



## Uncertainties in the regional estimation of Soil Erodibility. A German wide evaluation of the K-Factor comparing current datasets and calculation methods.

Philipp Saggau and Bastian Steinhoff-Knopp ▶

Soil erosion by water is considered as one of the most serious processes degrading the soil functionality of arable soils around the globe. To assess the risk of water erosion at larger scales, the universal soil loss equation (USLE) and its derivatives are commonly used for the implementation of policy instruments.

An important factor needed within (R)USLE model exercises is the K-factor, which reflects the natural erodibility of the topsoil. The spatial explicit determination of the K-factor is crucial to create reliable soil loss estimate maps. However, the accurate estimation of the K-factor at the regional level is challenging due to different existing calculation methods and as a variety of spatial data (e.g. soil texture fractions, rock fragments, soil organic matter) is needed. The latter severely limits the choice of available data, which differ in spatial resolution and information content of the required parameters. This leads to a high potential of uncertainty in the regional estimation of K-factors, but also of the soil erosion estimates at regional level.

Therefore, the aim of the study presented is to determine the spatial and quantitative accuracy of different soil data sets and calculation methods for estimating the K-factor for Germany. Furthermore, the influence of possible uncertainties on the estimation of soil erosion risk by combining all factors of the (R)USLE should be evaluated. Based on the aim of this study we modelled K-factors for three available harmonized German-wide datasets: I) LUCAS soil dataset of Europe, II) BÜK1000 and III) BÜK200 (soil overview maps for Germany) using the existing equations of A) Wischmeier and Smith (1978) and its extension of B) Auerswald et al. (2014) representing the original K-factor nomograph. For the validation of the three datasets, K-factors based on 2234 arable soil profiles across Germany from the Agricultural Soil Inventory (BZE\_LW) with most detailed soil information were calculated.

The results reveal significant differences between calculation methods and data sets for the German-wide assessment of K-Factors. The LUCAS soil dataset overestimates average K-Factors of the BZE-LW by ~ +21 % (RMSE = 0.015,  $R^2 = 0.30$ ), while BÜK200 underestimates K-Factors by ~ -30 % (RMSE = 0.016;  $R^2 = 0.34$ ). In contrast the calculation method has a low impact on the average K-Factor estimation (~ 5 %) while the RMSE is comparable high with 0.012 ( $R^2 = 0.57$ ).

The results imply that the choice of the calculation method and dataset at regional level is important and that detailed information on soil texture (e.g. very fine sand fraction) are crucial and strongly needed in order to improve the estimation of reliable K-Factors and soil erosion risk on regional-scales.

**How to cite:** Saggau, P. and Steinhoff-Knopp, B.: Uncertainties in the regional estimation of Soil Erodibility. A German wide evaluation of the K-Factor comparing current datasets and calculation methods., EGU General Assembly 2023, Vienna, Austria, 24–28 Apr 2023, EGU23-9045, <https://doi.org/10.5194/egusphere-egu23-9045>, 2023.

