



Variations of annual frequency of extreme rainfall events in Taiwan during 1951-2005

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Fifty-five years (1951-2005) of hourly rainfall data collected at five weather stations are analysed to study the long-term variations of the annual frequency of extreme rainfall events in Taiwan. A rainfall event is identified as extreme if the estimated exceedance probability of its occurrence is less than 10% in a GEV distribution. The linear trend is identified by binomial logistic regression method. The change point of an abrupt change is determined by both the nonparametric Mann-Whitney-Pittitt test and the parametric Bayesian analysis approach based on Poisson distribution. Significant increasing trends of the events with 1, 3, 6, 12, 24, 48, and 72-hour durations are detected at Taipei which is in northern Taiwan. At Hualien, in eastern Taiwan, only the events with very short durations (≤ 6 hr) show significant increasing trends. No significant trends are detected at the other stations. Statistically significant change-points are detected in the 10-year accumulative frequencies of the extreme events at all five stations. In northern and eastern Taiwan, the period with most frequent events during the 55 years of analysis appears in 1983-1998, while in western and southern Taiwan, the period with fewest events appears in 1989-2003. Our results suggest that the extreme rainfall events are becoming more frequent in northern and eastern Taiwan, but less frequent in western and southern Taiwan. These variations are related to the changing strength of subtropical anticyclone over the Philippine Sea and South China Sea. The complex terrain effect can significantly modify the large-scale influence and result in distinct contrast in the local climate responses.