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Spatial analysis of broad-scale landslide occurrence with emphasis on land abandonment in a homogeneous marl basin in SE Spain

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Landslides as the exponent of rainfall-induced slope failure are the result of local material properties and hydrological conditions. In addition to the frequency of potential triggering events, spatial heterogeneity is key to understanding the susceptibility of a region to landsliding. This spatial heterogeneity arises partly from differences in land cover and as such is not static, especially in the European part of the Mediterranean basin where land abandonment has been the most notable change in land cover conditions. It can be argued that an increase in vegetation cover would eventually be beneficial to slope stability in terms of additional evaporative losses, increased storage and enhanced soil armouring by roots and above-ground plant material. Notwithstanding, during the transition soil hydrological and mechanical properties will change, resulting in new patterns of connectivity of surface and subsurface runoff and slope stability can be affected adversely momentarily or more permanently through the delicate interaction between soil formation and degradation.
Few studies have looked into the spatio-temporal effects of land abandonment on slope stability. In this paper a medium-sized catchment in SE Spain, where landslide processes are prominent, was studied involving a detailed inventory of morphometric and environmental aspects. Data sampled in the field on geomorphologic processes and geological, soil and vegetation characteristics were analyzed using GIS techniques and supported by data obtained at finer scale inventories in four mass movement areas within the catchment, as well as earlier field and model studies of slope hydrology and stability. Results showed surprising differences between western and eastern exposed slopes with regard to slope length, mass movement length, and flow or slump dominated mass movements. Parent material was also found to be important with regard to either flow or slump dominated mass movements. Furthermore there was a direct relationship between vegetation cover and mass movement activity, indicating diverging pathways of hillslope development. In addition to a better understanding of the processes leading to landslides, the information on the emerging and shifting connectivity between areas is important to arrive at a more sustainable form of future land management.