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Bivariate copula-based drought analysis in Bali, Indonesia

Ardhasena Sopaheluwakan (1), Kenny Wiratama (2), Roberto Kondorura (2), Helena Margaretha (2), Robi Muharsyah (1), Dian Nur Ratri (1), and Supari Supari (1)

(1) Center for Climate, Agro- and Marine Climate, Agency for Meteorology Climatology and Geophysics (ardhasena@bmkg.go.id), (2) Department of Mathematics, Universitas Pelita Harapan

Drought is an insidious natural hazard which has worldwide effect. Less than normal precipitation over an extended period of time leads to drought and may cause environment-, economy-, and social-impacts. This study focuses on drought analysis on the island of Bali, Indonesia, where we use rainfall data from several gauge stations for the period of 1981-2013. This study use the standardized precipitation index (SPI), and we characterize drought events by two attributes which are duration and severity. We employ copulas to construct a joint distribution function of severity and duration from a predetermined marginal distribution for severity and duration. Several copulas were tested to determine the best data fit, and found that the Gumbel copula provides the best fit. Based on the derived copula-based joint distribution, we investigate some bivariate probabilistic properties of drought such as joint probability of droughts and joint drought return periods.