# Equatorial Moisture Dynamics of the Quasi-Biweekly Oscillation in the Tropical Northwestern Pacific During Boreal Summer

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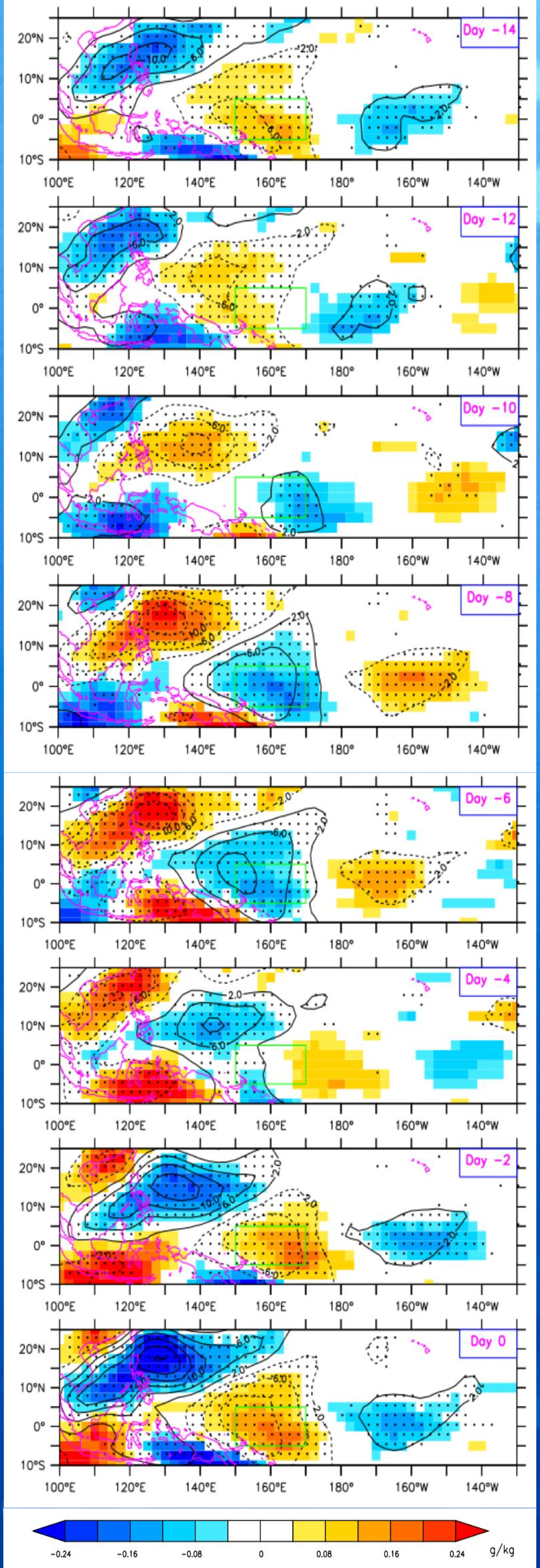

Fig. 1. Composite spatiotemporal evolution of the QBWO.Solid (dashed) contours represent positive (negative) OLR anomalies, and shading shows the specific humidity anomalies averaged between 300 and 1000 hPa.

The pronounced summertime quasi-biweekly oscillation (QBWO) with 10–20-day period significantly modulates the weather and climate systems in the tropical northwestern Pacific(TNP). It is shown that QBWO in the TNP usually originates from equatorial convective anomalies (ECAs) in the western Pacific(Fig. 1). In this study, ECAs in relation to the QBWO are investigated in terms of the equatorial moisture dynamics. The results show that the development of ECAs is preconditioned by significant moisture anomalies associated with zonal moisture advection along the equator（Fig. 2）. Prior to initiation at day -2, an equatorially westward-moving moisture precursor at a speed of approximately 5° longitude per day could be traced back to 140°W. A moisture budget analysis indicates that the successive westward movement of the moisture precursor is primarily due to the interaction between the zonal gradient of moisture anomalies and the mean easterly trade winds. The equatorial moisture dynamics likely maintain the quasi-biweekly variability of ECAs regarding the QBWO in the tropical northwestern Pacific(Fig. 3).

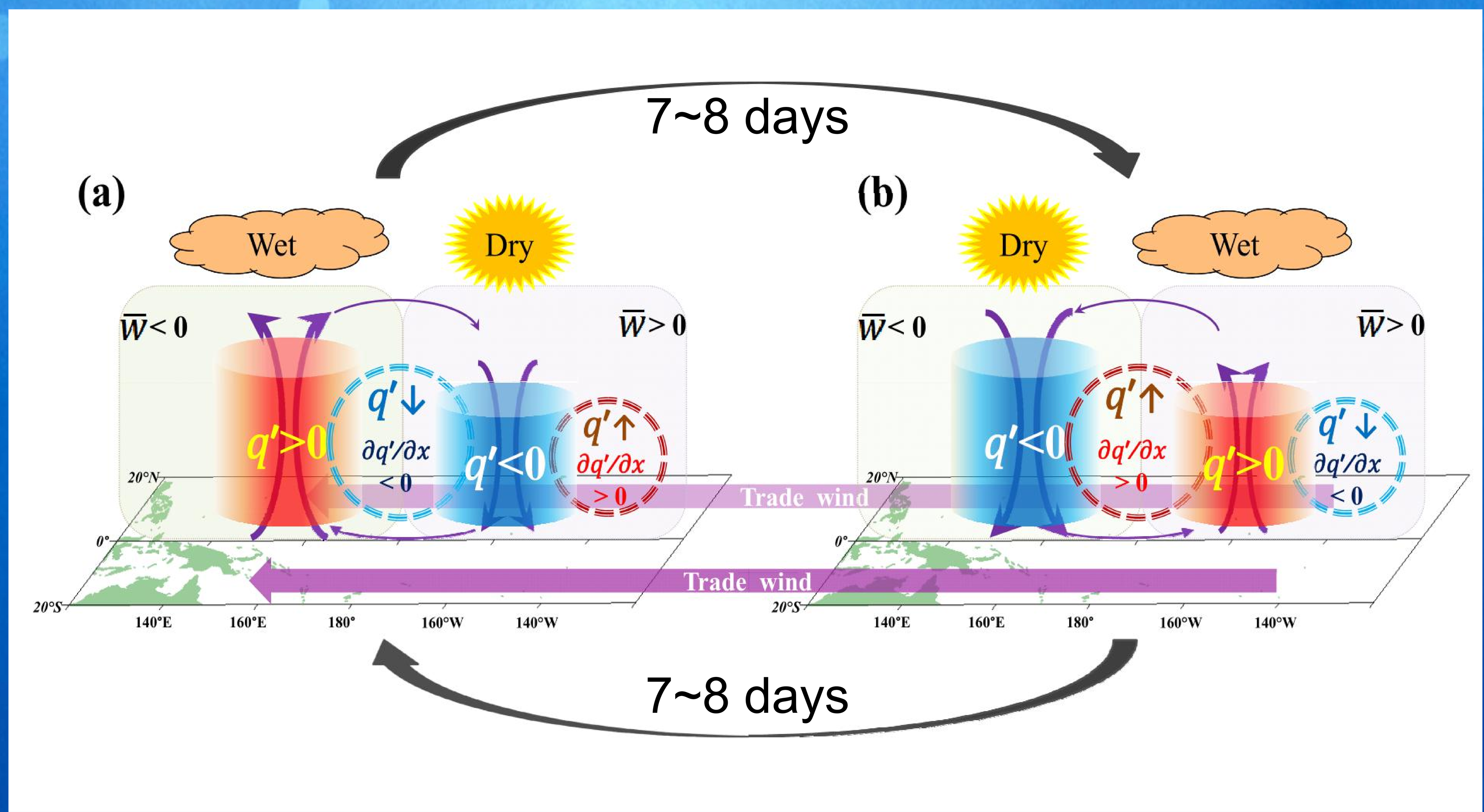


Fig. 3. Schematic diagram indicating the moisture dynamics of ECAs in relation to the QBWO. When enhanced ECAs are generated in the western Pacific(Fig.3a), a Walker-like cell is sustained with a strong ascending branch in the western Pacific and a weak descending branch east of the dateline. The above circulation pattern is accompanied by a zonal moisture dipole with a positive west and a negative east. In the presence of trade winds, the negative eastern pole shows a westward movement, and an opposite moisture dipole gradually forms. Consequently, the negative moisture anomalies trigger suppressed ECAs in the western Pacific, and a reverse Walker-like cell establishes at the equator(Fig.3b). In view of the zonal size of the moisture dipole (approximately 40° longitude) and the movement speed (approximately 5° longitude per day), nearly two weeks are required for the ECAs to fulfill one cycle in the equatorial western Pacific. Due to the oscillation of equatorial convective heating, periodic Rossby waves generate and evolve to the QBWOs under the favorable mean states over the TNP.

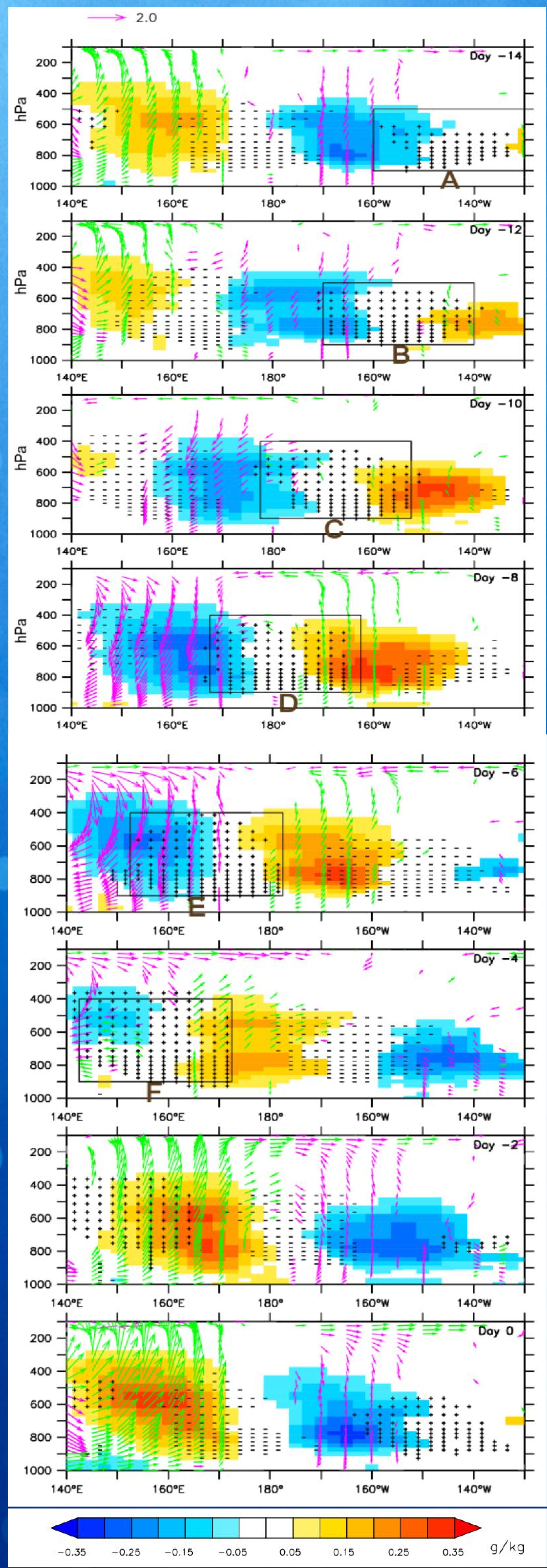

Fig. 2. Zonal-vertical structures of moisture and circulation along the equator. Shadings are specific humidity anomalies, and '+' ('−') symbols denote the positive (negative) time tendency of specific humidity anomalies.

Reference: Li, K., He, Q., Yang, Y., & Yu, W. (2021). *Geophysical Research Letters*, 48, e2020GL090929. https://doi.org/10.1029/2020GL090929.