

Recent advances towards an integrated assessment of wildfire effects in forest plantations in Portugal

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Wildfires have been a common phenomenon during the warm and dry summers in Portugal over the past decades, having affected, on average, some 100.000 ha per year and, in extremis, roughly 450.000 ha in 2005. Existing forecasts do not suggest major improvements in the next few decades, due to likely future climate conditions that are to be even more propitious to fire ignition and spreading and, arguably, the nature of the underlying causes that are deeply-rooted in Portugal's present-day society as well as in its rural and forest policies.

Since the dramatic wildfire summers of 2003 and 2005, the earth surface processes (esp) team has been working towards its ultimate goal of a model-based tool in support of post-fire land management which would allow identifying and mapping areas with high erosion risk after fire and post-fire land management operations and would allow predicting the effectiveness of emergency stabilization measures to reduce this risk. Although this tool is still in its infancy, in recent years the esp team has made some progress with modelling post-fire runoff and erosion, and its reduction by mulching with forest logging residues, with a special focus on soil water repellency in the adaptation of existing models to recently burned conditions (Vieira et al., 2014; Nunes et al., 2016; Van Eck et al., 2016). This modelling work will be addressed in detail by another presentation at this EGU conference (Nunes et al., 2017). The esp team does, however, dispose of a wealth of field data to further its modelling efforts, not just at the plot to field scale but also at the scale of small experimental catchments (typically less than 1 km²), not just for single fires but also for recurrent fires, not just for "doing nothing" and typical post-fire forestry operations (logging, wood extraction, bench terracing) but also for various soil conservation measures (hydro-mulching, forest logging residues mulching, shrub barriers), and not just for runoff and sediment losses but also for organic matter/carbon losses, nutrient losses and pollutant export (PAHs and metals). Arguably, however, the most relevant advances that the esp team has been making in the past few years concern the following three topics: (i) the evolution of PAH and metal contents of ash and topsoil layers with time-since-fire (Campos et al., 2016); (ii) the eco-toxicological effects of post-fire runoff on aquatic organisms, especially through in-situ assays (Ré et al., 2017); (iii) mid-term effects of forest residue mulching on soil (fertility) losses as well as vegetation and soil physical, chemical and biological properties (Campos et al., 2016; Prats et al., 2016, Puga et al., in press). Besides these three topics, the present presentation will address one topic of very recent nature (since summer 2016) and one topic of future work (from summer 2017 onwards), i.e. (iv) pre- vs. post-fire catchment behaviour and (v) post-fire carbon fluxes at the point to field scale, respectively.

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