Geophysical Research Abstracts
Vol. 12, EGU2010-12079, 2010
EGU General Assembly 2010

Evaluating the impact of hydrological uncertainty in assessing the impact of climate change on water resources of the Ebro River Basin (Spain)

Mauricio Zambrano-Bigiarini (1), Alberto Bellin (1), Bruno Majone (1), C. Isabella Bovolo (2), Stephen Blenkinsop (2), and Hayley J. Fowler (2)

(1) Dept. of Civil and Env. Engineering, Università degli Studi di Trento, Trento, Italy (mauricio.zambrano@ing.unitn.it, +39 0461 882672), (2) School of Civil Engineering and Geosciences, Newcastle University, Newcastle upon Tyne, U.K.

Quantification of the impacts of climate change on water resources depends on the emission scenario, climate model, downscaling technique and impact model used to drive the impact study. Uncertainties in projections of climate models and those involved in the quantification of its hydrological response limit the understanding of future impacts and complicate the assessment of mitigation policies. This work analyses the effects of climate change on water resources of the Ebro River Basin (NE Spain), considering the combined effect of uncertainty characterizing both the driving Regional Climate Model (RCM) and hydrological parameterization. In addition, we considered the relative importance of these two contributions.

Hydrological simulations in a few test catchments within the basin were performed by using the SWAT model, a widely used hydrological model often applied to large-scale watersheds. After a preliminary sensitivity analysis with Latin Hypercube One-factor-At-a-Time (LH-OAT), the Generalized Likelihood Uncertainty Estimation (GLUE) methodology was used for selecting hydrological parameter sets that best reproduced the observed streamflow during the control period from 1961 to 1991, in terms of percentage of measured data bracketed by the 95% prediction uncertainty (95PPU), and the ratio between the average thickness of the 95PPU band and the standard deviation of the measured data. Following validation, the same parameter sets were used to simulate the effects of climate change on future streamflows. A simple bias-correction methodology was used for downscaling daily time series of precipitation and mean temperature from an ensemble of 6 RCM time-slice experiments. These were obtained from the PRUDENCE project for a control period (1961-1990) and for a future time period (2071-2100) using the medium-high SRES A2 emissions scenario. The bias-corrected future RCM scenarios were then used to drive the hydrological simulations during the future period.

Notwithstanding the annual and seasonal differences in the projected future precipitation and temperature fields, by the end of this century all the RCMs project warmer and wetter winters and hotter and drier summers for the Ebro River Basin, leading to a general decrease of the mean seasonal streamflows for the period 2071-2100, with a larger drop in predicted monthly streamflows for catchments with more semi-arid climatological regimes.