

Probabilistic Projection of the Dynamic Evolution of Hydrological Extremes in A Changing Climate



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Hydrological extremes (droughts and floods) are becoming more frequent and severe in a changing climate, which can result in substantial economic and environmental damages as well as loss of human life. The reliable projection of the dynamic evolution of climate-induced hydrological extremes plays a crucial role in climate change adaptation and disaster risk reduction. In fact, extreme events and natural disasters are caused by multiple drivers and their interactions. And there are various sources of uncertainty inherent in hydrological risk assessment. It is thus desired to robustly assess the multidimensional characteristics of hydrological extremes and to explicitly quantify potential uncertainties in order to improve the reliability of assessing climate change impacts on hydrological extremes. In this talk, I will introduce a copula-based probabilistic framework for projecting future changes in multivariable drought characteristics based on the convection-permitting Weather Research and Forecasting (WRF) simulations with 4 km horizontal grid spacing. It is a first attempt to examine the multivariate drought evolution in response to climate change using the promising convection-permitting WRF modeling system. The Markov chain Monte Carlo algorithm is used to address uncertainties in copula construction and hydrological prediction, thereby leading to the probabilistic assessment of multivariable drought characteristics. In addition, I will talk about an emerging natural extreme event of dry-wet abrupt alternation and its complex evolution in a changing climate, which has been attracting increasing attention from the hydroclimate community in recent years due to the catastrophic effects of extreme disasters.



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