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Quantitative Study on Soil Detachment Capacity in the Process of Slope Gradient Scouring for Cinnamon Soil

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Soil detachment is a key parameter in soil physical erosion models. In this study, the Cinnamon soil was selected as the research object. Six soil moisture contents (3%, 6%, 9%, 12%, 15%, 18%),three slope gradients(5°, 10°and 15°),and three flow discharges (8, 12, 16 L/min) were designed. The results showed that: (i) as soil moisture content increased, soil detachment capacity increased first and then decreased. Due to the difference of slope gradients and flow discharges, the influence of soil moisture content on soil detachment capacity was different. Soil detachment capacity was the highest when soil moisture content was 15%. (ii) soil detachment capacity increased with increasing of slope gradient under six soil moisture contents. The soil moisture content and flow discharge can affect the variation pattern of soil detachment capacity with slope gradients. When the slope gradient was 15 °, soil detachment capacity reached the maximum. (iii) as flow discharge increased, soil detachment capacity increased under different soil moisture content, and increasing trend of soil detachment capacity showed different functional relationships by the influence of soil moisture content and slope gradient. When the flow discharge was 16 L/min, the soil detachment capacity had the maximum value. (iv) if only considered the influence of two factors, the contribution rate of error was greater than soil moisture content and slope gradient, soil moisture content and flow discharge. With three factors included, the contribution rate of flow discharge to the variation of soil detachment ability was the largest (33.46%), followed by slope gradient (29.43%) and soil moisture content (17.11%). The simulation accuracy of soil detachment ability can significantly improve from 0.512, 0.556, 0.707 to 0.994 by including flow discharge, slope gradient and soil moisture content.