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Wildfire ash mobilization by run-on under controlled laboratory conditions: Qualitative analysis

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Globally, high erosion rates are being triggered by extreme rainfall/runoff events. Ashes and char, by-product of devastating wildfires are the first particles mobilized and depleted. The contribution of the ash/char layer to the overall erosion process is still unestablished especially since separating ash and char fraction from litter, soil and eroded sediments is far from trivial. To address this knowledge gap, ASHMOB project (CENTRO-01-0145-FEDER-029351) is studying the mobilization of wildfire ash by wind and water erosion under controlled laboratory conditions as well as field conditions. The present study aims at contributing to the current knowledge on the physical process behind the mobilization of ashes and char when subject to runoff. This research is the second phase of the physical experiments on the mobilization by water of wildfire ash and char, performed at the Laboratory of Hydraulics, Water Resources and Environment of the University of Coimbra. To characterize ash erosion, a multi-channel flume was used (i.e., 5 parallel equal channels), which runs 5 replicate run-on events with exactly the same hydraulic conditions. To collect the full sample, a cart with trays moved at an established and controlled pace under the flumes, allowing the collection of water, ashes and sediments, thus characterising both hydrographs and ash yields for all event and replicate. Temporal resolution was fixed at 20 seconds per tray. Six major variables were tested: (1) Ash depth; (2) Type of burnt vegetation; (3) Ash layer length; (4) Ash particle size; (5) Slope. Preliminary results show that: (1) Smaller ash depths require lower flows to be mobilised by; (2) ***Pinus pinaster*** and ***Eucalyptus globulus*** have a different behaviour from ***Arbutus unedo*** ashes as the former tend to be transported more as a "aggregated block or chunk", possibly due to buoyancy, and the latter more like sediments; It was also observed that a higher number of large particles of char tend to provide a somewhat larger protection to the finer ashes than having little or no large particles of char; (3) a longer, in the flow direction, layer of ***Arbutus unedo*** ashes has little to no impact in the mobilisation process, whereas for the other vegetations, a longer layer implies less transport relative to the initial amount of ashes; (4) smaller particle sizes, when left without the "protection" of larger char particles are transported more easily; (5) Slope has a large impact on the transport of ashes, especially when considering the same bed roughness.