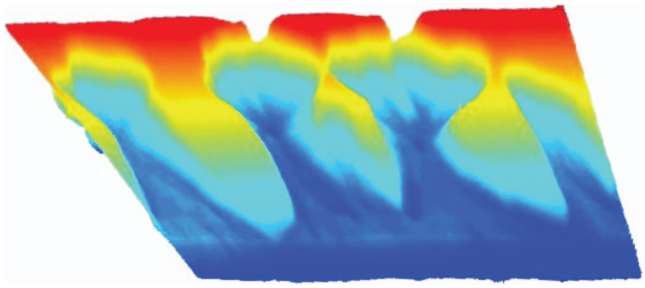

FIG. 1. (Color) A spontaneous set of eroded channels measured using the laser aided topography technique and then rendered using a false color scale.

Channel erosion due to subsurface flow

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We study the physical processes that create eroded channels and drainage networks by doing laboratory experiments. The apparatus consists of a sloping granular bed inside a 90 cm × 119 cm × 30 cm acrylic box. The granular material consists of 0.5 mm diameter glass beads. Water is fed from a reservoir in the back and the pressure is maintained at a constant level.[1] The water seeps through the porous medium and creates channels on the slope above a critical pressure which depends on the slope of the bed. We obtain the depth of channels as a function of time using the intersection of a laser generated light sheet with the pile surface[2] which is imaged with a digital camera. An example of a spontaneous set of eroded channels measured using the laser aided topography technique and then rendered using a false color scale is shown in Fig. 1.

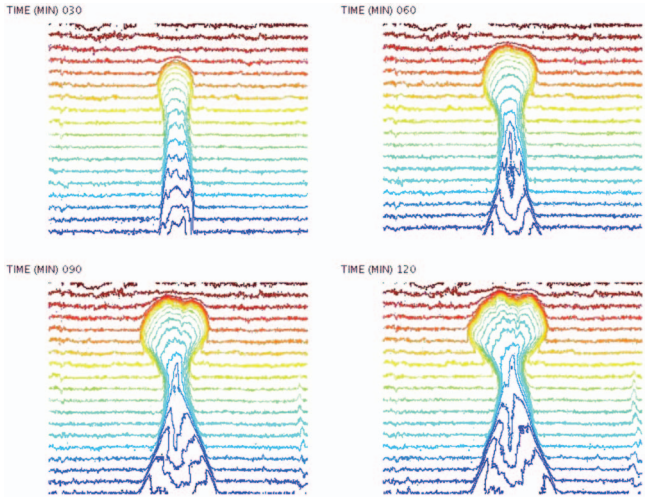

FIG. 2. (Color) Contour maps of channels obtained using the laser-aided topography technique after time $t=30$, 60, 90, and 120 min.

In order to simplify the phenomenon, we follow the evolution of an initial channel created with a triangular cross section. Contour maps of channels obtained using this laser-aided topography technique after time $t=30$, 60, 90, and 120 min are shown in Fig. 2. The channel head first develops a smooth amphitheater shape before the shape becomes unstable. The onset of the instability can be delayed by increasing the slope of the bed.

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