Feng, T., X.-Q. Yang, L. Wu, R. Huang, and D. Yang, 2020: How do the monsoon trough and the tropical upper-tropospheric trough affect synoptic-scale waves: A comparative study. *J. Meteor. Soc. Japan*, **98**, 735-754.
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Plain Language Summary: As an important precursor for tropical cyclone formation, a conventional synoptic-scale disturbance is usually identified from lower-tropospheric winds over the western North Pacific. However, another type of disturbance with the maximum perturbation in the upper troposphere may be misidentified. Comparing two long-lasting synoptic-scale wave events in 2004 and 2006, the present study showed that the disturbances occurred in the upper troposphere in 2006 while in the lower troposphere in 2004. Such a difference is ascribed to the large-scale background modulated by both the monsoon trough and the tropical upper-tropospheric trough.

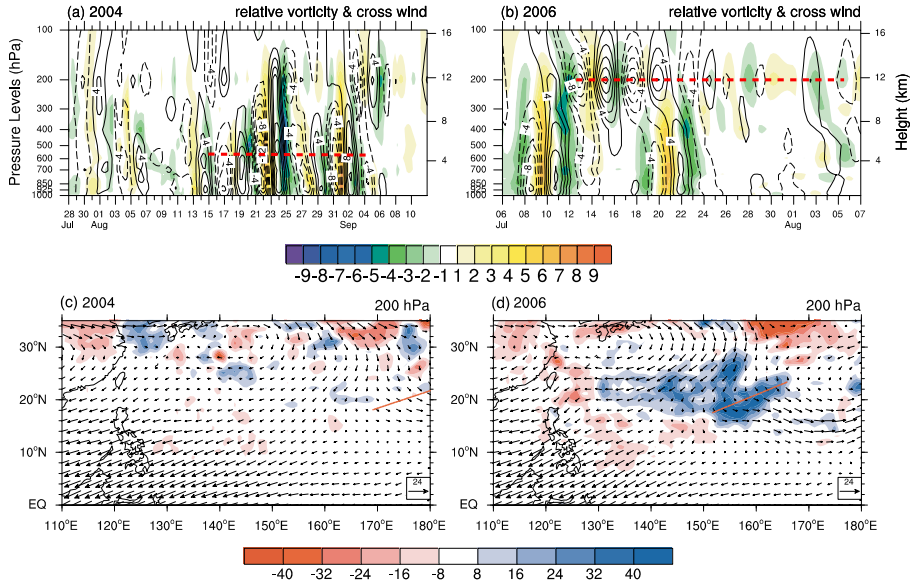

Figure 1. Time-height plot of relative vorticity (shaded, unit: 10^{-5} s^{-1}) and tangential wind (contour; m s^{-1}) in (a) 2004 and (b) 2006, and averaged horizontal wind (vector) and growth rate of eddy kinetic energy through barotropic energy conversion (shaded; 10^{-5} m^2 s^{-3}) at 200 hPa in (c) 2004; (d) 2006. When the tropical upper-tropospheric trough (TUTT) shifted westward in 2006 (Fig. 1d), synoptic-scale waves developed in the upper troposphere (Fig. 1b) through the conversion of kinetic energy from the TUTT (Fig. 1b).

- Distinct three-dimensional structures in synoptic-scale disturbances during 2004 and 2006 were investigated.
- Differences in the vertical structure indicated the diverse properties of these disturbances.
- The displacements of the monsoon trough, the tropical upper-tropospheric trough (TUTT), and associated vertical wind shear caused the structural change in these disturbances.