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An analysis of rainfall-runoff conversion in dry Mediterranean environments considering scale and connectivity

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Rainfall-runoff conversion in western dry Mediterranean environments is a process needed of better understanding. It is commonly assumed that overland flow generation occurs whenever high intensity events are present, although a small fraction of the precipitation is transformed in runoff. Recent studies suggest that for a better understanding of runoff generation, aspects such as scale and water paths and connectivity should be approached.
In this work, the rainfall-runoff conversion is analysed taking in consideration the contributing area and hydrological connectivity. Within the same basin, the Barranc del Carraixet, in eastern Spain, near the city of Valencia, it has been selected three scales of work: four experimental plots (8 x 40 m), micro-basin (17.01 ha) and small drainage basin (127.9 km2). Data used consists in rainfall and runoff values recorded during twelve months (from 1 April 2008 to 31 march, 2009). For the analysis of runoff generation at the different scales rainfall thresholds and runoff rates and thresholds were used. For hydrological connectivity, at plot level, coefficients of determination were analysed.
Results show the importance of scale in flow generation with increasing rainfall thresholds as the draining area becomes larger. In addition, the number of runoff and flow records diminished with scale. In the studied period it has been registered 26 rainfall events, 15 of which (66%) produced runoff at plot scale, only three registered flow at micro-basin scale, and none was recorded at watershed level. Inverse relationship is given between the volume of runoff and recurrence, with increasing scale. Connectivity, at plot level, is variable, increasing the R2 according the simplification of processes, when the interference of vegetation decreases, establishing better linearity between rain and surface flow. In the three cases, studied scale and connectivity seems to be factors that affect the form in which rainfall is converted in runoff, although the importance of them will be different in each scale.

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