EGU22-12486
https://doi.org/10.5194/egusphere-egu22-12486
EGU General Assembly 2022

Soil moisture: coauthor of the soil mosaic patterns

Jiří Kocum[1,2], Luděk Šefrna[2], and Lukáš Vlček[1,2]
[1]Department of Water Resources, Institute of Hydrodynamics, Czech Academy of Sciences, Pod Paťankou 30/5, 166 12 Prague 6, Czech Republic; kocum@ih.cas.cz, vlcek@ih.cas.cz
[2]Charles University, Faculty of Science, Department of Physical Geography and Geoecology, Prague, Czechia; e-mail: jiri.kocum@natur.cuni.cz, ludek.sefrna@natur.cuni.cz, lukas.vlcek@natur.cuni.cz

Soil coverage of Czechia has been well-mapped thanks to Complex Soil Survey (CSS) during the 1970s. Despite its considerable details, it is not capturing many of the non-negligible phenomena, and it is not as accurate as it could be as if it were performed today with today technology. This study deals with soil mosaics visible from aerial photographs on agricultural lands, which are not affected in the CSS maps, in terms of determination and classification based on the processes that create these mosaics. For this purpose, fifty localities in Czechia were selected. Attention is paid to the way of development, places of occurrence and the shape of the mosaic itself. One of the main goals is to use only freely available data such as DMR, aerial photographs and soil maps. That is because we want this analysis to be easily reusable by other pedologists in other places. In this study, we propose a classification of different soil mosaics.

The proposed classification consists of three groups, containing seven categories defined by the primary causes of occurrence. Not all sites are formed only by one degradation process. The mosaic is often composed of several degradation processes, and the resulting shape is its sum. The main factors are changes in the soil properties, soil organic matter content, and different ability in water retention (differences in soil moisture). The resulting classification can be used for a) further continuation of soil mapping (where it could serve as an aid in selecting suitable sites for soil probes), b) soil sample gathering (to decide where to gather soil samples to get the most representative soil sample of the area), c) precise determination of polygons with similar soil properties, d) better planning in precision agriculture, e) more realistic estimation of the K factor in the RUSLE equation, to raise the accuracy of estimation of soil erosion.

Furthermore, the relationship between the shape of the mosaic and the processes that create the mosaic was analysed. Because it's evident that similar processes cause similar patterns, we choose a Box-Counting method to calculate its fractal dimension. Results of this analysis didn't show any correlation, and it wasn't possible to determine the type of mosaic only according to its value of the fractal dimension. The machine learning approach would be probably more suitable for this problem. Database of shapes, divided into the categories according to the classification above. Automatical analysis of pictures of the mosaics and their sorting according to their highest similarity with one of the categories. The possibility of using more detailed satellite images for soil reflectance values in the case of soil mosaic classification could also be very beneficial in the

future. For capturing the soil mosaic by satellite images, high-quality images are necessary. Such images are not freely available yet, and that's why we didn't use them in this study.