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Scenario Assessment of Streamflow Simulation and its Transition Probability in Future Periods Under Climate Change

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Abstract The effect of climate change on water resources is an important challenge. To analyze the negative effects of this phenomenon and recommend adaptive measures, it is necessary to assess streamflow simulation scenarios and streamflow transition probabilities in future periods. This paper employs the HadCM3 (Hadley Centre Coupled Model, version 3) model to generate climate change scenarios in future periods (2010–2039, 2040–2069, and 2070–2099) and under A2 emission scenarios. By introducing climatic variable time series in future periods to the IHACRES (Identification of unit Hydrographs And Component flows from Rainfall, Evaporation and Streamflow data) hydrological model, long-term streamflow simulation scenarios are produced. By fitting statistically different distributions on runoff produced by using goodness-of-fit tests, the most appropriate statistical distribution for each month is chosen and relevant statistical parameters are extracted and compared with statistical parameters of runoff in the base period. Results show that long-term annual runoff average in the three future periods compared to the period 2000–1971 will decrease 22, 11, and 65 %, respectively. Despite the reduction in total runoff volume in future periods compared to the baseline period, the decrease is related to medium and high flows. In low flows, total runoff volumes for future periods compared to the baseline period will increase 47, 41, and 14 %, respectively. To further assess the impact of annual average runoff on flows, it is necessary to examine the correlation of time series using streamflow transition probabilities. To compare the streamflow transition probability in each of the future periods with base period streamflow in each month, streamflow is discretized

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