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Modeling river sediment concentrations during hydrologic events in the poorly gauged basin

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Analyses undertaken in this paper show that the Universal Soil Loss Equation (USLE) fails to predict the soil losses during hydrologic events, especially for arid region. The cause is due to the neglect of runoff in predicting the rainfall erosivity index. In this paper, the erosivity index in USLE is modified by relating the kinetic energy with rainfall, infiltration and runoff processes. The modified USLE model is verified to reflect the hydrological processes more accurately and to be capable of estimating event soil losses. As a new approach for modeling the event-based soil erosions in large catchments, the proposed erosion model also takes the channel erosion into account, together with sediment deposition and transport simulations; its application is broadened to model the variations of sediment concentrations during single events. Through a case study in the large arid region - Lushi River basin in China, the designed erosion model is validated to have good performances during most hydrologic events.