



Climate change effects on hydropower potential of the Alcantara river basin in Sicily (Italy)

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In recent years an increasing attention has been paid to hydropower generation, since it is a renewable, efficient, and reliable source of energy, as well as an effective tool to reduce the atmospheric concentrations of greenhouse gases resulting from human activities. At the same time, however, hydropower is highly vulnerable to global warming, because water resources are closely linked to climate changes. Indeed, the effects of climate change on water availability are expected to affect hydropower generation with special reference to Southern countries which are supposed to face dryer conditions in the next decades. The aim of this paper is to assess the impact of future climate change on the hydrological regime of the Alcantara river basin, Eastern Sicily (Italy), based on Monte Carlo simulations. Synthetic series of daily rainfall and temperature are generated, based on observed data, through a first order Markov chain and an ARMA model respectively, for the current scenario and two future scenarios at 2025. In particular, the mean and standard deviation values of daily rainfall and temperature at 2025, calculated using simulations of the Hadley Centre Ocean-Atmosphere General Circulation Model (HadCM3), are adopted to generate future scenarios of precipitation and temperature. Synthetic series for the two climatic scenarios are, then, introduced as input into the IHACRES model to simulate the hydrological response of the basin. The effects of climate change are, then, investigated by analysing potential modification of the resulting flow duration curves and utilisation curves, which allow to estimate a site's energy potential for the design of run-of-river hydropower plants.