Existence of soil pipes is common in many hillslopes. Soil pipes may result from subsurface hydraulic erosion, large decayed root channels, animal burrows and tension cracks etc.

Open soil pipes are considered to drain off water from a hillslope and play an important role in the subsurface runoff generation process reducing the slope failure susceptibility. However, soil pipes are also often detected at collapsed slopes, which suggest that under certain conditions they might act to induce slope instability.

Pipe openings seen at a landslide location.

The objective of this work is to understand how the soil pipes influence the pore-water pressure generation and slope failure processes.

A numerical model has been developed using FLAC3D.

Some Findings:

- Pipes reduce pore-water pressure around its upstream end and increases around its downstream end if compared to the case without pipes.
- Pore-water pressure at downstream end increases with increase in hillslope angle, pipe cross sectional area, pipe length, or depth of soil pipe.
- Soil pipe even if ended within a hillslope, increases the total discharge from the hillslope.
- If a soil pipe have different roughness, location of the roughest section is also an important parameter for both the hillslope discharge and the pore-water pressure.
- Complete collapse of soil pipe will increase the pore-water pressure beyond the pressure level if no pipe exist. Therefore, position and type of soil pipe collapse might play an important role in shallow landslide initiation.

A typical Contour of pore pressure profile (black line below the contour shows the location of soil pipe)

Pore-water pressure profiles along slope for different pipe conditions.