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Simulating post-fire stream and debris flows using process-based models

Markus Berli (1), Li Chen (1), Rose Shillito (1), William Meyer (1), Stephen Turnbull (2), Ian Floyd (2), Nawa Pradhan (2), and Kumud Acharya (1)

(1) Desert Research Institute (DRI), Hydrologic Sciences, Las Vegas, Nevada, United States, (2) US Army ERDC, Coastal and Hydraulics Laboratory, Vicksburg, Mississippi, United States

Wildfires can change watershed hydrological processes considerably resulting in increased risks for flooding, erosion, and debris flows. Various models exist to simulate and predict post-fire stream and debris flows for watershed-scale hazard control and design. The majority of these models are statistically-based, site-specific and therefore of limited use for analysis in a wider range of hydrologic and soil conditions. The goal of this study was to evaluate two process-based hydrological models (KINEROS2 and FLO-2D) by simulating post-fire stream and debris flows and comparing them with measured data from watersheds in Southern California. Results show that KINEROS2 and FLO-2D can capture fire-induced alterations of hydrologic processes such as decreased infiltration, increased runoff, stream flow and sediment transport. FLO-2D also captures debris flow dynamics pretty well. Both models, however, need a fair amount of input parameters and appropriate calibration to provide reasonable post-fire stream and debris flow predictions.