



Analysis of Actual Soil Degradation by Erosion Using Satellite Imagery and Terrain Attributes in the Czech Republic

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Soil water and wind erosion (possibly tillage erosion) is the most significant soil degradation factor in the Czech Republic. Moreover, this phenomenon also affects seriously quality of water sources. About 50 % of arable land are endangered by water erosion and about 10 % of arable land are endangered wind erosion in the Czech Republic. These processes have been accelerated by human activity. Specific condition of agriculture land in the Czech Republic including highland relief and particularly size of land parcel and intensification of agriculture does not enable to reduce flow of runoff water. Insufficient protection against accelerated erosion processes is related to lack of landscape and hydrographic elements and large area of agricultural plots.

Currently, this issue is solved at plot scale by field investigation or at regional scale using numerical and empirical erosion models. Nevertheless, these models enable only to predict the potential of soil erosion. Large scale assessment of actual degradation level of soils is based on expert knowledge. However, there are still many uncertainties in this issue. Therefore characterization of actual degradation level of soil is required especially for assessment of long-term impact of soil erosion on soil fertility. Soil degradation by erosion can be effectively monitored or quantified by modern tools of remote sensing with variable level of detail accessible.

Aims of our study is to analyse the applicability of remote sensing for monitoring of actual soil degradation by erosion. Satellite and aerial image data (multispectral and hyperspectral), terrain attributes and data from field investigation are the main source for this analyses. The first step was the delimitation of bare soils using supervised classification of the set of Landsat scenes from 2000 – 2014. The most suitable period of time for obtaining spectral image data with the lowest vegetation cover of soil was determined. The results were verified by statistical data of areas under farm crops from Czech Statistical Office. Information on number of scenes where bare soils are identified for each land parcel is available. This set of images with bare soils is used for assessment of soil degradation stage. Some land parcels were found without vegetation cover up to 40 times. Analysis was performed on 5 test sites in the Czech Republic and also using data from database of Soil Erosion Monitoring of Agricultural Land. Currently, more than 500 erosion events are registered in this database. Additional remote sensing data (Hyperion data, aerial hyperspectral data) was used for detailed analysis on the test sites. Results reveal that satellite imagery set, soil maps, terrain attributes and erosion modelling can be successfully applied in assessment of actual soil degradation by erosion.

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