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Analysis of climate change scenarios in an olive orchard microcatchment in Spain using the model WIMMED

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Olive orchards constitute traditional systems in the Mediterranean Basin. In Andalusia, Southern Spain, more than 1.5Mha are dedicated to olive crop land use, which represent a production of 1Mt of olive oil per year. This is a strategic economic sector with environmental and social relevance. In the context of climate change in Andalusia, the Intergovernmental Panel on Climate Change has highlighted that an increase of temperatures and rainfall intensities as well as the reduction of cumulated rainfall might be expected. This may mean serious detrimental economic and environmental risks associated to floods and the reduction of available water resources which would be convenient to quantify.

The objective of this work is to analyse the rainfall-runoff relationships in an olive orchard catchment by the application of the distributed hydrological model WIMMED (Herrero et al., 2009) simulating the effects of climate change, with a special emphasis on extreme events.
Firstly, the model was calibrated and validated with 9 maximum annual events of a datasets from 2005-2012 obtained in an olive orchard catchment in Spain (Taguas et al., 2010). In this stage, only the saturated hydraulic conductivity and soil moisture in saturation were adjusted after a sensitivity analysis where 68 simulations were carried out. A good agreement was obtained between observed and simulated hydrographs. The mean errors and the root mean square errors were 0.18 mm and 2.19 mm for the calibration and 0.18 and 1.94 mm, for the validation.

Finally, the catchment response to the increase of intensity and temperature and the reduction of cumulated rainfall were simulated for the maximum event of the series. The results showed a rise of 11% of the runoff coefficient quantifying the possible impact of climate change.

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