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The Impact of Climate Change on the stream flows of Purus river, Amazonian – Brazil.

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In 2010 the Amazon region experienced the third extreme drought in 12 years. Only a year before, in 2009, the same region experienced the flood of the century. Since some climate models predict an increased frequency of extreme events (IPCC, 2007), events like these raise an alert. If global climate change can have the potential to modify the rainfall patterns in the Amazon region, what impacts can be expected on water resources? To analyze the impacts of climate change in Purus river flows (Amazon Basin, Brazil), a relatively well-preserved region of the Amazon basin, we used the distributed hydrological model MGB-CPTEC (the Portuguese acronym for the Large Basins Model – Center for Weather Forecasting and Climate Studies) and the atmospheric regional model ETA. The MGB-CPTEC model consists of modules for soil water balance, evapotranspiration, runoff and subsurface flow for each cell and drainage network connecting the cells. Each cell is divided into land use blocks, resulting from the combination of soil and vegetation types. The resulting flows of each block are summed into each cell, and propagated through the flow cell module. The model′s input data were topography, vegetation, soil and climate. The topography data were derived from the STRM (Shuttle Radar Topographic Mission) with a resolution of 90m, from which is generated DEM (Digital Elevation Model). The vegetation data used in the current climate scenario was produced by the Monitoring Program of the Amazon forest by satellite (PRODES-INPE). The soil data were obtained from the Brazilian Institute for Agriculture (EMBRAPA) soil map, available at the Brazilian Institute for Geography and Statistics (IBGE) site. Climatic data such as precipitation, temperature, wind speed, humidity, pressure and radiation were obtained from databases of climatic Brazilian Institute for Space Research (CPTEC/INPE). As the basins have suffered different stages of disturbance since the 70's, the reconstruction of historical patterns of occupation (natural and planted pasture, forest, savannah and agricultural areas) of the Brazilian Amazon for the period 1940-1995 was included in the simulations. The model generates flow values, which are compared to observed hydrologic series, available in the database of the Brazilian Water Agency (ANA). Since most of these hydrological series begin in the 70s, the calibration period extended from January 1975 to December 1985 and the validation from January 1988 to December 1995. To predict the impact of climate change on the Purus stream flows we used the ETA model outputs, which use global boundary conditions provided by global model HadCM3. The future scenarios correspond to the periods 2010-2040, 2041-2070 and 2071-2100, while the present climate scenario (baseline) corresponds to the period 1960-1990. The calibration results were compared with recorded flow data and showed relatively small errors and model performances was relatively good. With respect to climate scenarios generated by the ETA model, there is a relatively good correspondence between the rainfall scenarios generated and the observed runoff.