Geophysical Research Abstracts
Vol. 17, EGU2015-15117, 2015
EGU General Assembly 2015

Categorical digital soil database for the Carpathian-basin using the modified e-SOTER methodology

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Harmonized, spatially and thematically consistent, high resolution soil data covering larger regions, several countries to model different environmental and socio-economic scenarios is needed for several applications. The only way to have such data with large spatial coverage and high resolution data is to make use of the available high resolution digital data sources, digital soil mapping tools in the development process. Digital soil mapping has become a very efficient tool in soil science, several applications have been published in this topic recently. Many of these applications use environmental covariates like remotely sensed images and digital elevation models, which are raster based data sources with block support. The majority of soil data users requires data in raster format with values of certain properties, like pH, clay content or soil organic matter content. However, the use of these soil properties are often limited, an adequate interpretation of these numbers requires knowledge on the soil system, and its major processes and process associations. This soil system description can be best done using the existing knowledge of soil science expressed in soil classification. as diagnostics – features, materials horizons, as important descriptive information - and the classification categories. The most commonly used and internationally accepted classification system is the Worlds Reference Base for soil description, the so called WRB. Each soil classification category represent a complex association of processes and properties, which is difficult to be used and understood and also mapped due to its complex information behind the category names.
The major advantage of the diagnostics based classification systems, like WRB, is that the complex soil categories, classes can be interpreted as unique combinations of the diagnostic features. Therefore each classes an be disaggregated into several diagnostics, where each have independent useful information describing a distinct part of the complex soil system. These diagnostics can be mapped independently and a set of soil property layers can be developed for the same area. This kind of dataset can provide the required qualitative information on a raster basis and can also be used to support automated classification algorithms as well.
The e-SOTER project developed a novel approach to develop and present categorical information this way, using digital soil mapping tools, digital elevation modelling and remote sensing – mainly MODIS - tools together with a harmonized training-calibration dataset of soil properties. This slightly modified procedure was used to develop a soil database to support the Danube-region data development initiative. The resulting dataset covers the Carpathian-basin and has several layers of occurrence probabilities of WRB diagnostic horizons/features/properties and an additional layer of the reference soil group (RSG) of the WRB system. This paper describes this novel approach for the development of digital soil datasets containing soil classification information. This approach disaggregate the class information for soil properties (WRB diagnostics) and map the occurrence likelihood using digital soil mapping, remote sensing and digital elevation modelling tools.

Keywords : e-SOTER, global soil mapping, digital soil mapping, categorical data, WRB, Carpathian-basin