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On the separation of upper and low-level centres of tropical storm Kong-Rey (2013) near Taiwan in association with asymmetric latent heating

Abstract

The CWA classifies tropical cyclone tracks that affect Taiwan into ten distinct types. Tropical Storm (TS) Kong-Rey (2013) belongs to Type 6, in which rainfall is typically concentrated on the eastern side of Taiwan. However, when Kong-Rey moved past eastern Taiwan, satellite and radar observations revealed obviously asymmetric structure, with a separation between the upper-level and lower-level centers. This asymmetry resulted in heavy rainfall in southwestern Taiwan, which was different from the typical Type 6 track of tropical cyclones. Therefore, this study investigates the critical factors and processes related to the separation of the upper-level center of Kong-Rey (2013) that caused the atypical rainfall pattern.

Numerical experiments using the CReSS model and potential vorticity tendency diagnosis were conducted to investigate the storm's motion and structure. The simulation results matched the observations and clearly demonstrated the separation between the upper-level and low-level centers. The potential vorticity tendency diagnosis indicates that diabatic heating played a crucial role in driving the detachment of the upper-level center. Furthermore, interactions with the terrain of Taiwan enhanced the storm's asymmetry, resulting in significant rainfall over southwestern Taiwan.

Keyword

Potential vorticity tendency diagnosis

Reference

Wang, C.-C., Y.-H. Chen, M.-C. Li, H.-C. Kuo, and K. Tsuboki, 2021: On the separation of upper and low-level centres of Tropical Storm Kong-Rey (2013) near Taiwan in association with asymmetric latent heating. *Quart. J. Roy. Meteor. Soc.*, 147, 1135–1149, <https://doi.org/10.1002/qj.3963>.