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Hydro-climatic change impacts in Central America

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A series of climate change studies using a combination of Global Circulation Models (GCMs), statistical downscaling techniques and a hydrological macroscale model is presented. The Variable Infiltration Capacity (VIC) hydrological model was calibrated using automatic procedures. With the exception of the low skill of the model in reproducing observed runoff in the Caribbean coast, the results of the calibration are promising. A suite of 30 GCM runs were evaluated with respect to their skill in reproducing the statistics of the 20th century climate present in the NCEP/NCAR reanalysis. The models were ranked according to their relative skill in reproducing the reanalysis statistics and were introduced one by one from the best to the worst in order to form multimodel ensembles of precipitation and temperature. Results show that -in general- the inclusion many models reduces the skill of the multimodel ensemble compared to the use of ensembles composed of a few models (if they are the best models). The problem is that the method is very sensitive to the metric used. The 30 GCM runs were downscaled to the grid of the hydrological model using the Bias Correction and Spatial Downscaling (BCSD) statistical method. The resulting 0.5x0.5 degrees meteorology from each of the 30 GCMs was used as input to VIC to generate climate change projections of surface runoff from 1950 to 2099. Results show a general increase in the frequency of drought conditions in Central America, particularly north of 10 degrees latitude and a warming of around 3oC at the end of the century compared to the baseline scenario from 1950 to 1999. Results also show reductions of up to 30% in runoff in some of the wet months.