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Research papers

Controls of flash flood peak discharge in Mediterranean basins and the special role of runoff-contributing areas

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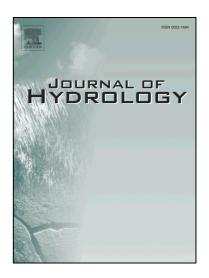
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## ACCEPTED MANUSCRIPT

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Abstract	5
During the complex dynamic interactions between rainfall and basin properties,	6
different portions of the basin produce runoff at different moments. Capturing this	7
spatiotemporal variability is important for flood analysis, but knowledge of this	8
subject is limited. The presented research aims at improving the understanding of	9
runoff-contributing areas (RCA; hillslope sections from which water flows, reaches	10
the stream network, and consequently the basin outlet) and at examining their	11
relationship with the magnitude of a flash flood's peak discharge. A distributed	12
hydrological model (GB-HYDRA) that enables computing RCA and flood discharge	13
was developed. The model was applied to four medium-size basins (18–69 km²) in a	14
Mediterranean climate and 59 flash flood events were analyzed. The correlation	15
between basin input flux (basin area multiplied by the basin maximal rain intensity	16
averaged over the time of concentration) and output flux (observed peak discharge)	17
was poor (R <sup>2</sup> =0.16). However, using a newly developed index, termed IRCA, to	18
calculate the input flux accounting only for the RCA extent and rainfall intensity over	19
it, resulted in a substantially higher correlation ( $R^2 = 0.64$ ) across a wide range of	20
flood magnitudes. The highest correlation was found using a 50-min time window,	21
which is shorter than the time of concentration. Flood events were categorized	22

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