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Abstract: Hydrological models are important tools for flood forecasting, for the assessment of water resources under current and a changing climate. However, the accuracy of hydrological models is limited by many factors, of which, the most important one is perhaps the errors in the input data. For the lumped and semi-distributed hydrological models, the main input is the estimated areal precipitation, and the quality of which is very much dependent on the spatial distribution and density of rain gauges. Many researches have been reported on the development, calibration and validation of hydrological models, however, the influence of the precipitation gauges density and network distribution on the modeling results has received much less attention. One of the reasons for the limited study of this important issue is it needs a catchment with sufficient size, wide diversity of topography and climate, and dense raingauges with long and good quality data. In this study, a famous and widely used hydrological model, the Xinanjiang Model was applied to Xiangjiang River basin to examine the influence of rain gauges' density and distribution on the performance of the model in simulating the streamflow and other water balance components, like actual evapotranspiration and soil moisture content. The Xiangjiang River basin, one of the most important economic belts in Hunan Province, China and the primary inflow basin of Dongting Lake - China's second largest freshwater lake, has dense rain gauge network with long and high quality data. To perform the study, 18 different input data scenarios representing different density and distribution situations are used as input to the Xinanjiang model. The influences of different input scenarios on the modeling results as measured by Nash-Sutcliffe coefficient, relative bias, and peak errors are compared, and guidance for optimal planning of rain gauges is proposed.

Keywords: Xinanjiang Model; Xiangjiang River basin; precipitation gauges network; precipitation; runoff