Climatological behaviors of Borneo vortex during Northern Hemisphere winter monsoon

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During Northern Hemisphere winter monsoon season, most regions over the equatorial belt are covered with convective clouds due to the migration of Inter Tropical Convergence Zone (ITCZ) or monsoon trough. Detailed studies of these episodes over southern portion of South China Sea had encountered a semi-permanent feature of low-level quasi-stationary vortex embedded within the trough, renowned as monsoon disturbance. Since the vortex is persistently formed off coast of the Borneo Island, it is sometimes called as Borneo vortex. The presence of the vortex in this region has long been associated with heavy rainfall activity and flood disaster during the winter monsoon seasons. This study examined the climatological behavior of the Borneo vortex using ECMWF reanalysis data between November and February for the year 1970/71 till 2009/10. It was found that majority of the vortices formed and dissipated within the vicinity of Borneo Island, signify that they were localized weather systems. The vortices mean center shifted southeastward towards the equator as the winter monsoon advanced from November till February. They had the longest lifespan in December, which indicated that the winter monsoon was most active during that month. By applying the Fourier spectral transformation in order to extract interannual and interdecadal variability of the vortex, the outcome suggested that it varied in accordance with Quasi-Biennial Oscillation (QBO), Tropospheric Biennial Oscillation (TBO), El-Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) phenomena. Further analysis showed that the lifespan of the vortices were longer during La-Niña years and cold PDO period. They tended to form northward of their mean latitude position during La-Niña years and southward in El-Niño years, while more of them were found eastward of their mean longitude position during cold PDO period compared to warm PDO period. Ongoing works are still taking place at this moment in order to identify some other climatological aspects related to this vortex.