A Bayesian approach to determine the rainfall thresholds for shallow landslides triggering

M.L.V. Martina (1), S. Pignone (2), E. Ferroni (1), E. Todini (1)

(1) (2) Department of Geo-Environmental Sciences, University of Bologna, Via Zamboni 67, 40126, Bologna, Italy, (2) ARPA, Agenzia Regionale per la Protezione dell'Ambiente, Viale Silvani, 40130, Bologna, (mario.martina@unibo.it)

The rainfall thresholds are, in this work, defined as the critical value for the combination of two controlling variables: a variable expressing the soil moisture conditions antecedent a storm event and a variable describing the magnitude of the storm event (e.g. rainfall intensity, total rainfall volume of the event). We used a statistical Bayesian approach in order to estimate the rainfall thresholds by choosing a critical value for the exceedance probability of the landslides given the two controlling variables. The study is based on the available data of the Emilia-Romagna for the landslides occurred in the last 70 years and specifically those located within the Reno catchment. The joint probability distribution function of the controlling variables conditional to a landslide does not show indication of critical threshold as it has been shown by previous works. We think that is not the correct way to analyze the data. As a matter of fact the comparison of the marginal and conditional pdfs of the controlling variables shows evident differences. By applying the Bayes's theorem, it has been possible to estimate the probability of a landslides event conditional to the controlling variables and confirm the intuitive dependence of the shallow landslides from the triggering factors.