



Is aridity a high-order control on the hydro-geomorphic response of burned landscapes?

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Fire results in hydro-geomorphic changes that are spatially variable and difficult to predict. In this study we compile 294 infiltration measurements, ten other soil, catchment runoff and erosion datasets, and a year of new data from 15 natural runoff plots across an aridity gradient from the eastern Victorian uplands in SE Australia. The results show that aridity (a function of the long term mean precipitation and net radiation) is associated with low post-fire infiltration capacities, increasing the chance of surface runoff, and strongly increasing the chance of debris flows. Runoff plots from the wettest site (aridity = 1.1) had an average runoff ratio of 0.3% compared with 33.6% for the most arid sites (aridity = 2.4). Post-fire debris flows were only observed in the more arid locations within the Victorian uplands, and resulted in erosion rates more than two orders of magnitude greater than non-debris flow processes. We therefore argue that in south eastern Australia aridity is a high-order control on the magnitude of post-wildfire hydro-geomorphic processes. The results from this Australian study may also help to provide insight into the landscape controls on post fire debris flows elsewhere. Aridity is a landscape-scale parameter that is mappable at a high resolution and therefore is a useful predictor of the spatial variability of the magnitude of post-fire hydro-geomorphic responses.