AvH8-20
8th Alexander von Humboldt International Conference
Cusco, Peru, 12 – 16 November 2012

Impact of projected climate change on hydrologic regime of the Brazilian and Peruvian basins

K. Adam, J.M. Bravo, K. Quiroz, M. Pereira, and T. Melo

Instituto de Pesquisas Hidráulicas - IPH, Universidade Federal do Rio Grande do Sul - UFRGS, Brazil
(katiuciapinto@yahoo.com.br)

We present an assessment of climate change impacts on the hydrologic regime of three basin located in South America: Upper Paraguay River basin (600,000 Km2), located in central South America in Brazil; The Ibicui River (35,158.43 Km^2) is tributary of Uruguay River and it is located on border of southern of Brazil and; Urubamba river basin located at the South Eastern of Peru, this basin has an area of 9656 km2 and forms part of the headwaters of the Amazon river basin. This methodology is based on predictions of twenty Atmospheric/Ocean General Circulation Models (AOGCMs).
We considered two climate change scenarios from the Intergovernmental Panel on Climate Change (IPCC) and two 30-years time intervals centered at 2030 and 2070 for Paraguai River basin and one year time at 2050 for Ibicuí and Urubamba River basins. The two IPCC emission scenarios on which the climate projections used in this study were based – A2 and B2 – are two of four qualitative scenario storylines (A1, A2, B1 and B2) characterized by different projections and assumptions regarding socio-economic development, conservation of natural resources, human population growth, technology improvement, and adoption or not of mitigation actions. In this study we selected the marker scenario of each family. Thus, results from the A2-ASF (where ASF means Atmospheric Stabilization Framework Model) and B2-MES (where MES come from MESSAGE: Model for Energy Supply Strategy Alternatives and their General Environmental Impact) emission scenarios are used. These emission scenarios thus set the forcing conditions to estimate future climate conditions, as by running AOGCMs for example.
Projected temperature and precipitation anomalies estimated by the AOGCMs for the study site are spatially downscaled using the delta change method (obtained through a climate scenario generator, MAGICC/SCENGEN) and used as input to a complex coupled hydrologic-hydraulic model (MGB-IPH model) aiming to estimate projected streamflow in climate change scenarios at several control point in the basin. Results show that impacts on streamflow are highly dependent on the AOGCM used to obtain the change predictions. Results indicate an increase in the annual mean temperature, but divergences about precipitation. Comparison between the current streamflow and models ensemble statistics of projected streamflows for several basins are presented in work, for both marker scenarios, A2-ASF and B2-MES, and for both time horizons A and B. The uncertainties in projected climate changes are amplified in the hydrological results. Nearly one half of the projections result in increased river discharge, and the other half result in decreased river discharge. If the mean or median of the predictions is considered, no change should be expected at all.

Keywords: Climate change, IPCC emission scenarios, temperature and precipitation anomalies projections, Streamflow anomalies projections.