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Influence of climate change on floods in the Arga catchment in Spain: intercomparison of model outputs.

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According to climate projections, the increasing warming-up tendency will lead to changes in the hydrological cycle and especially in the extreme events. One of these extreme events are floods. The main tool to evaluate the possible changes are local-scale impact studies. These studies use downscaled outputs of Global Climate Models (GCM), with different future scenarios defined by the IPCC. Then, with a hydrological model, changes in the simulated streamflows can be obtained. Several large-scale studies over Europe show an increase of the floods in Spain under the future, however, these studies have either a very low resolution to take into account the characteristics of a given catchment or use only a few climate models.
The aim of this study is to analyse the influence of climate change on flood hazard in Spain. The Arga river basin, located in northern Spain, is selected as a case study due to its importance in the Ebro river. The study seeks to examine how the basin would behave under two emission scenarios (4.5 and 8.5) provided by the IPCC in the AR5 and see the behaviour of extreme streamflows in a set of possible future scenarios. Two sources of data have been used: (i) statistical downscaled data from GCM by the Spanish Meteorological Agency (AEMET), and (ii) Regional Climate Models from EURO-CORDEX project. A total of 24 models have been used in the study. Outputs of these downscaled models were corrected in terms of bias to improve the fit for extreme events, as in general they are not able to characterise extreme events adequately. The HBV model was selected to simulate the rainfall-runoff transformation processes. Monte Carlo simulations were used to calibrate the model parameters throughout the basin. Daily precipitation and temperature series were used as input data of the HBV model.
Results of the simulations were analysed through Annual Maximum and Peaks Over Threshold series. The main conclusion of the study is the high variability among models. However, a decrease tendency on floods can be expected. A delay in the timing of the floods, from winter to spring, was also found. Besides, corrected and uncorrected data were compared, showing that the bias correction method used in the study clearly improves climatic data inputs of the hydrological model, mainly in the case of the AEMET projections.