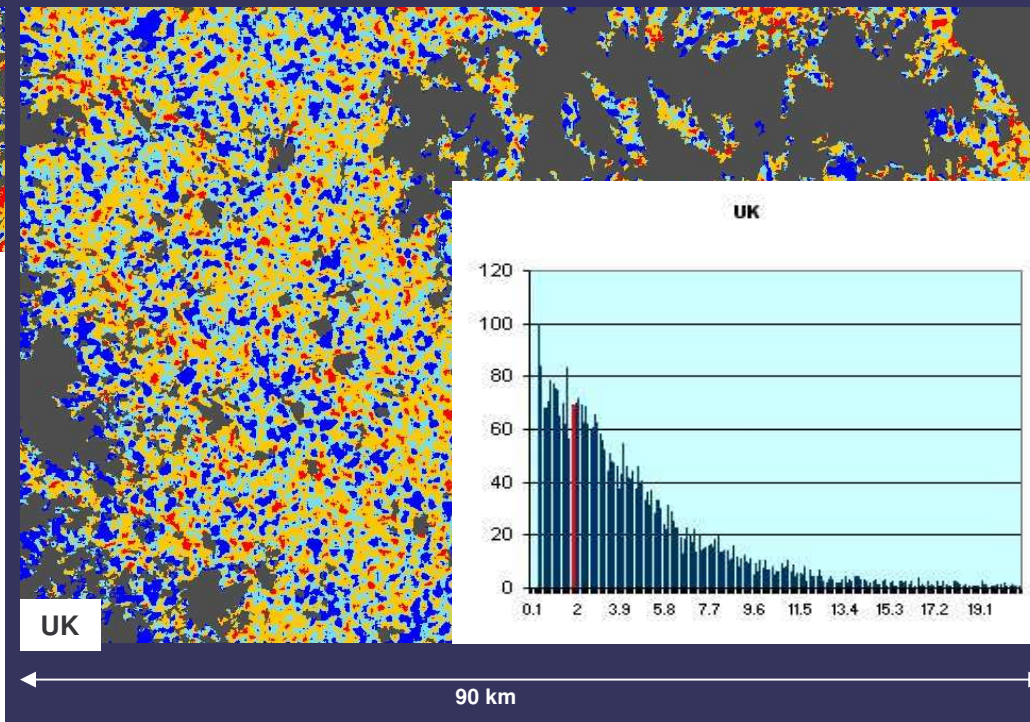
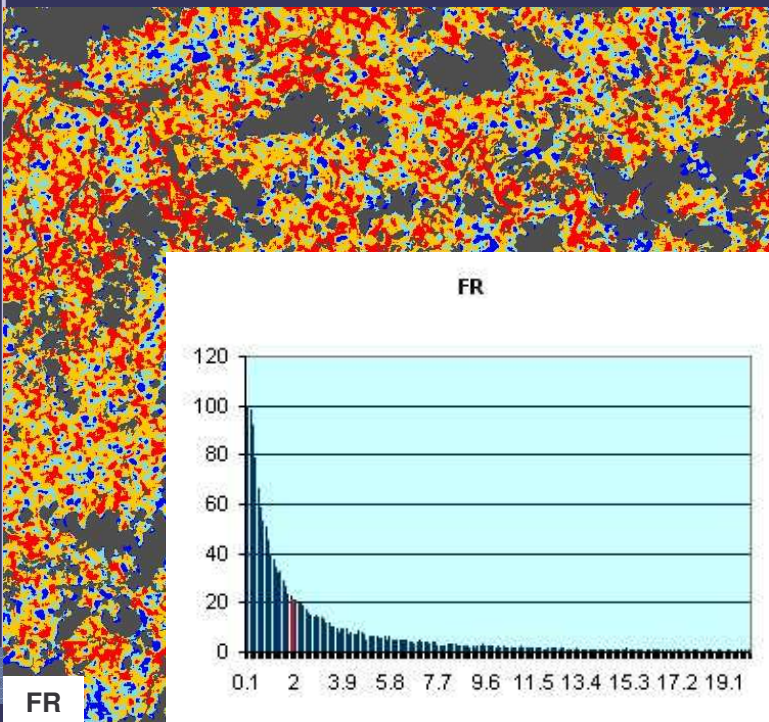
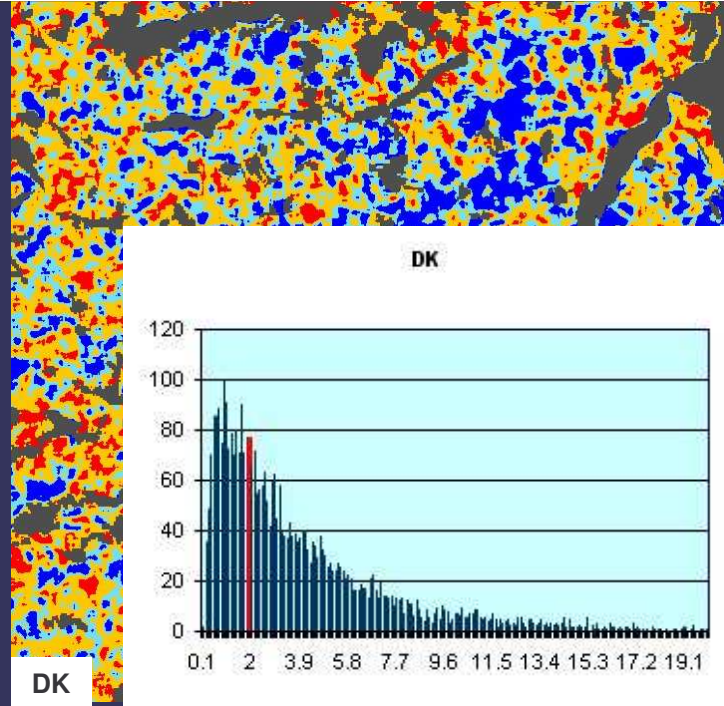
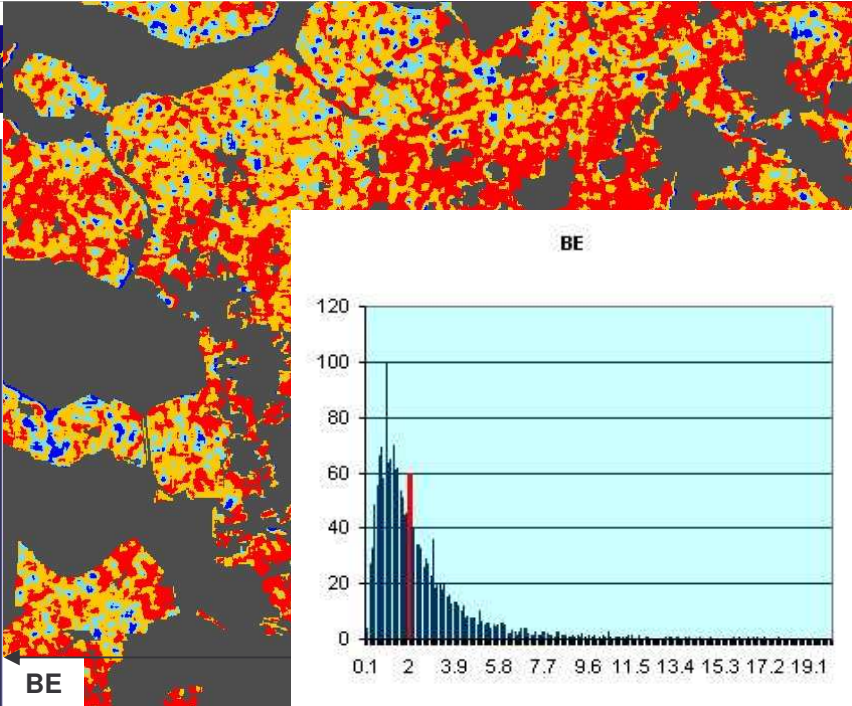


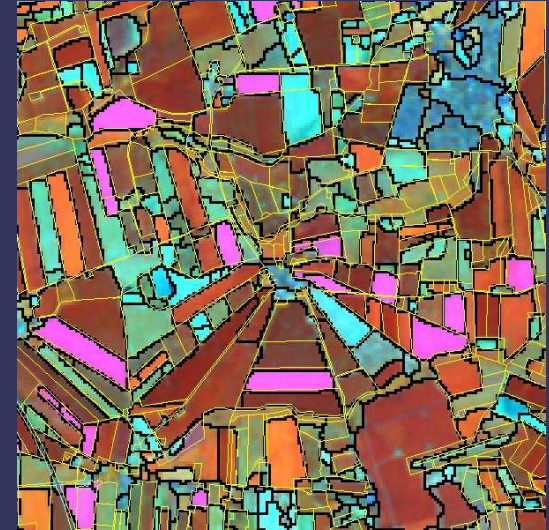
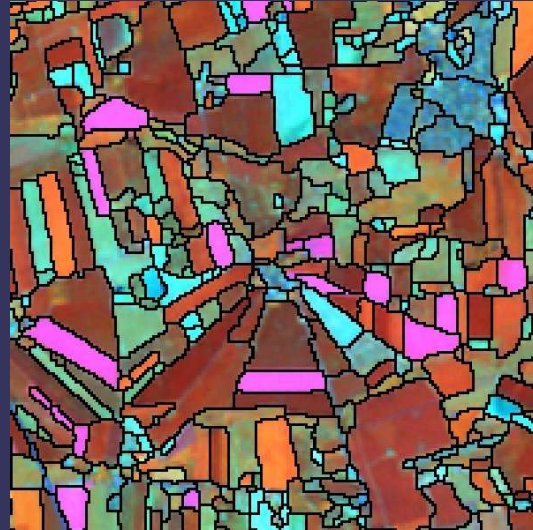
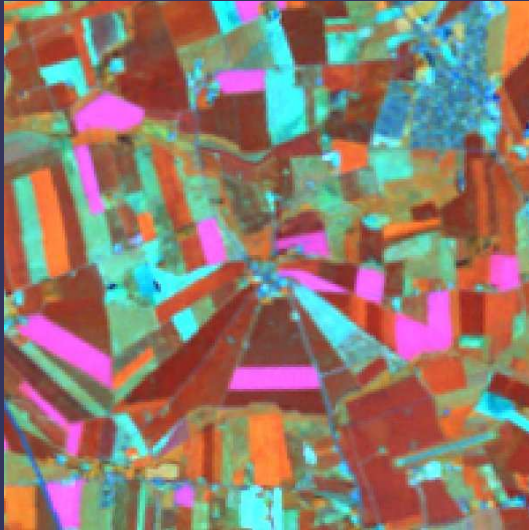
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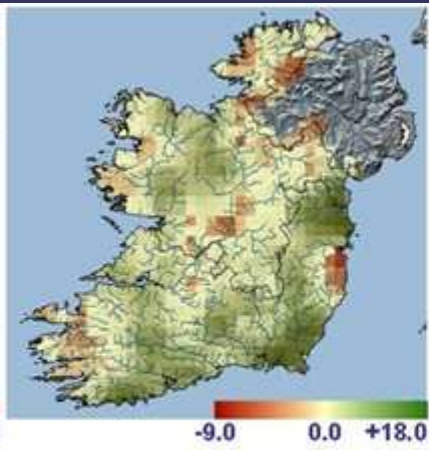
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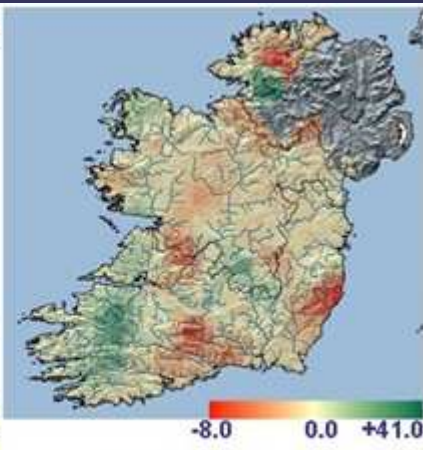




Difference in patch density
(15 classes) 2000 -1990

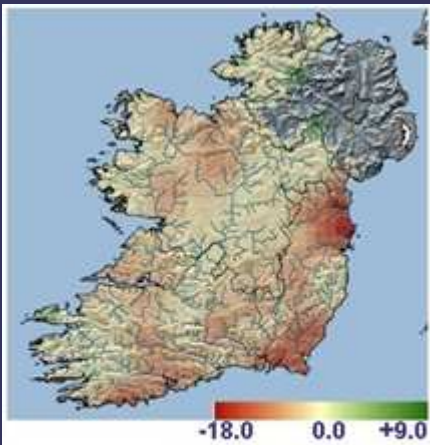


% difference in area
Agriculture 2000 -1990

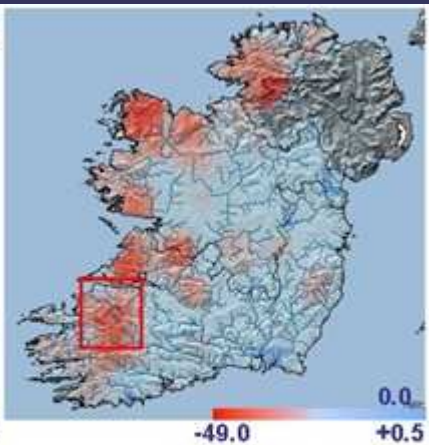


% difference in area
Forests 2000 -1990

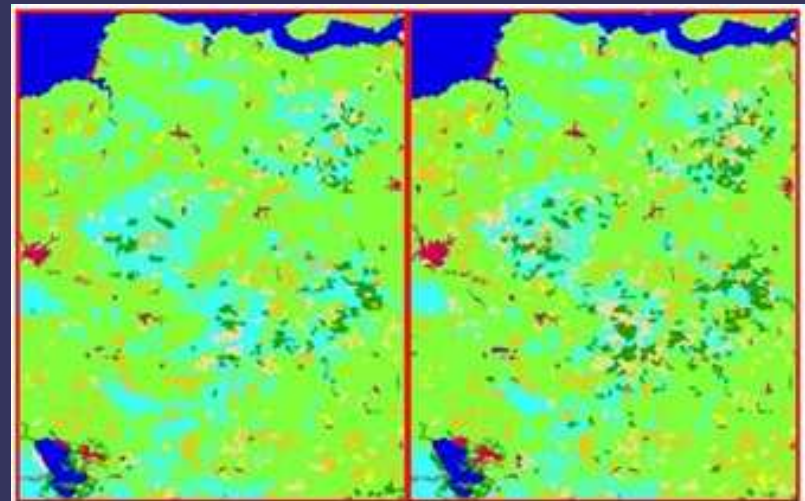
- 1 - urban
- 2 - industrial/transport
- 3 - arable
- 4 - vineyards
- 5 - trees plantations
- 6 - pasture/grassland
- 7 - glaciers
- 8 - forest
- 9 - shrubs
- 10 - open spaces
- 11 - wetlands
- 12 - water bodies
- 13 - heterogeneous agriculture
- 14 - moors and heathland
- 15 - burnt areas



% difference in area
Pasture - Grassland
2000 -1990



% difference in area
Wetlands 2000 -1990



CORINE 1990

CORINE 2000