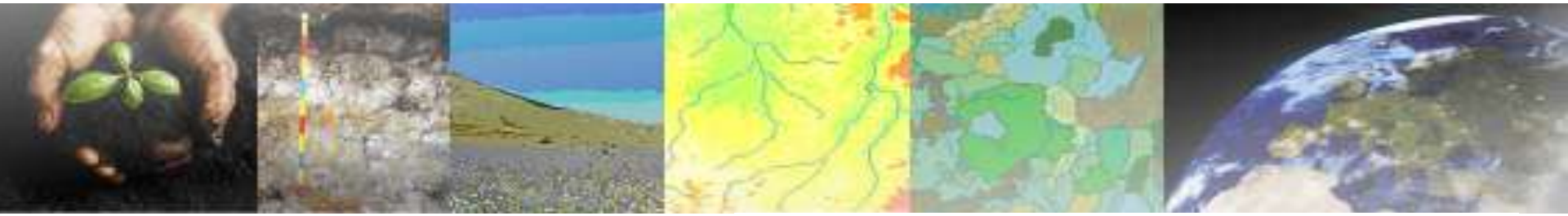
e-SOTER

Regional pilot platform as EU contribution to a Global Soil Observing System

Enhancing the terrain component in SOTER database

Joanna Zawadzka



Overview

- Overview of tested methods for terrain analysis
  - Benchmark datasets
  - New methods
    - Physical entities (hill shed analysis)
    - Homogenous segments (object-based segmentation)
- Assessment
  - Cramer's V statistic
  - Bayesian Networks
- Recommendations for e-SOTER

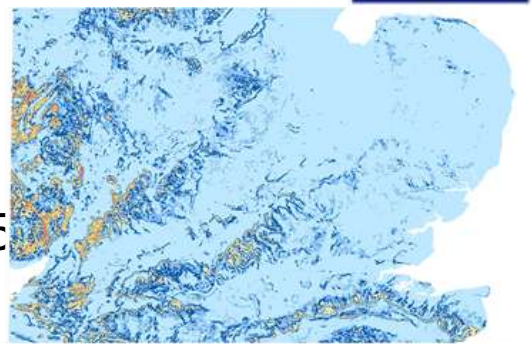
Benchmark datasets

- Methods found in literature

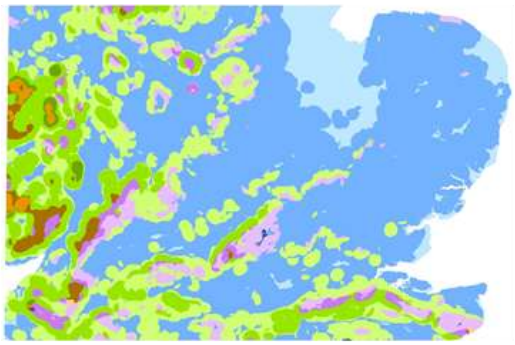
One of the ways to overcome the limitations of grid based methods is incorporation of **objects** into methodology of landform classification

- Grid based
  - Search windows of fixed sizes

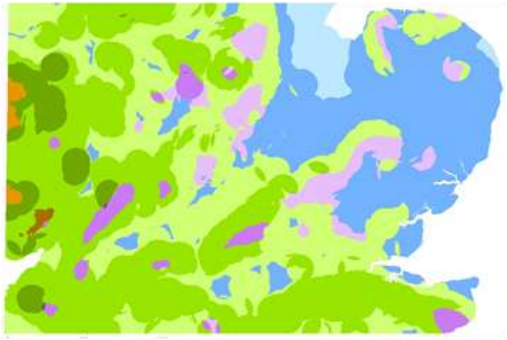
- Limitations:
  - Sensitive to grid size
  - Sensitive to window size
  - Scale of the landscape may not be represented by the combination of the two factors



900m diameter

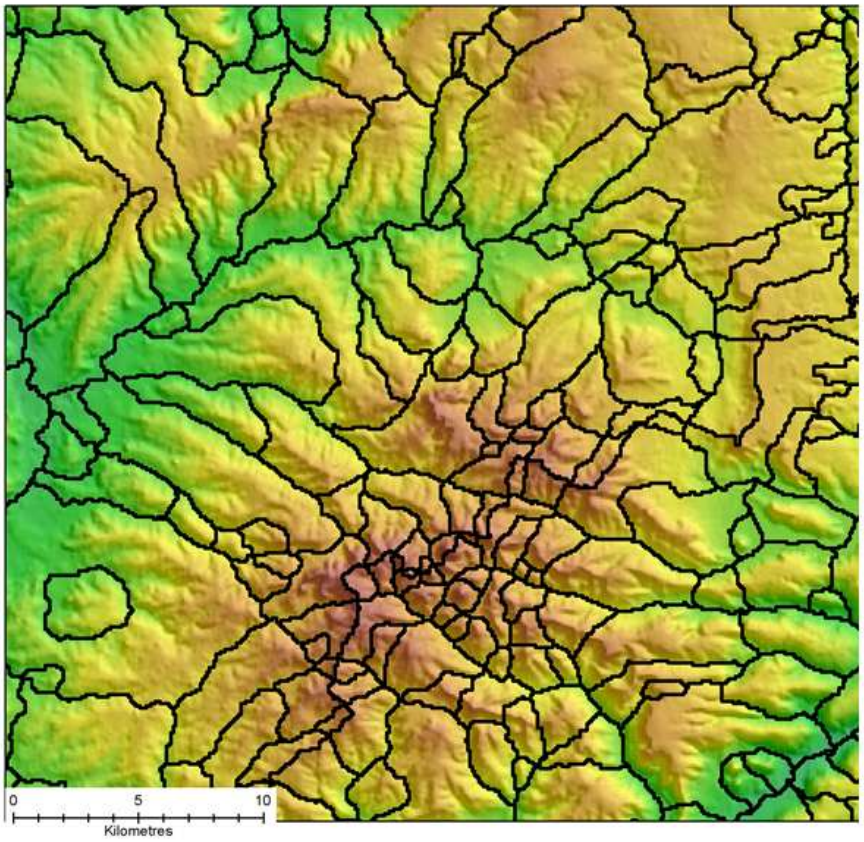


7200m diameter

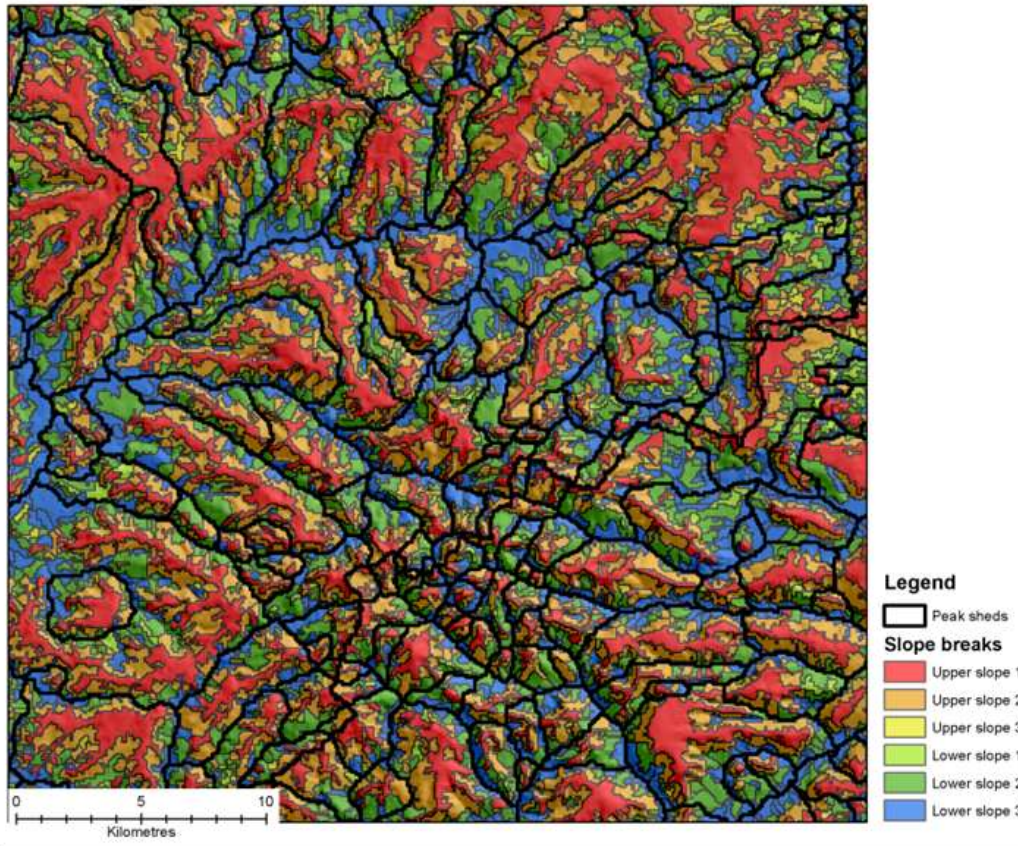


18000m diameter

Physical entities

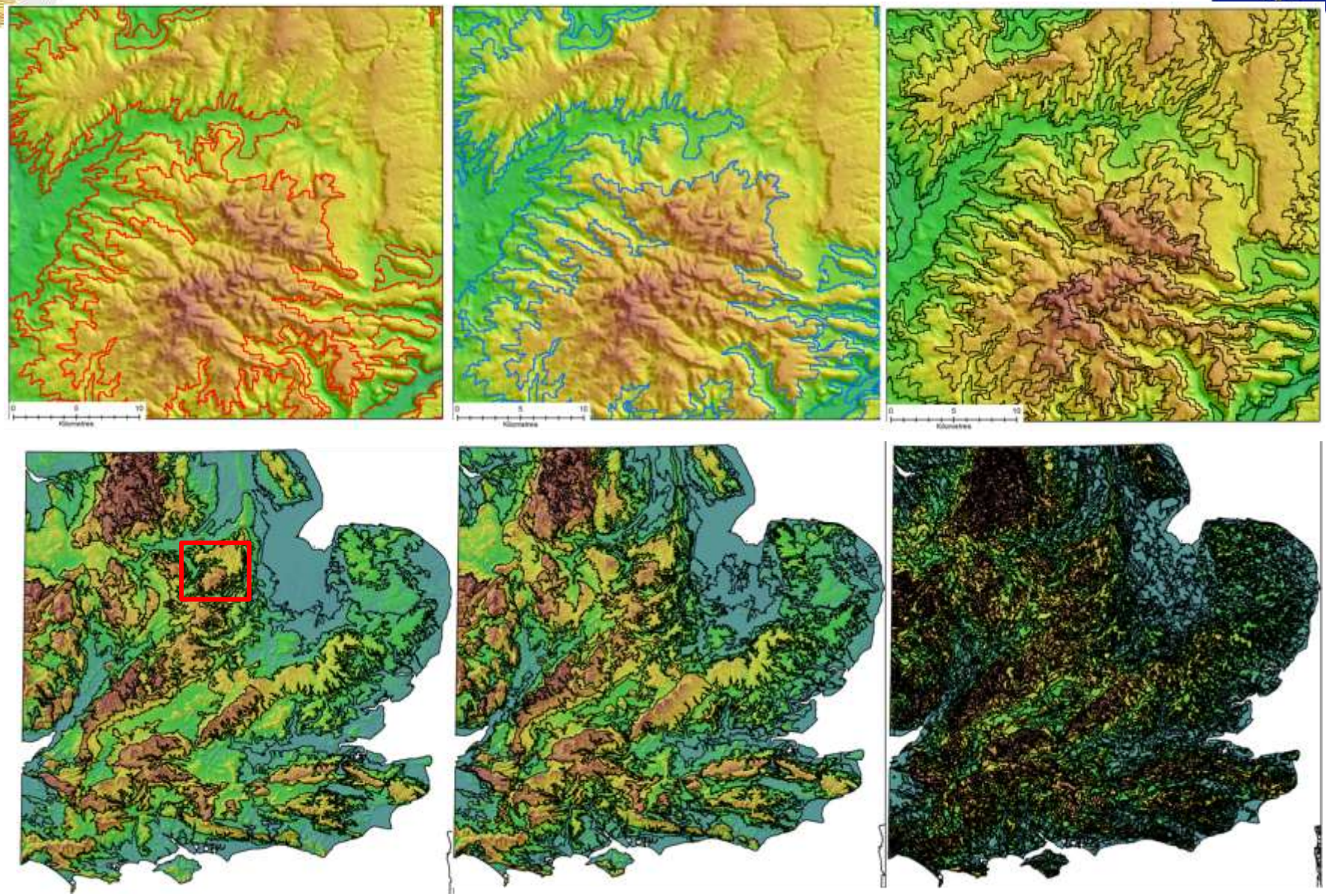


Peak sheds



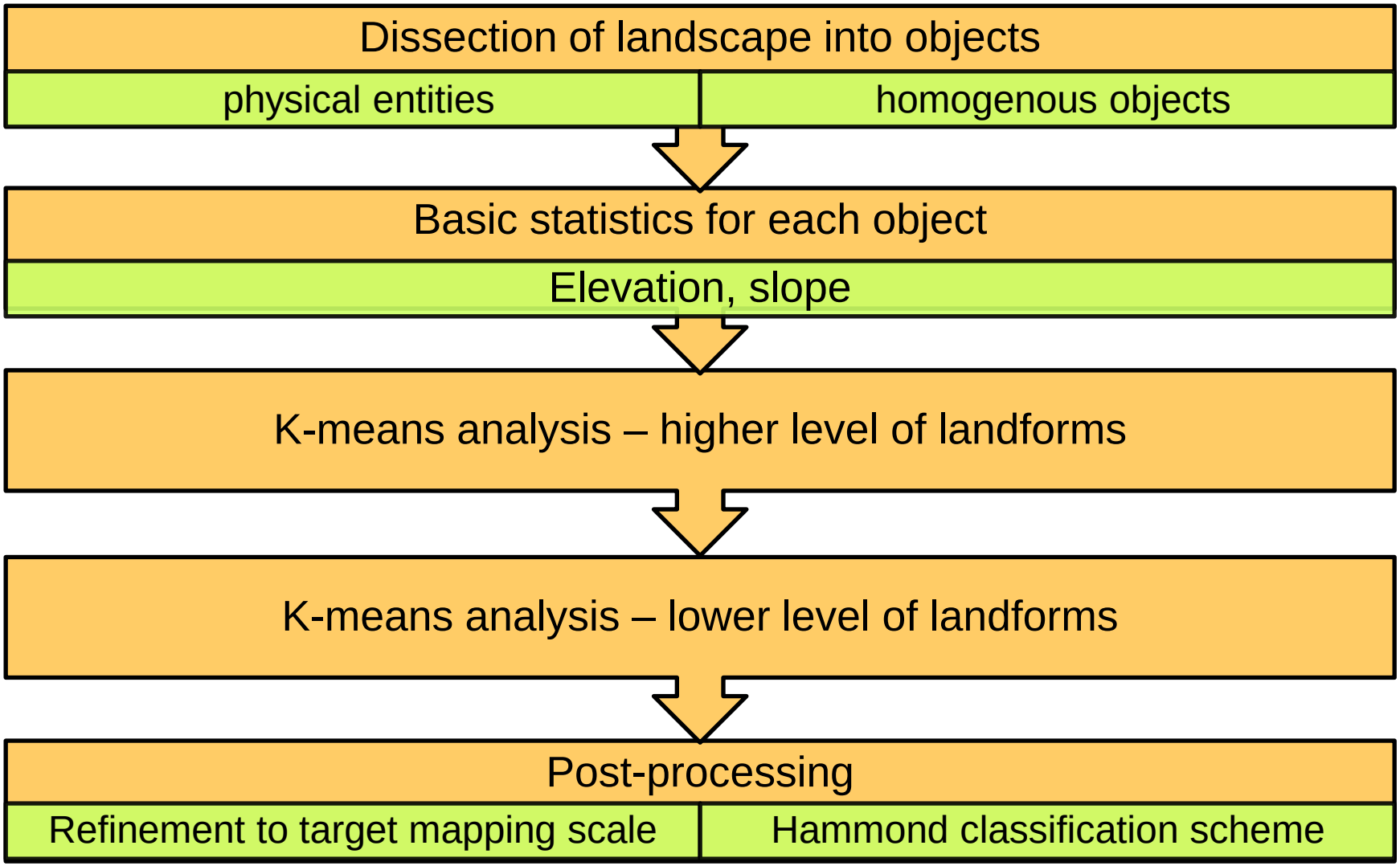
Peak sheds + slope breaks

Homogenous objects

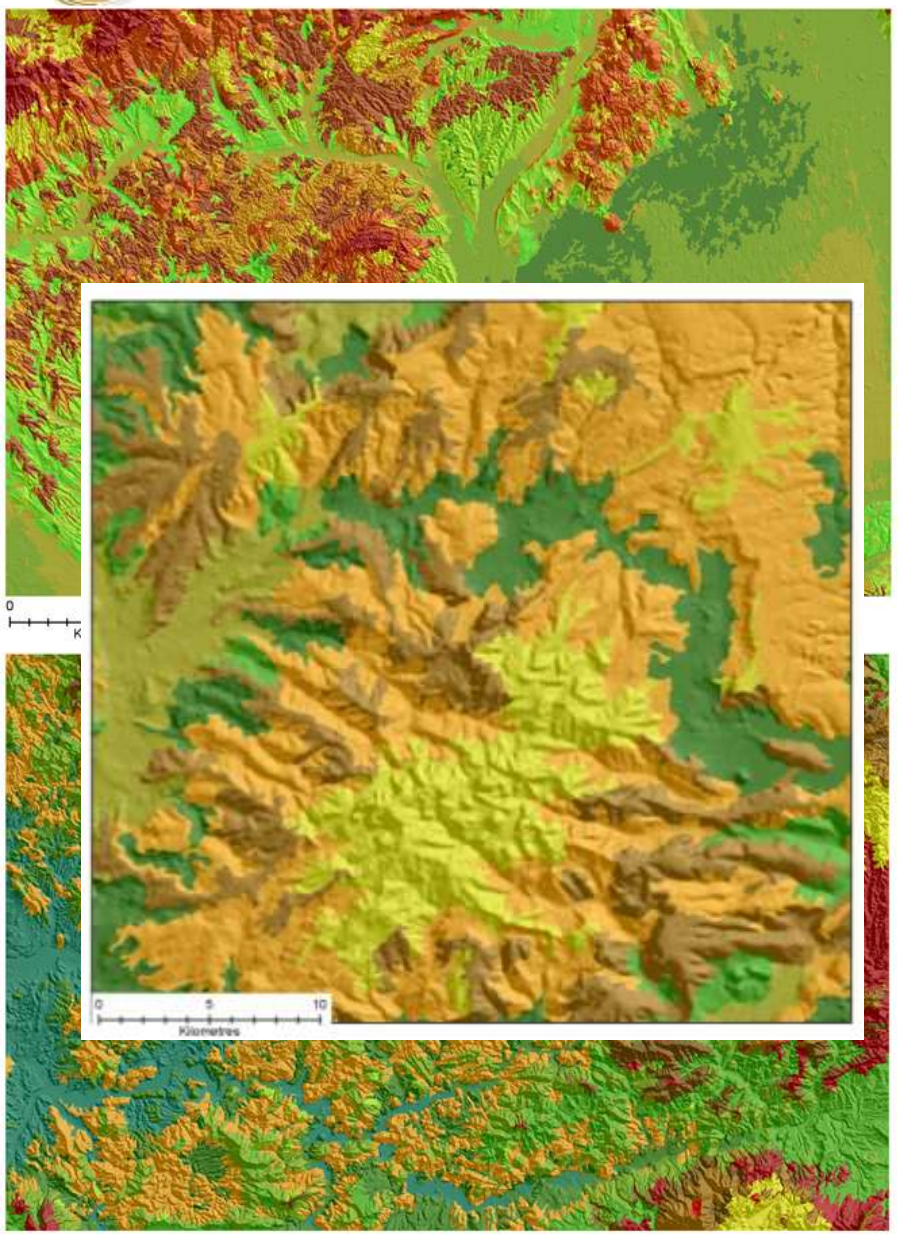


Level 1 Level 2 Level 3

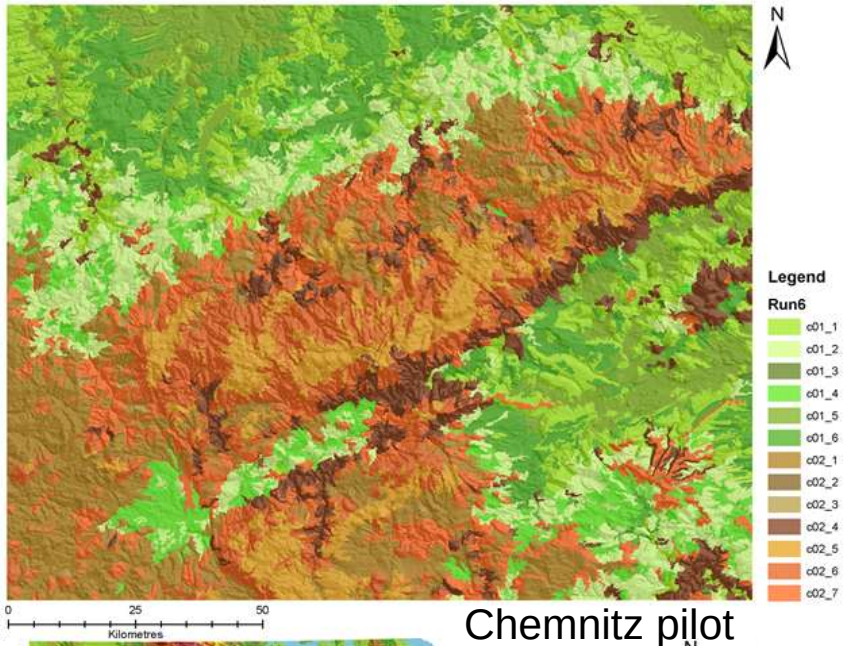
Concept of object based approach



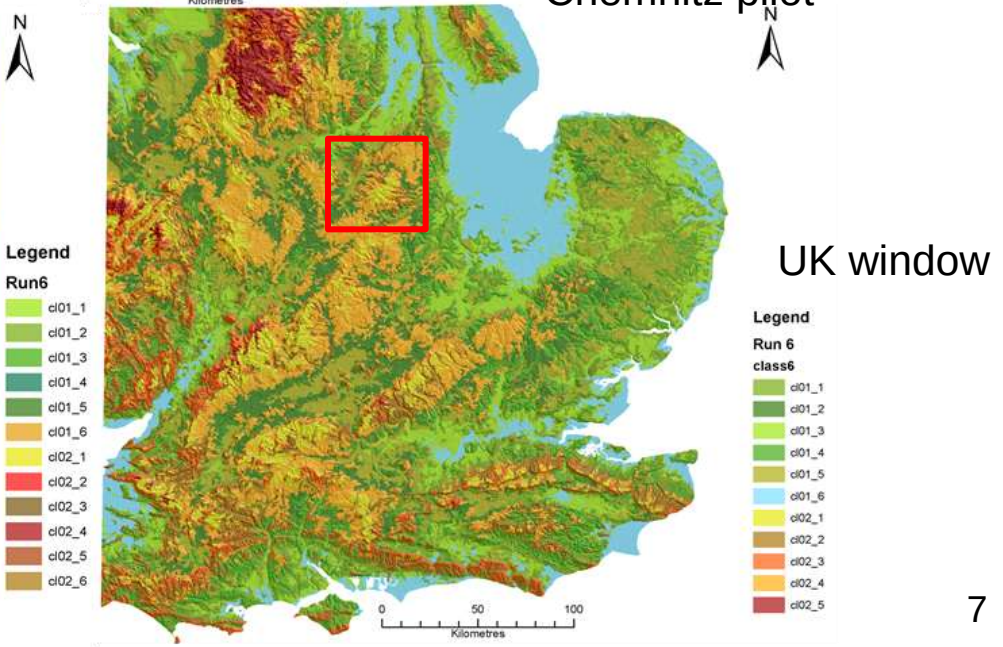
Cluster maps based on physical entities



Moroccan pilot

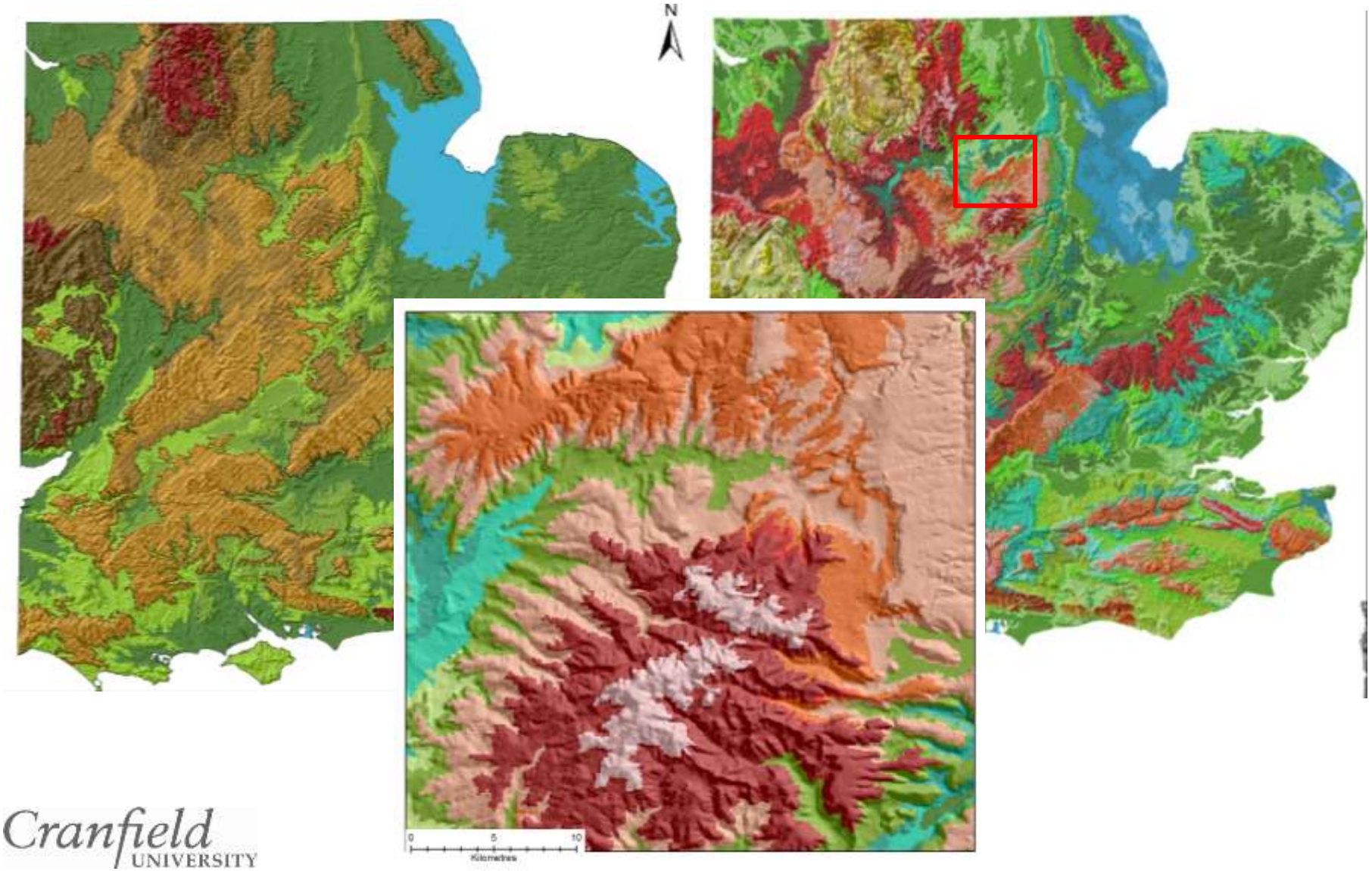


Chemnitz pilot



UK window

Cluster maps based on homogenous objects

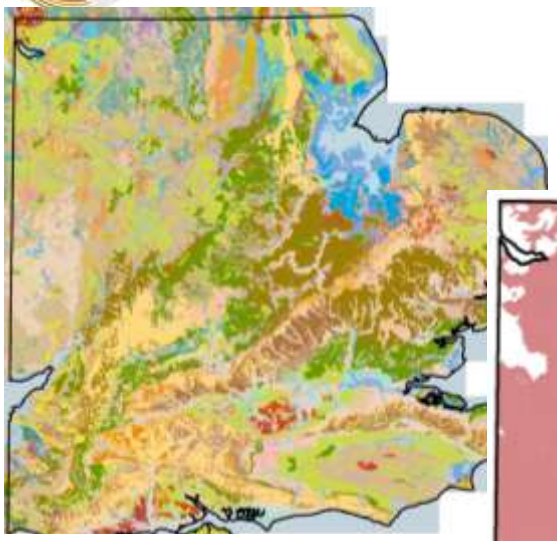


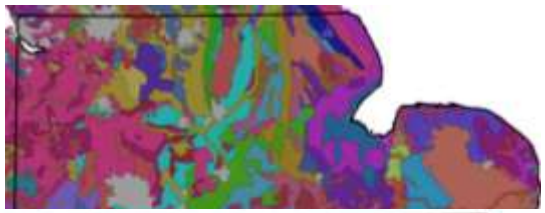
Cranfield UNIVERSITY

Application of Hammond classification scheme

- Hammond classifiers:
  - Slope – occurrence of slope <8%
  - Local relief
  - Profile type – occurrence of lowlands
- Each cluster was characterised with the values of the three classifiers extracted within:
  - peak sheds
  - object-oriented segmentation
- Three-character code applied to ranges of Hammond classifiers (Dikau et al., 1991) → landform **subclass**
- **Landform class and type** assigned to each subclass

Assessment –Validation datasets

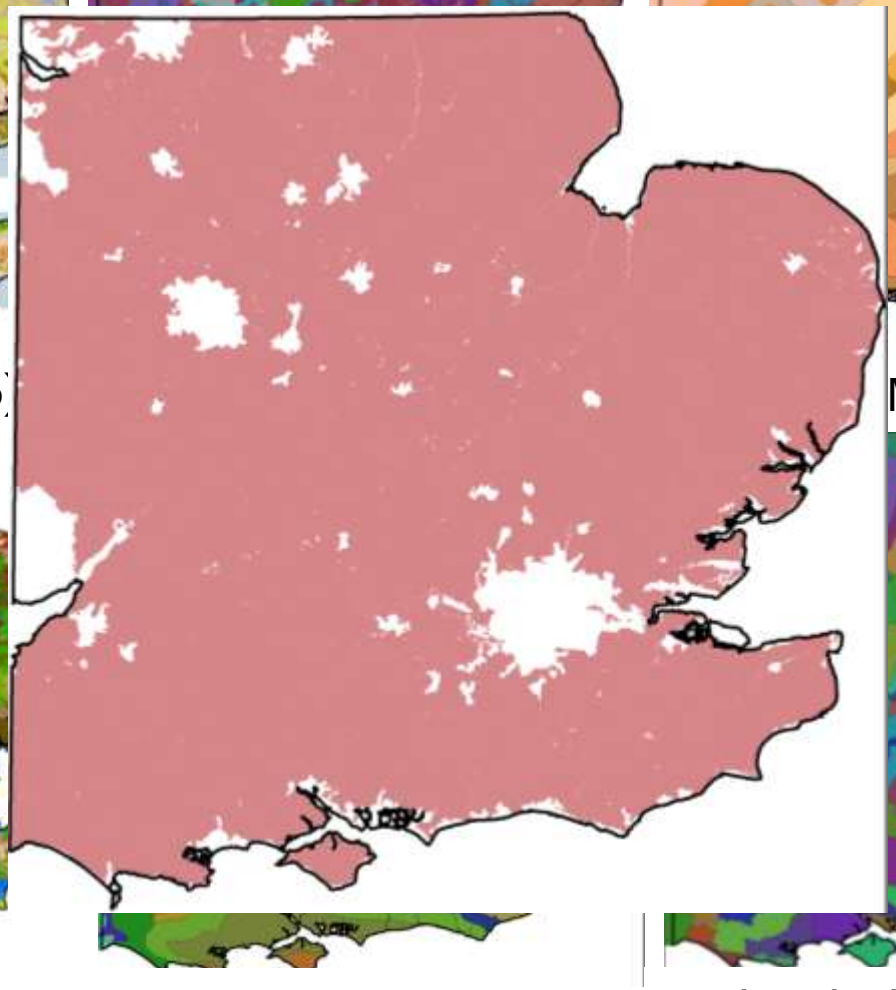


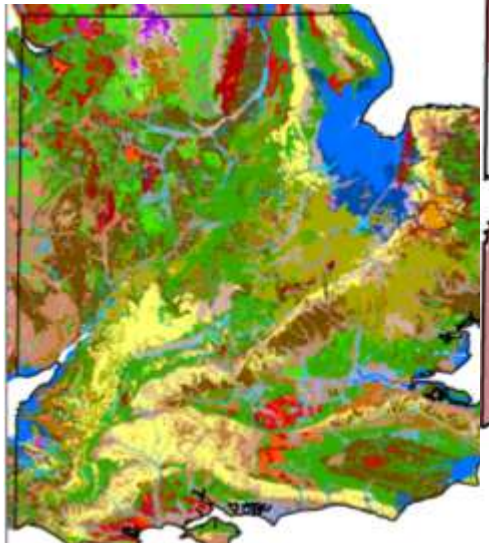


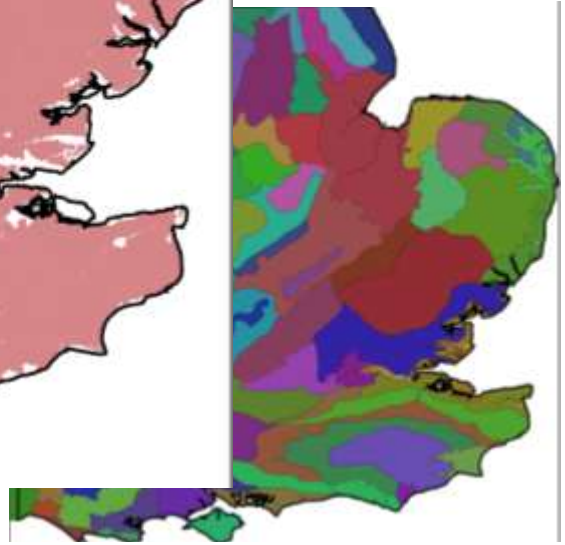
SOIL

NATMAP 1:250k (255)

Map (22)







SOILSCAPE/ LANDSCAPE

NATMAP soilscapes 1:250k (27)

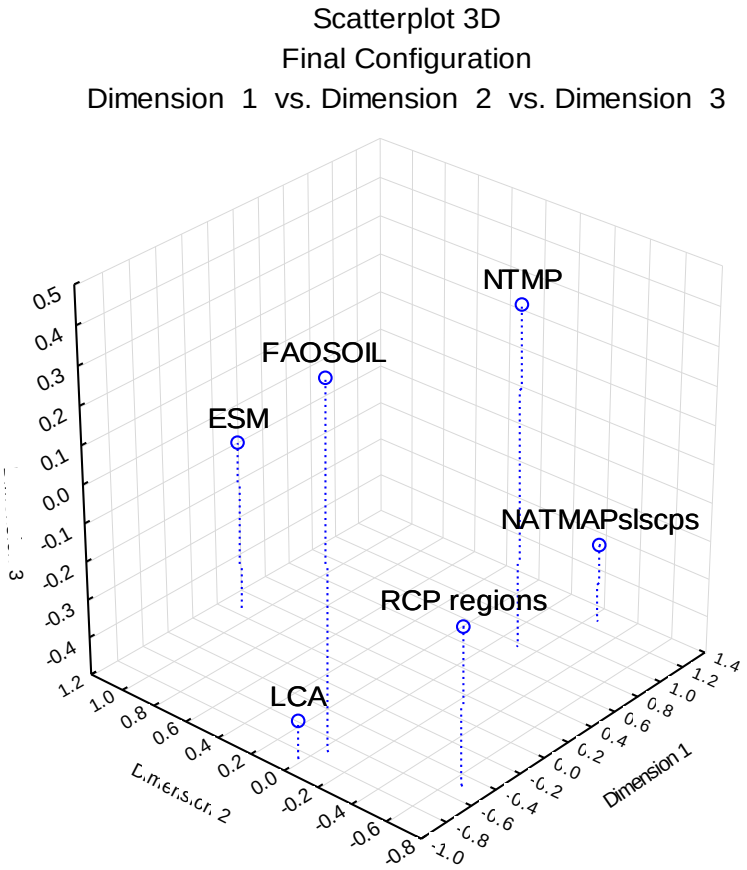
RCP regions 1:? (76)

National Character Areas 1:? (106)

Assessment – Cramer's V

- Simi… ferent num…
- Calc…

V … $)^2 / E_{ij}$



- Calc… sets
- Multi… d all valid…
  - …
  - List of distances in all dimensions

Assessment – Bayesian Networks

- Bayesian Belief Networks set to predict validation datasets with the use of various landform maps obtained in the project
- ‘Sensitivity to findings’ lists for each validation dataset – ordering according to the value of entropy reduction
- Indication of importance of each landform map
- Based on a sub-sample of regular points (~300k observations)

Discussion of validation results

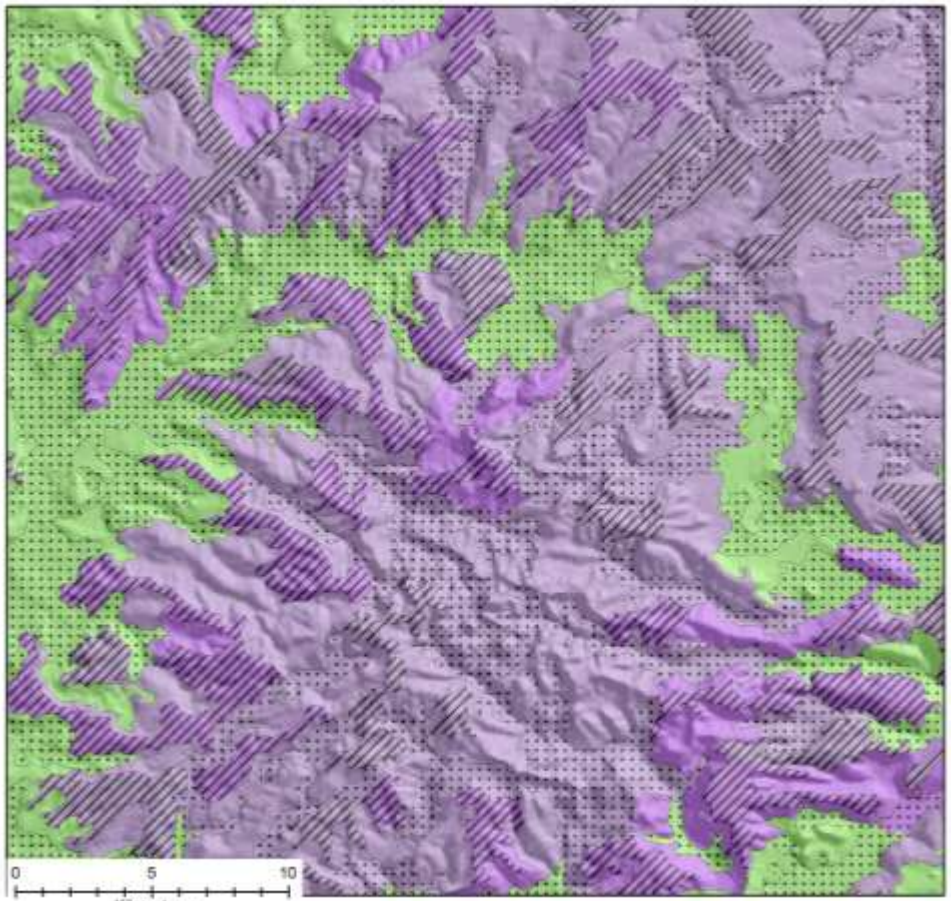
- Both methods give different but not dissimilar results
- **Bayesian Networks** favour approaches based on homogenous objects
- **Cramer's V statistic** finds more value in approaches based on physical entities.

Legend

Hammond classification scheme

TYPE, CLASS, SUBCLASS

- PLA, A1a, Flat_or_nearly_flat_plains
- PLA, A1b, Flat_or_nearly_flat_plains
- PLA, A1c, Flat_or_nearly_flat_plains
- PLA, A1d, Flat_or_nearly_flat_plains
- PLA, A2a, Smooth_plains_with_some_local_relief
- PLA, A2b, Smooth_plains_with_some_local_relief
- PLA, A2c, Smooth_plains_with_some_local_relief
- PHM, A3a, Plains_with_hills
- PHM, A3b, Plains_with_hills
- PHM, A4a, Plains_with_high_hills
- PHM, A4b, Plains_with_high_hills
- PHM, A5a, Plains_with_low_mountains
- PHM, B3a, Plains_with_hills
- PHM, B4a, Plains_with_high_hills
- PHM, B4b, Plains_with_high_hills
- PHM, B5a, Plains_with_low_mountains
- OPM, C4a, Open_high_hills
- OPM, C4b, Open_high_hills
- OPM, C5a, Open_low_mountains
- OPM, C5b, Open_low_mountains
- TAB, A3c, Tablelands_with_moderate_relief
- TAB, A4c, Tablelands_with_considerable_relief
- TAB, B4c, Tablelands_with_considerable_relief



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- Dobos E., Daroussin J., Montanarella L., An SRTM-based procedure to delineate SOTER Terrain Units on 1:1 and 1:5 million scales, EUR 21571 EN, 55pp. Office for Official Publications of the European Communities, Luxembourg, 2005.
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Thank you!