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Development and validation of a method to estimate the potential wind erosion risk in Germany

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The introduction of the Cross Compliance (CC) regulations for soil protection resulted in the demand for the classification of the the wind erosion risk on agricultural areas in Germany nationwide. A spatial highly resolved method was needed based on uniform data sets and validation principles, which provides a fair and equivalent procedure for all affected farmers. A GIS-procedure was developed, which derives the site specific wind erosion risk from the main influencing factors: soil texture, wind velocity, wind direction and landscape structure following the German standard DIN 19706. The procedure enables different approaches in the Federal States and comparable classification results. Here, we present the approach of the Federal State of Brandenburg.
In the first step a complete soil data map was composed in a grid size of 10 x 10 m. Data were taken from 1.) the Soil quality Appraisal (scale 1:10.000), 2.) the Medium-scale Soil Mapping (MMK, 1:25.000), 3.) extrapolating the MMK, 4.) new Soil quality Appraisal (new areas after coal-mining). Based on the texture and carbon content the wind erosion susceptibility was divided in 6 classes. This map was combined with data of the annual average wind velocity resulting in an increase of the risk classes for wind velocities > 5 ms-1 and a decrease for < 3 ms-1. The sheltering effect of landscape structure is regarded by allocating a height to each landscape element, corresponding to the described features in the digital “Biotope and Land Use Map”. The “hill shade” procedure of ArcGIS was used to set virtual shadows behind the landscape elements for eight directions. The relative frequency of wind from each direction was used as a weighting factor and multiplied with the numerical values of the shadowed cells. Depending on the distance to the landscape element the shadowing effect was combined with the risk classes. The results show that the wind erosion risk is obviously reduced by integrating landscape structures into the risk assessment. After the renewed classification for the entire Federal State, about 60% of the area in the highest, and 40% in the medium risk classes changed into lower classes. The area of the highest potential risk class decreased from 40% to 17% in relation to the total area. A validation of this approach was made by data of the Digital Surface Model (DSM, first pulse) from laser scanning of an area of 144 km^2 with a spatial resolution of 1 x 1 m. It could be shown that the allocated height values of the landscape elements were correct in 75% per cent, too low in 15% and too high in 11% off all cases. The current landscape element map of the Federal State of Brandenburg will be replaced, when the DSM is available for the entire area in the near future.