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The impact of new detailed (R)USLE-C-factor maps for Germany on soil loss estimates

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The (R)USLE and its many derivates are the most used models to estimate soil loss by water at regional scale. Within the (R)USLE the C-factor is used to assess the impact of crop and soil management on erosion. The exact, temporal and spatial explicit determination of the C-factor is crucial to create reliable maps on soil loss estimates, monitoring the impact of agricultural practices on soil erosion and evaluating the efficiency of policy instruments.

The derivation of accurate high-resolution C-factor data for larger regions remains a challenge, as a variety of spatio-temporal data (crops/crop rotation, tillage management, interannual variation of rainfall erosivity) is needed. Based on recent improvements in calculation methods and the availability of earth observation data, the C-factor can be estimated using agricultural statistics and parcel-based information on crop cultivation. Consequently, we developed two types of spatially explicit and regional C-factor datasets for Germany, mapping the impact of agricultural practice on soil erosion in a more reliable and spatially detailed way: i) harmonized mean C-factors for municipalities for 1999, 2003, 2007, 2010, 2016 and 2020, and ii) parcel-based C-factors for the period 2017-2020 based on crop type maps from satellite data.

In this contribution, we will present the implemented methods and will discuss the impact of the new detailed C-factor maps on soil loss estimates in a spatial resolution of 10 x 10 m for German cropland. The results show an increase in the C-factors for municipalities during the last two decades by 17 %. The parcel-based data reveals the C-factor ranges within the municipalities: While the mean C-factor for all parcels across Germany is 0.107 (conventional cropping; 2017-2020), the standard deviation within the municipalities ranges from 0 to 0.141 at a mean standard deviation of 0.045. This results in differences in erosion rates of up to 7 t / (ha • a), highlighting the importance of spatially explicit C-factor estimates.

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