Geophysical Research Abstracts
Vol. 17, EGU2015-825, 2015
EGU General Assembly 2015

Improving the performance of digital soil maps by the application of remotely sensed data used in terroir mapping – case study of the Tokaj wine region

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The aim of the soil mapping is to explore and visualize the spatial extension and variability of the thematic knowledge about soils. Soil maps are thematic maps, which can present information about the primary or derivative soil characteristics, soil classes and knowledge about the processes, function and services of the soils. The method for information obtaining about soils is sampling which results only point data and should be spatially extended by a properly chosen process.
The digital soil mapping (DSM) method uses environmental auxiliary variables for the spatial extension. These variables should be in direct or indirect relation with the target soil characteristic and should provide full coverage for the target area. Environmental variables can be derived from digital elevation models, land cover data or satellite images which can be obtained most efficiently with remote sensing methods. The soil-landscape relation can be modelled by geostatistical and data mining methods based the soil data and auxiliary variables.
The study area is Tokaj wine region (approximately 400 km2) which is located in Northeast-Hungary, in Tokaj Mountains. Soil data is available for 200 sampling points. The terrain variables – such as elevation, slope, aspect and other derivatives – are derived from a relatively high resolution digital elevation model (DEM; 1 m), that was generated by LiDAR. The other environmental variables – such as land cover, NDVI – are prepared based on Landsat images which are acquired at different seasons in line with vegetation phenology and soil coverage.
The target maps are prepared by digital soil mapping methods. For the analysis of the relationship between soil sampling data and the auxiliary variables different geostatistical methods are used to choose the most appropriate environmental variables for the spatial modelling. The spatial extension of point data are performed by interpolation methods.
For summarizing the main aim of this study is to test the opportunity and use of earth observation information and optimize the applied environmental auxiliary variables (like satellite image bands, acquisition time, DEM derivatives) in mapping the target soil parameters.