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# Effects of wildfire on soil water repellency in pine and eucalypt forest in central Portugal

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Soil water repellency is a naturally occurring phenomenon that can be intensified by soil heating during fires. Fire-induced or –enhanced water repellency, together with the loss of plant cover, is widely regarded as a key factor in increased surface runoff and accelerated erosion in recently burnt areas.
The present study is part of the EROSFIRE-II project, whose main aim is to assess and predict post-wildfire hydrological and erosion processes at multiple spatial scales, ranging from micro-plot (< 1 m2) to small catchments (< 1 km2). This work concerns the occurrence and severity of topsoil water repellency in the two forest types occurring in the Colmeal study area, i.e. Maritime Pine and eucalypt stands The objectives are: (i) to clarify the role of wildfire, by comparing recently burnt and adjacent long unburned stands; (ii) to determine the temporal patterns in repellency, through monthly measurements during the first year following the wildfire, and relate them to soil moisture variations in particular.
The Colmeal study area is located in the Lousã mountain range in central Portugal. The wildfire occurred in August 2008 and consumed a total area of about 70 ha. Within the burnt area, two slopes were selected with the same parent material (schist) but different forest types (Pinus pinaster and Eucaliptus globulus). In addition, two similar but long unburned slopes were selected in the immediate surroundings. For a period of 10 months, starting November 2008, water repellency and moisture content of the 0-5 cm topsoil layer were measured in the field at monthly intervals. Repellency was measured using the 'Molarity of an Ethanol Droplet' (MED) test, soil moisture content using a DECAGON EC5 sensor.
The results revealed a very strong repellency (ethanol classes 6-7) at all four sites during the first sampling period in November 2008, suggesting that the immediate wildfire effects were minor for both forest types. In the subsequent 5 to 6 months, however, there was a definite tendency for higher ethanol classes at the recently burnt than the adjacent unburned sites. Especially in the case of the pine stands, this tendency was inverted during the remaining months.
The above-mentioned differences between the neighboring sites reflected more pronounced temporal patters in the case of the unburned sites, where median repellency levels corresponded none to slight severity ratings from December to March (pine) or April (eucalypt). Such seasonal drops in repellency were considerably shorter at the two burnt sites (1-2 months) and also less pronounced, without median ethanol classes becoming zero as occurred at the burnt sites. The seasonal repellency patterns at the unburned sites could be explained rather well by changes in soil moisture content. The same was not true, however, for the burnt sites.