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Shallow landslide prediction in the Serra de Cubatão, São Paulo

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Various methods are currently used in the space and time prediction of the shallow landslides in a scale basin. Between them, the physically based models, such as dSLAM, SINMAP, SHALSTAB and TRIGRS, which present innumerable advantages associated to the physical description of these processes from mathematical equations. The last two ones had been already applied in different areas, including those under humid tropical conditions, presenting quite satisfactory results. The main objective of this research consists on the prediction of the shallow landslides, using TRIGRS (Transient Rainfall Infiltration and Grid-Based Regional Slope Stability) and SHALSTAB (Shallow Landslide Stability Analysis) models, in a pilot basin, located at Serra do Mar (SP), in Cubatão city. The occurrence of mass movements is common in this region, mainly shallow landslides types, causing a lot of social and economical damages. The evaluation of the efficiency of these models and the analysis of the influence of the topographical and geological parameters in the susceptibility of the area are also focused in this research. To reach objectives, susceptibility sceneries had been stimulated taking into account different mechanical and hydrological values. The
influence of topography (elevation, slope gradient, curvature, aspect and contribution area) and geological parameters was analyzed through the percentages of Scars Concentration and the Landslides Potential, both taken from the mapping of the scars in 1985. The susceptibility maps had been validated through these two indices, considering, also, the percentages of areas predicted as unstable without the presence of scars, and of the stable ones with scars. The results had shown a strong topographical control in the shallow landslides distribution, once the scars of these processes concentrated, mainly, between the elevation of 400m and 800m, on convex or rectilinear slope with angles between 40º and 50º, and guided for quadrant N, NE and NW. As for the simulations of susceptibility, it had not been observed significant differences in the prediction of the unstable areas simulated by models TRIGRS and SHALSTAB. It was identified an expressive agreement between the maps of susceptibility and scars in great part of the scenery. However, the use of reduced values of the effective cohesion resulted in overestimation of the unstable areas, seen through the high percentage of areas without the presence of scars. Based on these results, the use of these two models are considered important tools in the prediction of the shallow landslides, mainly, in areas where the mechanical and hydrological data are scarce, as in many areas of Serra do Mar .