



**UNIVERSITY OF THE PHILIPPINES**

**Master of Science in Meteorology**

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*The impact of Madden-Julian Oscillation on Philippine winter rainfall*

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## ABSTRACT

Intraseasonal variability in the tropics is modulated by Madden-Julian oscillation (MJO), a large-scale convective disturbance which propagates eastward across the equatorial Indian Ocean and western-central Pacific at a rate of  $5 \text{ ms}^{-1}$ . Impact of MJO on Philippine rainfall during boreal winter months December to February of years 1987 to 2017 was studied using composite analysis of rainfall, convective and circulation anomalies. MJO events were identified using the Real-time Multivariate MJO (RMM) index, and days with strong MJO events were used for compositing and calculating anomalies for each MJO phase. Normally, Philippines experiences a northeasterly wind with convection mostly occurring in the Eastern Philippines. High amount of rainfall is experienced in the windward direction while places in the leeward direction receive no or less rainfall. However, rainfall was found to deviate from normal winter values coherent with the MJO phases, with generally negative anomalies during phases 1,2,3,7 and 8 (MJO convective center in Indian Ocean and western Hemisphere) and positive anomalies during phases 4-6 (MJO convective center in Maritime Continent and Western Pacific). The greatest impact of MJO occurred in type I and III climate regions (dry climate during boreal winter) which experienced enhanced (suppressed) rainfall during rainy (dry) phases of MJO. All rainy MJO phases showed a field significant rainfall enhancement while all the dry MJO phases except for phase 7 showed a field significant rainfall suppression which means the impact of MJO on rainfall did not occur by chance. The impact of MJO on Philippine rainfall can be explained not just by the direct influence of tropical convective anomalies but also by the result of enhancement (suppression) of the winter monsoon, induced anomalous low (high) sea level pressure, rising (sinking) air and the eastward (westward) extent of the Western Pacific Subtropical High.

Keywords: MJO, Philippine rainfall anomalies