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Hydrological and erosion response at micro-plot to -catchment scale following forest wildfire, north-central Portugal

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Wildfires can have important impacts on hydrological and soil erosion processes, due to the destruction of vegetation cover and changes to soil properties. According to Shakesby and Doerr (2006), these wildfire effects are: i) much better known at small spatial scales (especially erosion plots) than at the scale of catchments; ii) much better studied with respect to overland flow and streamflow (and, then, especially peak discharges) than to soil erosion. Following up on a precursor project studying runoff generation and the associated soil losses from micro-plot to slope-scale in Portuguese eucalypt forests, the EROSFIRE-II project addresses the connectivity of these processes across hillslopes as well as within the channel network.

This is done in the Colmeal study area in central Portugal, where the outlet of an entirely burnt catchment of roughly 10 ha was instrumented with a gauging station continuously recording water level and tubidity, and five slopes were each equipped with 4 runoff plots of < 0,5 m2 (“micro-plot”) and 4 slope-scale plots as well as 1 slope-scale sediment fence. Starting one month after the August 2008 wildfire, the plots were monitored at 1- to 2-weekly intervals, depending on the occurrence of rainfall. The gauging station became operational at the end of November 2008, since the in-situ construction of an H-flume required several weeks.

A preliminary analysis of the data collected till the end of 2008, focusing on two slopes with contrasting slope lengths as well as the gauging station: revealed clear differences in runoff and erosion between: (i) the micro-plot and slope-scale plots on the same hillslope; (ii) the two slopes; (iii) an initial dry period and a subsequent much wetter period; (iv) the slopes and the catchment-scale, also depending on the sampling period. These results suggest that the different processes govern the hydrological and erosion response at different spatial scales as well as for different periods, with soil water repellency playing a role during the initial post-fire period.

The current presentation will review these preliminary results based on the data collected during the first year after the wildfire.