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Can we adapt RUSLE to soil erosion modelling of Alpine regions?

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Modelled soil erosion estimates for Alpine regions are often contradictory, not only with respect to the absolute rates but also regarding the spatial pattern. The empirical Revised Universal Soil Loss Equation (RUSLE), which predicts the average annual soil loss through simple multiplication of 5 soil erosion risk factors, is still most frequently used at large spatial scales. The model was chosen since its complexity meets the low data availability in Alpine regions. However, the model was originally developed for lowland arable regions and the empirical foundation of the RUSLE restricts the transferability to other environments. In this study, we evaluate the single RUSLE factors regarding their applicability for Alpine regions and future research needs will be discussed. The evaluation will be based on the comparison of modelled with measured (^{137}Cs, sediment traps and rainfall simulation) soil erosion rates.

Regarding rainfall erosivity, Alpine areas are characterised by a distinct seasonal variability with high values during the summer season. Snow-fall is not considered as an erosive force, however, subsequent snow-melt and probably more important snow-movement can increase the erosivity again. Our data shows, that a reduction of the vegetation cover exponentially increases soil loss. Consequently, the percentage of vegetation cover should be incorporated in the assessment of the RUSLE vegetation factor (C-factor), which can be achieved through high resolution satellite imagery. Further, the topography factor (LS) is of crucial importance. We propose to calculate the L-factor based on a digital elevation model with 2 m resolution and a multiple flow algorithm. Preliminary data to adapt the S-factor for steeper slopes will be presented.

We conclude that the RUSLE seems to be a good starting point to assess relative differences of soil erosion risk in Alpine areas if model parameters are adapted to mountain conditions.