

Spatiotemporal variability and trends of rainfall extremes in the Philippines: Linkage with ENSO and monsoon

Marcelino II Villafuerte^{1*}, Jun Matsumoto¹, Ikumi Akasaka¹, Hiroshi Takahashi¹, Thelma A. Cinco²

¹Department of Geography, Tokyo Metropolitan University, Tokyo, Japan, ²Philippine Atmospheric, Geophysical and Astronomical Services Administration

Due to the recent extreme rainfall events that led to disaster in the Philippines, long-term trend and variability of rainfall extremes in the country are investigated using daily rainfall data from 35 meteorological observing stations during 1951-2010. Seven extreme precipitation indices that characterize daily rainfall in terms of intensity, accumulation and duration in a seasonal perspective are used. The non-parametric Mann-Kendall test is implemented in combination with moving block bootstrap to detect significant trends. Results indicate a tendency toward wetter condition during boreal summer (July-September, JAS) while a drying condition during boreal fall (October-December, OND) in the Philippines. The influence of El Niño-Southern Oscillation (ENSO) and Western North Pacific (WNP) summer monsoon on the extreme precipitation indices are further explored by means of composite analysis and rank correlation technique. Around 20%-60% drier (wetter) condition is associated with El Niño events during OND (JAS); however, ENSO influence is more pronounced during OND as compared to JAS. On the other hand, strong WNP summer monsoons are generally associated with high values of wet extreme precipitation indices during JAS, specifically at stations located on the western section of the Philippines. A weak strengthening of the WNP summer monsoon is detected; however, the spatial incoherency of trends found in extreme precipitation indices, and the influence of tropical cyclones and other tropical disturbances with short temporal-scale suggest that found trends could not be attributed to a single factor but to combinations of several factors directly or indirectly affecting extreme precipitation over the Philippines.

Keywords: rainfall extremes, ENSO, monsoon, long-term trend, Philippines