
Uncertainty and sensitivity analyses of empirical approaches to estimate sediment delivery ratios of European river catchments

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ABSTRACT

Sediment delivery ratios (SDR) are common tools to link soil loss to sediment yields (SY) of river catchments. Large-scale erosion and nutrient emission models rely on simple catchment properties to estimate such SDR. In order to assess the sensitivity and uncertainty of these SDR models in different parts of Europe, I compiled a European sediment database and derived alternative soil loss maps from pan-European data. 16 maps were created using the universal soil loss equation (USLE) and different approximations for its R, L, C, and K factors. The SDR were calculated from all maps and 4 regression models were applied to explain the variability of SDR and SY in various regions. As a consequence of the huge uncertainty in USLE estimates, the uncertainty in modelled SY ranged on average from 30% to 60% in different parts of Europe. The model and algorithm choices also affected the quality of SDR and SY predictions. Using the USLE with a 4-parameter SDR model allowed satisfactory results outside the Mediterranean zone. SDR models with fewer parameters were less appropriate. Among the USLE factors, the K factor had the strongest impact on the performance of the 4-parameter model, followed by the L and C factors. The sensitivity to the R factor was low. In northern Europe, the approximation of USLE factors was as important as the parameterisation of the SDR model. Although no soil loss map allowed satisfactory results everywhere, carefully choosing the soil loss map can significantly improve regional SDR and SY predictions.