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A reevaluation of the relationship between storm motion, vertical wind shear, and rainfall asymmetries in typhoons.

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Recently the influences of vertical wind shear on tropical cyclone (TC) structure has been increasingly investigated. For example, Corbosiero and Molinari (2002, 2003; hereafter CM) provided some observational evidence for the strong linkage between vertical wind shear and convective asymmetries in TCs. In the present study we also examine the relationship between ambient vertical wind shear and rainfall asymmetries for the typhoons which made landfall on mainland Japan in 2004.

For this study, vertical wind shear is defined as the vector difference between the average 200-hPa and the 850-hPa wind within a radius of 500 km from the cyclone center and calculated from the JMA global analysis data. On the other hand, wavenumber-one asymmetries of rainfall are determined by applying a spectral analysis routine to the Radar-AMeDAS precipitation data. Figure 1a shows a directional relationship between shear vector and wavenumber-one component of rainfall rate. The figure suggests that the rainfall rate tends to be enhanced directly downshear with a leftward preference, consistent with CM. Due to the limited number of samples we couldn't evaluate the relative influence of the vertical wind shear and storm motion effects on rainfall distribution as CM. Instead, we show here the relationship between shear and motion in Fig. 1b. It should be noted that the relationship can be established without the rainfall data which is not available over the open oceans. The Fig. 1b shows that TCs tend to move leftward (rightward) relative to the shear vector in the westerly (easterly) shear zone or in the middle (low) latitudes.

Keywords: storm motion; vertical wind shear; convective asymmetry

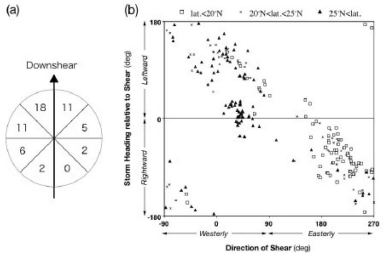

Figure 1 a) The number of times the highest rainfall rate was analyzed, per octant, within a radius of 100 km from the center, and b) directional relationship between storm motion and environmental shear (measured counterclockwise from due east).

References

[1] K. L. Corbosiero and J. Molinari, *Mon. Wea. Rev.* 130, 2110 (2002).
[2] K. L. Corbosiero and J. Molinari, *J. Atmos. Sci.* 60, 366 (2003).