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Assessment of Increased Debris Flow Hazard After Wildfires: Lessons from the Dalaman Fire, Eastern Mediterranean, Turkey

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Wildfires have a long history in the Mediterranean and Atlantic coastal regions, and such devastating events are anticipated to increase in parallel with changing climatic conditions. Wildfires play an important role in short-term ecological and geomorphological changes, as they can instantly affect vegetation, soil properties, and drainage properties. In comparison to unburned conditions, wildfire alters the erosional response of hillslopes, increasing the potential for runoff and sediment flux, as reported in many studies. Specifically, wildfire-affected steep hillslopes can promote the initiation of debris flows which may cause substantial sediment delivery and increase hazard levels for society and infrastructure downstream of burned areas.

In this study, we report the erosional response of hillslopes and spatial probability debris flows after the July 10, 2019, Dalaman, Göcek (Muğla) wildfire, which was effective in a total of 15 km^2 forested area. We used different ground and remote sensing methods covering two years of field observation and measurements from shortly after the event. In our study, in which we compared the results obtained by conventional field-based assessments with Unmanned Aerial Vehicle (UAV) measurements, we quantified that the erosion is localized spatially in the middle and upper parts of the basins and led to an average erosion rate of more than 10 mm in two years. In addition, we revealed that the susceptibility of the debris flows after the fire has increased significantly, primarily concentrated in the far north of the fire-affected hillslope sections. We concluded that the spatial probability of debris-flow events and their runouts would increase their impacts by significantly affecting the excavation of hillslope materials, mainly boosted by salvage logging after the event. Moreover, our preliminary findings show that accurate estimates of the magnitude of post-wildfire debris flow and erosion potential are essential to comprehend immediate hazards as well as long-term geomorphic changes.

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