MODULATION OF PHILIPPINE RAINFALL BY CONVECTIVELY COUPLED EQUATORIAL WAVES

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ABSTRACT

Rainfall is the most prominent climatic event in the Philippines. In this study, the influence of convectively coupled equatorial waves (CCEWs) to rainfall in the Philippines was investigated and quantified using 17-year long daily Outgoing Longwave Radiation (OLR) and rainfall from Tropical Rainfall Measuring Mission (TRMM, 1998-2015). Wavenumber-frequency filtering method was employed to isolate and filter the band signal of each CCEWs for domain covering Philippines, from 110°E to 130°E and 5°N to 20°N. Variance analysis were used to determine the contributions of CCEWs to rainfall variability for Philippine domain, and for northern, central, and southern region. Also, the relationship of CCEWs events and ground-based rainfall from Philippine Atmospheric, Geophysical and Astronomical Service Administration (PAGASA) synoptic station was analysed for the year 2016.

Kelvin, equatorial Rossby (ER), and mixed Rossby gravity (MRG) waves modulated Philippine rainfall variability by 3.36%, 4.19%, and 1.92%, respectively. Kelvin waves dominated the southern Philippines (Zone 3) contributing about 3.9% of the total rainfall variance. It has two distinct peak which occurs during May – June and December – January. The secondary peak of Kelvin waves was weaker compared to the primary peak. On the other hand, ER waves prevailed in the central Philippines (Zone 2) with 4.6% of the total rainfall variance. ER waves were relatively active throughout the year except for months of September – October. During July – August, the signals of ER waves were shifted to northern Philippines (Zone 1). Similar to Kelvin waves, MRG waves also had its maximum modulation in Zone 3 with about 2.2% of the total rainfall variance. It also have two distinct peaks which occurs during July and November. MRG waves peak during July was extended to Zone 1. Ground-based data showed rainfall correlating with the OLR signals of the CCEWS. Rain occurred mostly during passage of waves (i.e, 0 or no lag) particularly Kelvin waves and MRG waves. ER waves signals, however, was found to lead rainfall by 1 day in the southern Philippines and lag 1 day in the northern Philippines. This study shows that CCEWs significantly modulated Philippine rainfall, especially in the southern region.

Keywords: Convectively coupled equatorial waves, rainfall, Philippines