ABSTRACT
POTENTIAL VORTICITY TENDENCY ASPECTS
OF THE MOTION OF TYPHOON MUIFA (2004)

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This study attempts to determine the dominant influence on the motion of tropical cyclone (TC) Muifa (2004) using the expanded potential vorticity tendency (PVT) framework to explain TC motion. The framework suggests that a TC is likely to move towards the region of maximum asymmetric PVT which is mainly contributed by the asymmetric components of potential vorticity (PV) advection and diabatic heating (DH). To diagnose the process first, the limited area grid-point Eta model is used to generate the analysis data to obtain air temperature, zonal and meridional components of wind. Cloud top temperature from the Geostationary Observing Environmental Satellite (GOES-9) infrared (IR) images in the wavelength range of 10.2-11.2μm and 11.5-12.5μm were also used. Here, the results are illustrated on a circular grid using radar plot. The circulation of TC Muifa and its environment is illustrated by the typical distribution of sea-level pressure, wind vectors, GOES-9 IR derived temperature, vorticity, and potential temperature. As Muifa intensifies the vertical structure of potential vorticity (PV) becomes more symmetric as this is distributed horizontally and vertically. The role of the individual physical processes of PV advection and diabatic heating (DH) is to generate heat to contribute to the overall process of PVT. Each individual contribution is apparently indicated by the azimuthal asymmetric structure where the maximum magnitude of DH dominates over the PV advection terms. DH maximum occurred at 12 GMT 18 November during which Muifa reaches its peak wind speed at 115 knots. On the average, DH is not maximum during the day which implies that much of the latent heat release occurred during the night. The positive correlation of DH with maximum wind decreases towards the TC center. On the other hand, the negative correlation of PV advection terms with maximum wind increases towards the TC center. The maximum in PV advection terms rotates ahead or is aligned to the direction ahead of the turning motion. But, in instantaneous motion, the maximum in the PV advection terms points to the direction of motion. In one section of the track where the recurving direction is opposite to the direction of turning motion: the magnitude of the SAAPV term to the left of the direction of motion, increases clockwise while the magnitude in the AASPV infront of the direction of motion decreases clockwise. In terms of magnitude, DH is a dominant influence modifying the PVT structure and hence, the motion of TC Muifa while in terms of pattern, the PV advection terms are dominant indicators of the steering flow and the direction of motion.