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Characteristics of runoff processes on unmetalled loess roads under experimental rainfall conditions

FENGXIA TIAN[1], XIUBIN HE[1], GUIYU LI[2] & SHIQING ZHENG[3]

1 Key Laboratory of Mountain Surface Processes and Ecological Regulation, Institute of Mountain Hazards and Environment, Chinese Academy of Sciences, Chengdu 610041, China
tianfengxia@imde.ac.cn
2 CHINA Water Resources Pearl River Planning, Surveying and Designing Co. Ltd, Guangzhou 510610, China
3 Institute of Soil and Water Conservation, CAS & MWR, Yangling, Shaanxi 712100, China

Abstract Runoff commonly triggers severe erosion on unmetalled road surfaces and roadside slopes. In this context, this paper explores the use of theoretical analysis of runoff processes for an unmetalled loess road, based on the kinematic wave theory, and explores the key controlling factors. The results of the theoretical analysis are assessed using measured data from simulated rainfall tests on artificial experimental road sections. The results suggested that: (1) the kinematic wave equation is appropriate for describing dynamic processes of overland flow on unmetalled loess roads; (2) the discharge, depth and velocity of runoff on the unmetalled loess roads increased with increasing rainfall intensity, whereas the velocity of runoff increased with increasing slope length; (3) the velocity of runoff increased as flow depth decreased with increasing slope gradient; and (4) unit width discharge on road sections with different slopes under the same rainfall intensity (120 mm h^{-1}) remained similar.

Keywords unmetalled loess roads; kinematic wave theory; flow depth; flow velocity; slope gradient