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Can post-fire erosion rates be estimated using a novel plastic optical fibre turbidity sensor?

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It is well-established that wildfires can play an important role in the hydrological and erosion response of forested catchments, substantially increasing overland as well as stream flow and associated sediment yield during the earlier stages of the window-of-disturbance. Even so, it continues a major challenge to quantify post-fire erosion rates and their evolution with time-since-fire, both for plot and catchment outlets. This constraint could to some extent be overcome by low-cost turbidity sensors, placed in runoff collection tanks and at multiple points across stream flow sections. Plastic optical fibre turbidity sensors (POF) have, in that respect, much potential, due to their reduced costs, suitability for multiplexing and robustness under adverse monitoring conditions. The present study explores this potential for recently burnt areas, where the characteristics of the transported sediments can be expected to change markedly over time due to exhaustion of ashes. To this end, a large number of plot- and catchment-scale runoff samples were studied that had been collected in the course of 1- to 2-weekly field monitoring of a recently burnt study area in north-central Portugal. Comparison of the sediment and organic matter contents of these samples with turbidity readings obtained with a novel POF sensor suggested that the POF sensor would greatly facilitate obtaining rough estimates of post-fire erosion rates but would not dispense of regular calibration under changing sediment load characteristics.