

# Prediction of rainfall-induced landslides in unsaturated granular soils for setting up of early warning systems

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**Abstract:** Early warning is being used more and more for protection against natural risks. In some cases, as for extreme meteorological events, it has proven efficient for risk mitigation; in other cases, as for rapid landslides, the use of early warning is conditioned by the very short lead time which is available between the event and its impact on exposed goods. In particular, in the case of rainfall-induced landslides, early warning should rely on monitoring of rainfall and on empirical relationships between this and landslide occurrence, forcing to launch the warning signal before the event when the probability of occurrence is considered to be high enough. Because of the complexity of the problem and of the risk of false or missing alarms, landslide prediction should bear on a clear knowledge of the mechanics of slope failure, with the support of advanced technologies for monitoring and data transmission and of reliable procedures for a timely analysis of collected data.

The paper examines some of these problems, with particular reference to prediction of landslides, reporting experience on events involving pyroclastic soils.