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GPS precipitable water vapor variability over Northern Borneo during ENSO 2003-2007

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The Maritime Continent, comprised of large islands and seas in an expanse of 90^{o} to 150^{o}E within 10^{o}N to 10^{o}S of the equator, is the most unique region on the globe when it comes to water vapor dynamics due to its complex land-sea interactions. Convective activities ranging from localized thunderstorms to global-scale interannual and intra-seasonal variability associated to El Niño-Southern Oscillation (ENSO), Indian Ocean Dipole, northeasterly cold surge, Borneo vortex and Madden-Julian Oscillation play respective roles in influencing the climate at the Maritime Continent. In this study, analysis of precipitable water vapor (PWV) variability derived from Global Positioning System (GPS) satellite data over North Borneo region during ENSO phenomenon from 2003 to 2007 yielded 3.41% higher PWV during El Niño than during La Niña. In the 5-year analysis, PWV and rainfall showed positive correlations during El Niño event while the opposite was seen between PWV and sea surface temperature (SST). Further analysis on the 2006 El Niño event revealed a consensus percentage drop ranging from 4 to 8% in surface meteorological parameters and PWV. The drop in PWV was also seen is the PWV anomaly of 2006 when compared to the PWV anomaly of the previous year. The onset of El Niño defined by average SST anomaly (SSTa) over three Niño regions ranging between 0 to 0.4^{o}C saw a decreasing trend in PWV. An adaptation of Trenberth (1997) El Niño definition for the Borneo region identified an El Niño event when the SSTa > 0.4^{o}C continuously and exceeds 1.0^{o}C. Based on this definition, the 2006 El Niño event saw a correlation of 0.74 at 95% confidence level between PWV and SSTa. Furthermore, rain rate analysis from TRMM 3B43 over the range 102-120^{o}E and 5^{o}S-11^{o}N showcased a brief drop during the onset of El Niño but was affected by the beginning of the northeast monsoon in October. The consistent trend shown in PWV throughout the 5-year El Niño duration suggests PWV capability in precision monitoring of convective activities and can be further employed to monitor other climate activities.