WATER RESOURCES EVALUATION UNDER CLIMATIC TREND EFFECTS IN MEDITERRANEAN CATCHMENTS

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The availability of water in the Mediterranean areas in sufficient quantities and adequate quality represents a significant problem of European dimension. The potential impacts of climate change on hydrological response are of significant importance in these regions, where climate exhibits strong seasonality and the availability of water in the dry season determines the feasibility of multiple crop rotations. Based on a coupling of a stochastic rainfall model and the IHACRES rainfall-runoff model, this paper presents a simple Monte Carlo procedure to predict the potential impact of climate change scenarios on the hydrological flow regime (and hence water resources availability) in the Belice river catchment, south west Sicily.

The stochastic rainfall model daily precipitation is a well known two-state model merging a non homogenous First-Order Markov Chain to describe rainfall occurrences and a Mixed Exponential Rainfall Probability distribution to describe daily rainfall amount. The model, calibrated using the actual rainfall data, has been used to generate daily synthetic rainfall series characterised by a change in the monthly mean and the variance of the rainfall amount.

These changes have been obtained from simulations of the Hadley Centre Ocean-Atmosphere General Circulation Model (HadCM3). Estimated greenhouse effect concentration gases for the A2 and B2 scenarios, developed by the IPCC in 1996, were used as the global radiative forcing for the performance of the simulations extending from mid 19th century until the end of 21st century. Percentage changes in monthly rainfall and its standard deviation between a 30-years period from the present (1971-2000) and three 11-years future time-slices (2020-30, 2045-55 and 2075-85) have been calculated.

The IHACRES conceptual model with a configuration of one parallel linear channel and linear reservoir, corresponding to ‘quick’ and ‘slow’ components of runoff is hence fed by the synthetic daily series coming from the stochastic rainfall model (i.e. rainfall and temperature) in order to generate long synthetic daily discharge series corresponding to three future time-slices.

Finally, these series were elaborated to quantify the impact of climate change on water resources availability, drought frequency, ecc.