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Response of runoff and soil erosion patterns to changes in storm characteristics, soil moisture patterns and vegetation cover for Mediterranean watersheds

J.P. Nunes (1,2), J. Seixas (2) and J.J. Keizer (3)

(1) Marine and Environmental Research Center (CMA), Institute for Marine Research (IMAR), Portugal, (2) Department of Environmental Sciences and Engineering, New University of Lisbon, Portugal, (3) Center for Environmental and Marine Studies (CESAM), University of Aveiro, Portugal (jpcn@fct.unl.pt / Fax: (+351) 212948374 / Phone: (+351) 212948374)

Climate change in Mediterranean regions is expected to increase storm frequency and intensity while decreasing overall rainfall and soil moisture. It is also expected to lead to increases or decreases in vegetation cover, varying with space and vegetation type. This has led to a significant amount of uncertainty on assessing the impact of climate change on storm runoff and erosion patterns in Mediterranean watersheds. This work explores this issue by analyzing the sensitivity of runoff and erosion to varying degrees of change to storm rainfall, pre-storm soil moisture conditions, and vegetation cover. The analysis was carried out for two Portuguese watersheds with contrasting climates, soil characteristics and land cover. Incremental decreasing and increasing changes (from -20 to +20%) to rainfall, soil moisture and vegetation cover were applied over three storms per catchment. The main results point to the high sensitivity of storm runoff and peak runoff rates to changes in storm rainfall amount (c. 2.2 % per % change) and, to a lesser degree, to soil water content (c. -1.2 % per % change). In terms of soil erosion, the sediment yield of the catchments show a greater sensitivity than upslope erosion rates to both parameters: c. 7.8 versus c. 4.0 % per % change for storm rainfall, and c. -4.9 versus c. -2.3 % per % change for soil water content, indicating that a significant part of the impacts of these changes act on catchment sediment connectivity. The parameters showed a relatively low sensitivity to changes in vegeta-

tion cover. Finally, the very low soil depth in one of the catchments (c. 100 mm) led to a greater sensitivity to changes in storm and soil moisture patterns. Overall, the results indicate that changes to soil moisture levels caused by climate change could be sufficient to offset the impact of greater storm frequency and intensity in Mediterranean watersheds. The impacts on vegetation cover could serve to mitigate or exacerbate consequences for soil erosion, depending on vegetation type.