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Evaluation and improvement of the predictivity of a digital parent material map

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Parent material is an essential soil property, whose mapping is a challenging task, since parent material – landscape models are even less established quantitatively, then those used in traditional soil mapping, due to more difficult and indirect cognizability of the deeper layers from surface. For the compilation of a reliable parent material map with quantified accuracy a digital mapping method was elaborated.

- Disaggregation of legacy geology map by RF modelling
- Spatially predicting the reliability of the disaggregated map
- Spatial identification of less reliable, stable predictions
- Elaboration of a sampling design
- Field work, collecting spatially non-exhaustive field observation (visual)
- Interpretation of the newly collected data
- Testing the improvement in the performance of the digital parent material map by involving increasing number of ground truth data

With the use of remotely sensed data and machine learning a new, large scale parent material was complied in an old mining region of Hungary. Different scale existing geological maps were used for training and for testing the classification concerning the lithological composition. To predict the parent material we applied various machine learning methods (Random Forest, Support Vector Machine and Conditional Neural network) using data originating from Earth Observation as ancillary information. Satellite imagery data, was used both in form of native spectral bands and derived spectral indices. Various derivatives of SRTM provided morphological auxiliary data. Digital soil property maps were also introduced into the modelling process. Finally 63 predictors were applied.

We examined the importance of each variable and we found that the data of the morphometric variables (e.g. MRVBF, elevation, slope) and some soil particle size fractions (i.e. clay, silt, sand) are the most important ones, compared to the rest of the tested spectral variables.

The resulting classified maps were validated several ways:

- after the first results, we run some analysis on the predicted map to examine its overall accuracy, and it equals to 0.77;
- we checked the difference of the predicted and the original maps;

- we also examined the number of predicted unique value of each pixel and the percentage of the most frequently predicted value.

In the next step field work was organized for the collection of spatially non-exhaustive field observation. A sampling design was elaborated based the evaluation results and taking into consideration the fact that there quite a few outcrops in the area which could help our work. After interpreting the newly collected data the improvement in the performance of the digital parent material map are being tested by involving increasing number of ground truth data.

Our paper will present the most recent results.

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