

Rainfall Characteristics in a Tropical Montane Cloud Forest, Gunung Alab, Crocker Range Park, Sabah, Malaysia

ABSTRACT

Generally, the tropical montane cloud forest (TMCF) has known to be the headwater for rivers which are the vital source of freshwater for the downstream user. Though one of the important information for freshwater management is the rainfall characteristics, for TMCF catchment it is still less explored in Sabah. This paper investigates the temporal pattern and variability of rainfall in Gunung Alab experimental catchment (GAEC) in the Crocker Range Park (CRP), Sabah, Malaysia. The analyses were based on rainfall observation data obtained in January 2006 to December 2018. As a comparison, similar analyses were also conducted to the rainfall observation data from a meteorological station in the west coast area of Sabah referred in this study as the coastal area of Kota Kinabalu (CAKK). The average annual rainfall for the 13 years data was 3527.1 mm and 2824.8 mm in GAEC and CAKK, respectively. The yearly average rain days in GAEC was 223 days and in CAKK was 157.1 days. Both stations received maximum monthly rainfall during the intermonsoon season which generally occurred in April - May and September - October. In general, GAEC experienced low intensity of rains in long-duration whereas, CAKK experienced more extreme rainfall (average 2.4 ± 1.9 day yr⁻¹) compared to GAEC (0.3 ± 0.9 days yr⁻¹). Based on the set of rainfall data, total rainfall of 129.4 mm day⁻¹ and 224.6 mm day⁻¹ can be expected to be equal or exceeded once in 26 years at a probability of 3.85%, in GAEC and CAKK, respectively. In GAEC, one, two, five and ten years of recurrence interval, the expected maximum daily rainfall was estimated at 65.2 mm day⁻¹, 80.7 mm day⁻¹, 99.9 mm day⁻¹, and 114.1 mm day⁻¹. Whereas, in CAKK, the one, two, five and ten years of recurrence interval of maximum rainfall can be expected at 77.2 mm day⁻¹, 136 mm day⁻¹, 168.5 mm day⁻¹ and 196.7 mm day⁻¹, respectively. The El Niño episodes reduce 10.5% - 18% and 2.7% - 27.9% of annual rainfall from the long-term average in GAEC and CAKK. These findings give insight into the potential capacity of GAEC as headwater catchment and reflect the sensitivity of the local rainfall distribution influenced by natural phenomenon namely, the El Niño-Southern Oscillation (ENSO) within the observation period.