FUEGORED 2016

Modelling hydrological connectivity in burned areas. A case study from South of Spain.

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Keywords (3-5)

Hydrological Connectivity
Modelling
Scenarios
Mediterranean
Fire Severity

Abstract (100-600 words)

Overland flow connectivity depends on the spatio-temporal interactions of hydrological and geomorphic processes as well as on the human footprint on the landscape. This study deals with the modelling of hydrological connectivity in a burned area with different levels of fire severity. Namely, the objectives are to: i) characterize and ii) modelling the pre- (PreF) and post-fire (PostF) scenarios, as well as iii) evaluate the effect of the vegetation changes due to the fire and the initial post-fire management practices (construction of new skid trails and check-dams) on the magnitude and spatial pattern of connectivity. Four post-fire scenarios are simulated: immediately after the fire (PostF1), with new skids and without check-dams (PostF2), with new skids and check-dams and without vegetation recovery (PostF3), and with new skids and check-dams and incipient vegetation cover (PostF4). The study area corresponds to eleven headwater sub-catchments (total area of 329 ha) that cover the entire burned area of the mountain in the West and Southwest facing hillslopes (ca. 200 ha). This site is located in the province of Malaga, South of Spain, and all sub-catchments are disconnected between them. The fire started in 2014, 27 June and lasted two days. The landscape is mainly mountainous, with very steep slopes and marble rocks, Mediterranean climate, and a land use of shrubs and pine forests (pre-fire scenario). Settlements appear at the bottom of the slopes. After the wildfire, land management were carried out in order to remove completely the burned trees and thus new skid trails were built. Then, eleven concrete check-dams and twelve wooded check-dams were built in the main gullies. The different scenarios of linear landscape elements, vegetation cover and modifications on the topography related to the construction of new trails and check-dams were included in the simulations. The IC index of hydrological connectivity was chosen to perform this metric at a spatial resolution of 5 x 5 meters. The analysis of the different spatial patterns and temporal changes was done considering the different levels of fire severity and changes on hydrological connectivity were also analysed at the outlet of each sub-catchment.