Geophysical Research Abstracts
Vol. 13, EGU2011-13583, 2011
EGU General Assembly 2011

The impact of fire on the spatial and temporal distribution of hydrologic and geomorphologic processes at slope and catchments scales.

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Wildfires are quoted as a major catalyser of adjustments in hydrological and geomorphological processes in response to global changes (i.e. climate and land use changes).
They alter completely the hydrological and geomorphological processes responses at plot, slope and catchment scale, producing unpredictable responses, inducing degradation processes and generating new equilibriums, often under more despoiled conditions.
This work summarizes twenty years of work at two burn catchments in Central Portugal, the Lourizela catchment in the Litoral mountain range, and the Caratão catchment, close to the Tagus river. Based on the survey of hydrological properties and processes on those two catchments we aim illustrate the spatial and temporal distribution of hydrological and geomorphological degradation processes.
Wildfires enhance Hortonian overland flow as a result of a decrease in surface roughness, the occurrence of a water repellent layer and the destruction of vegetation and litter layer, that play an important role in water interception and infiltration. Nevertheless fire impacts are limited in time.
Although overland flow increases downslope towards the catchment channel, producing widespread sheet erosion, it may, in specific conditions to build up to produce gully erosion and bank collapse. Under these conditions, bedload erosion and transport becomes important, and although it can reach more than 2.5m3.ha-1 in a single event, the field identification of source areas shows that the bedload sediment contributing area represents less than 10% in a 0.56km2 catchment.
The response time and magnitude of peak flows following rainfall events also changes significantly for the studied catchments, as a result of the hydrological processes at slope scale. In fact, the sudden change of the hydrological processes in a forested catchment, from a Hewlett model to a Hortonian response, reduces the response time and increases peak magnitude.
A striking feature of the studied disturbed catchments is that hydrological and sediment transport processes increase from slope to catchment scales, which is in opposition with the paired undisturbed catchments, where hydrological and sediment transport processes tend to decrease with broader areas.
We will present several strategies to tackle with the adverse impacts of wildfires, reducing the risk of degradation and the hazard they represent to the inhabitants located downstream and downslope of burned areas. These solutions can be ranked in pre and post wildfire, and are expected to contribute to the adaptation to new global change conditions, while maintaining, as much as possible, ecosystem resilience and environmental services.