

# 國立中央大學大氣物理研究所書報討論

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## **A Review of the Interactions between Tropical Cyclones and Environmental Vertical Wind Shear**

### **Abstract**

This comprehensive review synthesizes over a century of research on the intricate interactions between tropical cyclones (TCs) and deep-layer vertical wind shear (VWS), calculated as the horizontal wind vector difference between 200 and 850 hPa. Although VWS typically causes vertical vortex tilting, organizes precipitation into wavenumber-1 asymmetric patterns, and induces kinematic imbalances, such responses depend heavily on mid-level wind configurations, the presence of dry environmental air, and underlying sea surface temperatures. Shifting from the traditional focus on VWS induced weakening, this paper highlights an emerging line of research exploring how TCs intensify under moderate to strong shear conditions (magnitudes exceeding 5 m/s). Specifically, it delineates four primary pathways to intensification: vortex tilt reduction, vortex reformation, axisymmetrization of precipitation, and outflow blocking. These mechanisms are often interdependent, reflecting the strong coupling between convective processes and vortex asymmetries. Ultimately, this review discusses persistent knowledge gaps and offers strategic recommendations for future investigations to enhance our theoretical understanding and the operational predictability of TCs in sheared environments.

### **Keywords**

Vertical wind shear ; Tropical cyclones

### **Reference**

Rios-Berrios, R., Finocchio, P. M., Alland, J. J., Chen, X., Fischer, M. S., Stevenson, S. N., & Tao, D. (2024). A Review of the Interactions between Tropical Cyclones and Environmental Vertical Wind Shear. *Journal of the Atmospheric Sciences*, **81**, 713-741. <https://doi.org/10.1175/JAS-D-23-0022.1>