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Runoff and inter-rill soil erosion following wildfire and terracing in north-central Portugal

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In Portugal, wildfires occur frequently and affect large areas, on average some 100.000 ha per year but in extreme years such as 2003 and 2005 over 300.000 ha. Wildfires can lead to considerable changes in geomorphologic and hydrological processes, as evidenced by the strong and sometimes extreme responses in post-fire runoff and erosion reported from various parts of the world, including Portugal. Besides wildfire itself, also post-fire forestry practices can strongly influence the hydrological and erosion response in recently burnt areas. In north-central Portugal, for example, rip ploughing in down-slope direction was found to be far more damaging in terms of soil loss than fire. Whilst rip ploughing in down-slope direction has now by and large been abandoned in the region, the construction of terraces in preparation of new tree and especially eucalypt plantations has become increasingly common. Although terraces are traditionally viewed as a technique for soil conservation, the authors have measured high splash erosion rates on recent terraces and have frequently observed small-scale erosion features and, on one occasion, gully formation over the full hill slope length. Runoff and sediment losses, however, have hardly ever been quantified for recently terraced plantations. In this study, we compared runoff and erosion, at the micro-plot scale, before and after terracing, during the first seven months after a wildfire and during the subsequent 17 months. This was done at two contrasting hill slopes, designated here as eucalypt and pine site. The former was, at the time of the wildfire, covered by eucalypt and then terraced and re-planted with eucalypt over its full extent; the latter was initially covered with pine and then partially terraced and planted with eucalypt and partially left to regenerate spontaneously. Total rainfall was rather similar for the pre- and post-terracing period (1205 and 1437 mm), in spite of their different, above-mentioned durations. The corresponding runoff coefficients were rather similar at the pine site (25-35 %) but markedly higher after than before terracing at the eucalypt site (45 vs. 25 %). Likewise, total sediment losses were much higher after than before terracing at both sites (10-40 vs. 0.1-0.6 Mg ha-1). The spatio-temporal patterns in runoff and erosion during the pre- and post-terracing periods are now being analyzed in more detail.