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Post-fire landslide susceptibility mapping in the 2016 fire-affected areas of Chios Island (Northeastern Aegean Sea, Greece)

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On July 25 and August 26 2016 wildfires broke out in the southwestern and central-western part of Chios Island (NE Aegean Sea, Greece), respectively. The first affected an area of approximately 47km2 and burned through almost 90% of olive groves and mastic trees, while the second broke out in a forested area and affected approximately 6.6km2 of forest and farmland.
A research aiming at the post-fire landslide susceptibility (LS) mapping of both areas was conducted. Morphological data (slope, aspect, curvature, drainage network) derived from a 5m-DEM model of the areas was used. Lithological and geological data (lithology, tectonic structures) were digitized from previous field work maps. Land cover was derived from Worldview-2 satellite images before and after the fire events. Soil thickness was derived from field survey observations within the fire-affected areas, road network from OpenStreetMap and rainfall data resulted from related measurements derived from Chios meteorological station. Post-fire landslide inventory was created after an extensive field survey of both areas before the beginning of the rainfall period (October 2016) and before the end of winter season (February 2017).
Data classification of each factor according to their estimated LS followed, by using the reverse ranking method, where 1 is the least susceptible and 10 is the most one. Each category was normalized to 100% and the final raster thematic maps of landslide controlling factors were produced. Finally, using numerical weight for each factor, which was assigned by the Analytic Hierarchy Process using Pairwise Comparison Method and according to the weighted linear combination, a map was generated where each cell has a certain post-fire LS index (LSI) value. The higher the LSI value, the higher the LS, whereas lower LSI value means lower LS.
This procedure was repeated twice, first using pre-fire land cover and secondly using the severity of the fire events. The resulted maps, classified with natural breaks method, constitute the final pre- and post-fire LS maps of the affected areas with five LS categories: very low, low, moderate, high and very high.
Comparison of these two final maps showed, more or less, the same LS areas, but with LSI value enhanced. The validated results showed good agreement between post-fire landslide occurrence and the produced post-fire LS maps.