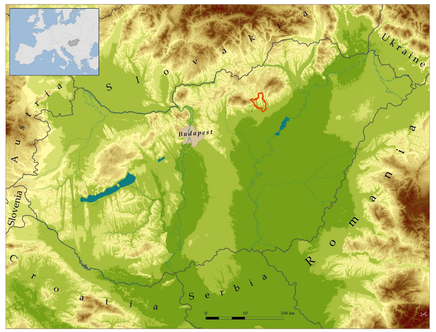
László Pásztor[1], Anna Dobos [2], Lívia Kürti [2], Annamária Laborczi[1], Katalin Takács[1]

Turning soil survey data into digital soil maps in the Energy Region Eger Research Model Area

[1]Institute for Soil Science and Agricultural Chemistry, Centre for Agricultural Research, Hungarian Academy of Sciences
Herman Ottó út 15. H-1022 Budapest, Hungary; www.mta-taki.hu

[2] Agria-Innoregion Knowledge Centre of the Eszterházy Károly College, Institution of Geography and Environmental Sciences
Eszterházy tér 1. H-3300 Eger, Hungary; http://uni-eger.hu/en

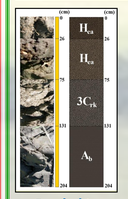


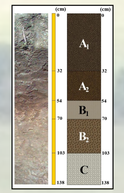
Acknowledgements:
Our work has been supported by the Hungarian National Scientific Research Foundation (OTKA, Grant No. K105167) and TÁMOP-4.2.2.A-11/1/KONV project.

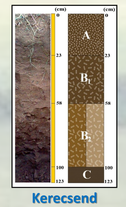
Agria-Innoregion Knowledge Centre of the Eszterházy Károly College has carried out targeted basic researches in the field of renewable energy sources and climate change in the framework of TÁMOP-4.2.2.A-11/1/KONV project. The project has covered certain issues, which require the specific knowledge of the soil cover; for example: (i) investigation of quantitative and qualitative characteristics of natural and landscape resources; (ii) determination of local amount and characteristics of renewable energy sources; (iii) natural/environmental risk analysis by surveying the risk factors.

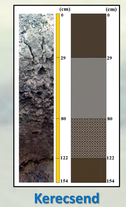
The Energy Region Eger Research Model Area consists of 23 villages and is located in North-Hungary, at the Western part of Bükkalja, which is a pediment surface with erosional valleys and dense river network. The diverse morphology of this area results diversity in soil types and soil properties as well. There was large-scale (1:10,000 and 1:25,000 scale) soil mappings in this area in the 1960's and 1970's which provided soil maps, but with reduced spatial coverage and not with fully functional thematics. To achive the recent tasks (like planning suitable/optimal land-use system, estimating biomass production and development of agricultural and ecomonic systems in terms of sustainable regional development) new survey was planned and carried out by the staff of the College. To map the soils in the study area 10 to 22 soil profiles were uncovered per settlement in 2013 and 2014. Field work was carried out according to the FAO Guidelines for Soil Description and WRB soil classification system was used for naming soils.

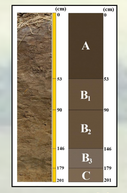
According to the general goal of soil mapping the survey data had to be spatially extended to regionalize the collected thematic local knowledge related to soil cover. Firstly three thematic maps were compiled by digital soil mapping methods: thickness of topsoil, genetic soil type and rate of surface erosion. High resolution digital elevation model, Earth observation imagery, geology and land cover maps were used as spatial ancillary environmental variables related to soil forming processes. Regression kriging (RK) has been used for the spatial inference of quantitative data (thickness of topsoil); classification and regression trees (CART) were applied for the spatial inference of category type information (genetic soil type and rate of surface erosion) with the aid of the available and properly preprocessed auxiliary co-variables. The applied spatial resolution was 25 meters. The deduced digital soil maps hopefully will significantly promote to plan sustainable economic model in the region which can provide protection and regeneration of local natural conditions and potentials for local inhabitants for a long time.

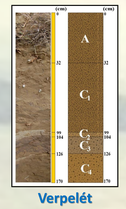

Egerbakta Histosol

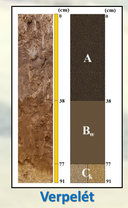

Egerszalók Umbrisol

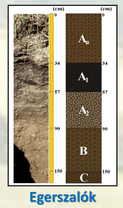

Kerecsend Technosol

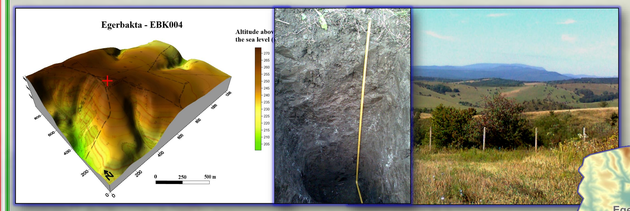

Kerecsend Chernozem

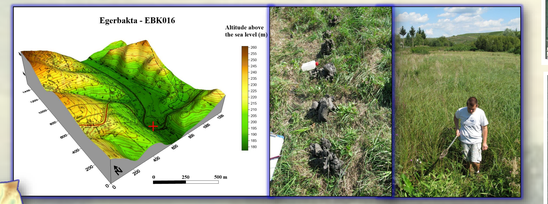

Tarnaszentmária Luvisol

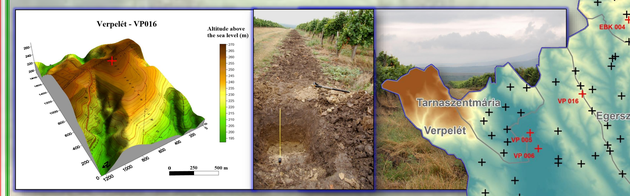

Verpelét Arenosol

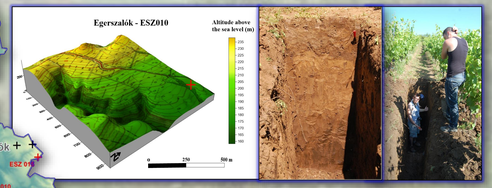

Verpelét Cambisol

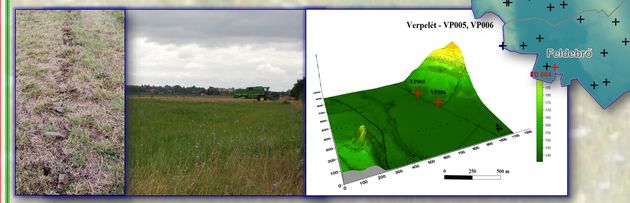

Egerszalók Fluvisol

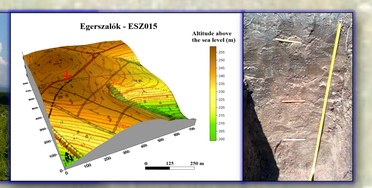


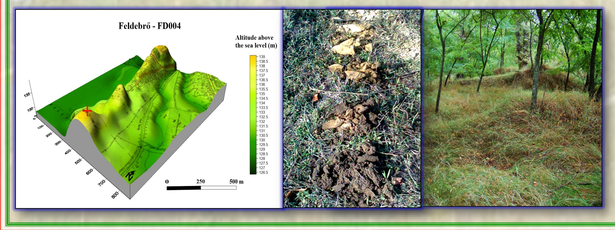


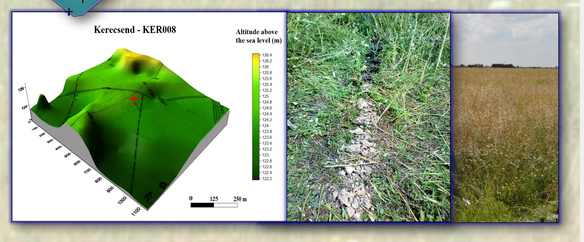


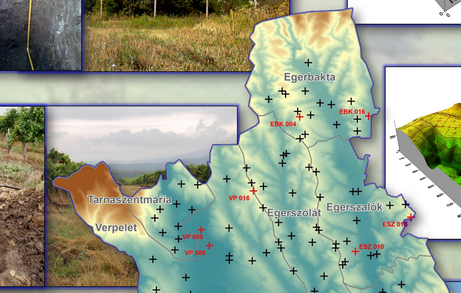


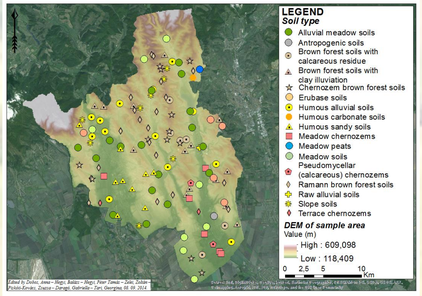


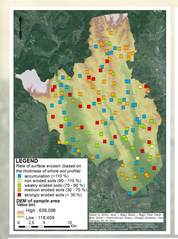












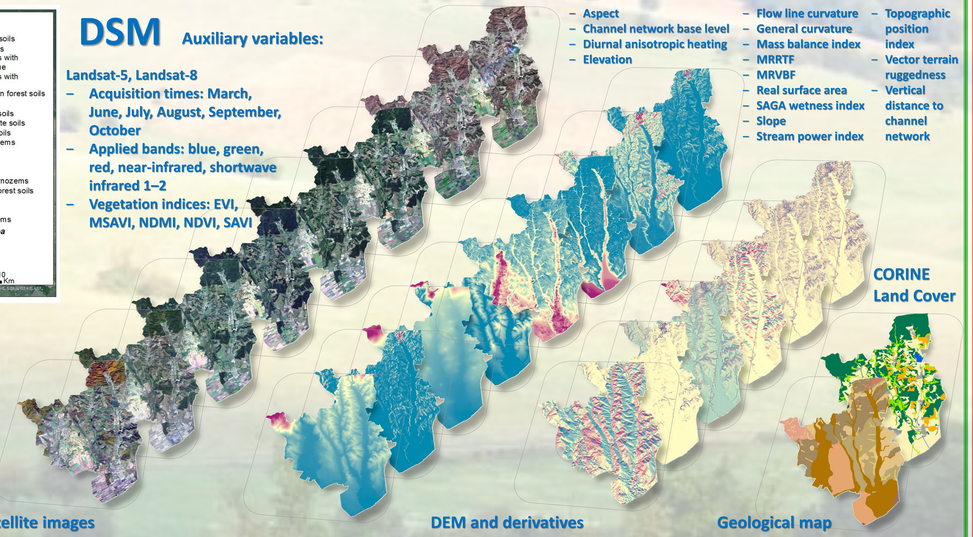
DSM

Auxiliary variables:

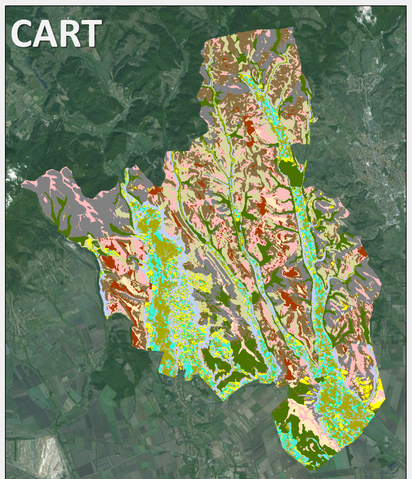
Landsat-5, Landsat-8
- Acquisition times: March, June, July, August, September, October
- Applied bands: blue, green, red, near-infrared, shortwave infrared 1–2
- Vegetation indices: EVI, MSAVI, NDMI, NDVI, SAVI

- Aspect
- Channel network base level
- Diurnal anisotropic heating
- Elevation
- Flow line curvature
- General curvature
- Mass balance index
- MRRTF
- MRVBF
- Real surface area
- SAGA wetness index
- Slope
- Stream power index
- Topographic position index
- Vector terrain ruggedness
- Vertical distance to channel network

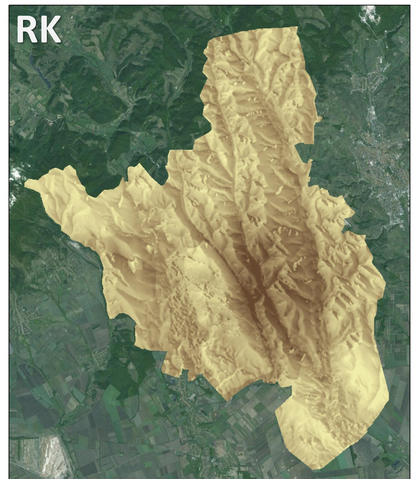
CORINE Land Cover



CART



RK



CART