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# Quantifying the impact of climate change on floods by using both continuous and event-based hydrological modelling

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Climate change will modify magnitude and timing of floods in the future. Consequently, new methodologies to quantify the impact of climate change on floods at the catchment scale are required. This study aims to quantify the changes in peak flow quantiles expected in the future, by using the climate change projections of the Fifth Report (AR5) of the IPCC, supplied by the EURO-CORDEX programme. Four catchments located in the Duero River Basin in northwestern Spain are considered as case studies.

First, biases in precipitation and temperature climate projections have been corrected by using the available observations in the control period (1971-2004) in the four catchments. Second, the hydrological response in the four catchments has been simulated with the continuous simulation model HBV. The model has been calibrated in the four catchments. Time series of soil moisture content in the catchment were obtained, identifying the initial moisture content in the day of occurrence of the annual maximum rainfalls. Third, an event model has been used to simulate flood response to the annual maximum rainfalls, considering the initial soil moisture content supplied by the HVB model. The results of the event model provides a better characterization of the catchment flood response than the continuous HBV model.

The methodology has been applied in the control period (1971-2004), for validation purposes. Then, the methodology has been applied to the future period (2011-2095), to obtain the expected changes in peak flow quantiles, as a consequence of climate change. The combined use of the results of the continuous hydrological simulation with the HBV model with the event model improves the results provided by either the HBV model or the event model independently. The proposed methodology allows a better characterisation of the catchment flood response to a given precipitation event, while also considering the expected variation in the antecedent moisture content in the catchment in the future, as a consequence of expected changes in temperature and precipitation regimes. The application of the proposed methodology to the case studies has shown that climate change will increase peak flow quantiles in the future, in three of the four catchments.