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Appraisal of the process-based analytical derivation approach in calculating the probability distribution of annual runoff in different watersheds

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In this paper, the process-based analytical derivation approach is applied to insight into the nonstationary of the probability distribution of annual runoff in humid and arid watersheds of China. The nonstationary of the runoff generation process in watersheds are captured by the hydrological inputs and model parameters of the process-based analytical derivation approach. The results indicate that climate change and human activities can impact the probability distribution of annual runoff in different ways, for the nonstationary analysis of humid watersheds, climate change leads to changes in hydrological inputs, and human activities leads to changes in model parameters, which leads to nonstationary of the probability distribution of annual runoff. For the nonstationary analysis of arid watersheds, climate change leads to changes in hydrological inputs, the combined action of human activities with climate change leads to changes in model parameters, which leads to nonstationary of the probability distribution of annual runoff.