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A modelling framework to project future climate change impacts on streamflow variability and extremes in the West River, China

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Abstract In this study, a hydrological modelling framework was introduced to assess the climate change impacts on future river flow in the West River basin, China, especially on streamflow variability and extremes. The modelling framework includes a delta-change method with the quantile-mapping technique to construct future climate forcings on the basis of observed meteorological data and the downscaled climate model outputs. This method is able to retain the signals of extreme weather events, as projected by climate models, in the constructed future forcing scenarios. Fed with the historical and future forcing data, a large-scale hydrologic model (the Variable Infiltration Capacity model, VIC) was executed for streamflow simulations and projections at daily time scales. A bootstrapping resample approach was used as an indirect alternative to test the equality of means, standard deviations and the coefficients of variation for the baseline and future streamflow time series, and to assess the future changes in flood return levels. The West River basin case study confirms that the introduced modelling framework is an efficient effective tool to quantify streamflow variability and extremes in response to future climate change.

Key words climate change; streamflow; variability; flood; delta-change method; bootstrapping