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Analysis of long term historical rainfall data using copula: characterizing wet events in the case of Jakarta, Indonesia.

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The greater Jakarta area in Indonesia is vulnerable to floods. Many parts of the province are subjected to regular flooding on a yearly basis during the peak of the monsoon period or rainy season in January and February. We are interested to study the variability of rainfall in Jakarta on monthly scale. This study focuses on the analysis of 'wet months' using monthly precipitation data from the 19th century to the present day. We use the Standardized Precipitation Index (SPI), where wet events with SPI value exceeding unity are characterized by three attributes derived from SPI, which are duration, severity and intensity. We employ copulas to construct a joint distribution function of severity-duration, intensity-duration and severity-intensity from a predetermined marginal distribution for severity, duration and intensity. Several copulas were tested to determine the best data fit and based on the derived copula-based joint distribution, we investigate some bivariate probabilistic properties of the 'wet months' such joint drought return periods, and conditional distribution of severity for fixed values of duration. The results show that for fixed values of duration, the wet events are increasing in their severity value in the past decades. This means that the rain climate in the study area is increasingly wetter.