Geophysical Research Abstracts
Vol. 16, EGU2014-12338, 2014
EGU General Assembly 2014

Assessing Portuguese Guadiana Basin water management impacts under climate change and paleoclimate variability

Rodrigo Maia (1), Bruno Oliveira (1), Vanessa Ramos (1), and Levi Brekke (2)
(1) University of Porto - FEUP, Faculty of Engineering, Civil Engineering, Porto, Portugal, (2) U. S. Bureau of Reclamation

The water balance in each reservoir and the subsequent, related, water resource management decisions are, presently, highly information dependent and are therefore often limited to a reactive response (even if aimed towards preventing future issues regarding the water system). Taking advantage of the availability of scenarios for climate projections, it is now possible to estimate the likely future evolution of climate which represents an important stepping stone towards proactive, adaptative, water resource management.
The purpose of the present study was to assess the potential effects of climate change in terms of temperature, precipitation, runoff and water availability/scarcity for application in water resource management decisions. The analysis here presented was applied to the Portuguese portion of the Guadiana River Basin, using a combination of observed climate and runoff data and the results of the Global Climate Models.
The Guadiana River Basin was represented by its reservoirs on the Portuguese portion of the basin and, for the future period, an estimated value of the inflows originating in the Spanish part of the Basin.
The change in climate was determined in terms of relative and absolute variations of climate (precipitation and temperature) and hydrology (runoff and water balance related information). Apart from the previously referred data, an hydrological model and a water management model were applied so as to obtain an extended range of data regarding runoff generation (calibrated to observed data) and water balance in the reservoirs (considering the climate change impacts in the inflows, outflows and water consumption). The water management model was defined in order to represent the reservoirs interaction including upstream to downstream discharges and water transfers.
Under the present climate change context, decision-makers and stakeholders are ever more vulnerable to the uncertainties of climate. Projected climate in the Guadiana basin indicates an increase in temperatures and a reduction of the precipitation values which go well beyond the observed values and, therefore, must be forcefully included in any realistic proactive water resource management decision. Using the results of this study it is possible to estimate future water availability and consumption satisfaction allowing for the elaboration of informed management decisions.
In this study, the CMIP 3 Global Climate Models were considered for the definition of the effects of climate change, using the median and extreme tendencies based on the range of variation of the multiple climate projection scenarios. The observed climate variability, along with these model-derived tendencies, were used to inform the hydrology and water management models for the historical and future periods, respectively. Additionally, for a more comprehensive analysis on climate variability, a stochastic model was implemented based on the paleoclimate variability obtained from tree-ring records.