

Towards an early-warning system for rainfall-

induced landslides in forested catchments: a case

study in Valsassina (Northern Italy)

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SLIP (Shallow Landslides Instability Prediction)

is a mathematical model aimed at predicting the shallow landslide occurrence in response to heavy rainfall events. Assuming an infinite slope, the model performs a stability analysis specifically taking into account the contribution of the partial saturation to the soil shear strength in terms of apparent cohesion ($c\psi^*$) which, in turn, depends on the degree of saturation (Sr) of the soil (Montrasio, 2000).

$$Fs = \frac{\cot\beta \tan\varphi' [\Gamma + m(n_w - 1)] + C'\Omega}{\Gamma + mn_w}$$







Modified version of SLIP:

SLIP was integrated with a quantification of the soil reinforcement provided by root systems as a function of tree species and tree density.

$$\tau = c' + \sigma' t g \varphi' + c_r$$

Study Case:

Valsassina, Giugno 2019



Modello W&W, 1976







Result of analysis

• = UNSTABLE AREAS ($Fs \leq 1$)



C_R=0.5 kPa

C_R=1 kPa

C_R=2 kPa

C_R=4 kPa