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Effects of litter cover on sediment transport capacity of overland flow

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Sediment transport capacity (Tc) is a key input parameter of process-based soil erosion models. The precise estimation of sediment transport capacity is critical for improving the prediction accuracy of these erosion models. *Tc* is affected by flow hydraulics, sediment properties and soil surface conditions. The potential effects of vegetation cover on *Tc* are not fully understood. The objectives of this study were to investigate the effects of litter cover on *Tc* over a range of flow discharge and slope gradient values and to establish the empirical formula for *Tc* under the influence of litter cover. The experiments were conducted in a 5-m-long and 0.38-m-wide nonerodible flume bed. Unit flow discharge varied from 1.316×10^{-3} to 3.947×10^{-3} m^2 s^{-1} and slope gradient from 8.8 to 26.8%. Pine needle litter of *Pinus tabulaeformis* was selected as the experimental material, and the litter cover was designed as 0%, 5%, 10%, 20%, 30%, 50%, 70%, respectively. The diameter of the test sediment varied from 0.25 to 0.59 mm, with a median diameter of 0.35 mm. The results showed that the measured *Tc* decreased exponentially as the litter cover increased. The slope gradient had a stronger effect on *Tc* of 0 litter cover than unit flow discharge. An empirical transport capacity formula for parameters including unit flow discharge, slope gradient and litter cover was derived, with a coefficient of determination (R^2) of 0.941 and a coefficient of Nash-Sutcliffe model efficiency (*NSE*) of 0.941, which indicated that *Tc* can be predicted satisfactorily by the three parameters. The results will not only improve the prediction accuracy of soil erosion models, but also provide a theoretical basis for the evaluation of soil and water conservation benefits.