Changes in Yangtze Precipitation Extremes and the association with thermodynamic, dynamic, and local drivers

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Spatiotemporal variability of precipitation extremes is increasingly the focus of attention in both the climate and hydrology communities, especially in the context of global climate change. Indicated by the Clausius-Clapeyron equation under the constant relative humidity assumption, it is expected, from the thermodynamic perspective, that extreme precipitation would increase as the globe warms. However, when it comes to the regional response of precipitation to global warming, the results could be highly uncertain due to the influences of dynamic factors such as large-scale circulation patterns and local effects. Here, we investigate trends in a set of extreme precipitation indices (EPIs) over the Yangtze River Basin (YRB) during the period of 1960-2019. Also, we explore the possible associations between spatiotemporal variability of the EPIs and global warming, ENSO, and local effects. Our results show marked rising trends in frequency and intensity of Yangtze precipitation extremes. Global warming tends to enhance the frequency and intensity of precipitation extremes over the YRB. The La Niña phase of ENSO could lead to an increase of precipitation extremes in the current year, but a decrease of precipitation extremes in the coming year. Local warming mainly exerts a reducing effect on precipitation extremes, which is likely associated with the significant decrease of relative humidity in the YRB. Our findings highlight the need for a systematic approach to investigate changes in precipitation extremes over the YRB.