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# Laboratory experiments of hillslope erosion induced by groundwater seepage

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Groundwater flow is a major contributor of instability of hillslopes as increased pore-water pressures reduces soil strength. In addition, recent research demonstrated that upon the rise of the groundwater table, seepage flow exiting natural hillslopes entraps soil particles and causes erosion cavities which may then trigger the collapse of the upper land. It is crucial to understand the erosion mechanisms under seepage forces to design an appropriate remedial solution since the loss of slope stability generally manifests itself as landslides which cause loss of life and property. In this study, the effect of the seepage forces on the erosion mechanisms of sandy slopes were investigated by laboratory physical slope models. For this purpose, a reduced scale sandy slope (angle of 45 degrees) with dimensions of 195 cm long, 100 cm wide and 110 cm high was compacted in 5 cm lifts to obtain a dry density of 14 kN/m$^3$. Two different hydraulic gradients were generated to induce seepage. Models were equipped with vibrating wire pressure cells and piezometers to record the total pressures, and pore-water pressures within the slope, respectively. The measurements by tensiometers installed on one side of the box indicated the progress of phreatic surface from the reservoir to the slope face. Seepage flow entrapped soil particles as it exited the slope surface. The extent of the seepage erosion was monitored by three-dimensional laser scanning. The cavity caused by the groundwater flow erosion induced progressive slope failures. By the end of the experiment, the slope gained stability as the eroded soil mass at the toe acts as a buttress against seepage forces. Acknowledgment: This material is based upon work supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) under Grant No. 215M745.