Geophysical Research Abstracts
Vol. 19, EGU2017-8039-1, 2017
EGU General Assembly 2017

Influence of climate change on floods in the Arga river in Spain

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Catchment response to extreme events is expected to be modified under climate change. This study focuses on the effect of climate change on flood response in the Arga river basin in Spain. Global Climate Models (GCM), under two emission scenarios (RCP4.5 and RCP8.5) proposed by the Fifth Assessment Report from IPCC (AR5) have been used. These models were downscaled and regionalized by the Spanish Meteorological Agency (AEMET), obtaining eighteen precipitation and temperature projections. Precipitation and temperature series supplied by the models were compared to the observed data in a set of ten gauging sites, selecting the six models that best fit the observed data (ACCESS 1-0, BCC-CSM 1-1, BNU-ESM, CNRM-CM5, INMCM4, MPI-ESM-LR). Outputs of the six downscaled models were corrected in terms of bias to improve the fit for extreme events that usually drive floods in this catchment. The Hydrologiska Byråns Vattenbalansavdelning (HBV) model was used to transform precipitation and temperature data into flow series at the mouth of the basin. A Genetic Algorithm and Powell's Method Optimization function included in the HBV model was used to calibrate the model parameters. The calibrated model was used to obtain flow projections in the future under climate change. Results of the simulations were analysed through Annual Maximum streamflow Series (AMS), to study changes in the flood frequency curve, and Peaks Over Threshold (POT) to study changes in flood seasonality. The AMS analysis shows that high return period floods will decrease slightly in both scenarios for most of the models, as high return period precipitations also decrease in most of the models supplied by AEMET. Furthermore, the POT analysis exhibits a delay of winter floods converting into spring floods.