The creation of a digital soil map for Cyprus using decision-tree classification techniques

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The study aims to produce a digital soil properties map of Cyprus covering the area under the direct control of the Republic of Cyprus. The digital map will have an approximate use at a scale of 1:50.000. The first step is the creation of a raster database of predictive variables selected according to the *scorpan* formula (McBratney et al., 2003). The formula considers soil forming factors like previous soil data (s), climate (c), organisms (o), relief (r), parent material (p), age (a), and landscape position (n). Selected elements are used as predictors like temperature and aridity index; total loss on ignition, vegetation and forest type, the digital elevation model and related relief derivatives (slope, aspect, curvature), bedrock, surficial geology and geomorphology (Noller, 2009), geochemistry (Cohen *et al.,* 2011), a sub-watershed map and others.

In the second step, the digital soil map is created using the Random Forests package in R. Random Forests is a decision tree classification technique where many trees, instead of a single one, are developed and compared to increase the stability and the reliability of the prediction. The model is trained and verified on areas where published 1:25.000 scale soil maps are available and then it is applied for predictive mapping to the other areas.

Preliminary results obtained in a small area in the plain around the city of Lefkosia, where eight different soil classes are present, show very good capacities of the method. The Ramdom Forest approach leads to reproduce soil classes with a success percentage included between 88% (calcaric fluvic Cambisols and vertic Cambisols) and 96% (skeletric calcaric Regosols and calcaric lithic Leptosols). The soil classes will be field checked with mapped and unmapped areas including points with new soil properties. This study is part of the AGWATER project (AEIFORIA/GEORGO/0311(BIE)/06), co-financed by the European Regional Development Fund and the Republic of Cyprus through the Research Promotion Foundation.

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