# An Initiation Process of TD-type Disturbances under an Influence of Upper-Level Troughs

Yuya, Hamaguchi*[1], Yukari, N. Takayabu[1]

1 Atmosphere and Ocean Research Institute, The University of Tokyo, Kashiwa, Japan

*Correspondence to: yuya_h@aori.u-tokyo.ac.jp

Tropical depression-type disturbances (TD-type disturbances, or TDDs) are widely known as westward-moving disturbances with 3-5-day periods and ~3000-km wavelengths over the western Pacific (Takayabu and Nitta 1993). As Ritchie and Holland (1999) reported, roughly 50% of western Pacific tropical cyclones form in association with TDDs. In spite of their social importance in terms of tropical cyclogeneses over the western Pacific, their initiation processes have not been fully understood. At the same time, recent satellite products reveal that upper-tropospheric wavy structures are often observed prior to TDDs' occurrences. Though TDDs are thought to be originated from lower-tropospheric eddies in association with convection, some researches have indicated possible upper-tropospheric contributions in energetics of TDDs (*e.g.* Maloney and Dickinson 2003). From these perspectives, we focused on the relationship between TDDs and the upper-level perturbations to understand the mechanism of the initiation process of TDDs. After analyzing the relation using JRA-55 products (velocity anomaly, water vapor variables, and potential vorticity) and CLAUS datasets (brightness temperature) in both time-space and frequency-wavenumber domains, we found that a considerable number of TDDs are given birth in upper-level anomalous southerly wind region in front of troughs. Convections are likely to be initiated through processes such as the destabilization of the atmosphere and sustained upward flow induced by the upper-level trough. In addition, our analysis on the water vapor budget shows that the trough-related initiation process of TDDs are severely confined to wet area, which may indicate the necessity of consideration of a synergistic effect of the upper trough and large-scale distribution of water vapor which is largely influenced by the sea surface temperature (SST).

**Key words:** TD-type Disturbance, Upper-Tropospheric Trough, Initiation Process

## References

Takayabu, Y. N., and T. Nitta, 1993: 3–5-day period disturbances coupled with convection over the tropical Pacific Ocean. *J. Meteor. Soc. Japan,* **71,** 221–246.

Ritchie, E. A., and G. J. Holland, 1999: Large-scale patterns associated with tropical cyclogenesis in the western Pacific. *Mon. Wea. Rev.,* **127,** 2027–2043.

Maloney, E. D., and M. J. Dickinson, 2003: The intraseasonal oscillation and the energetics of summertime tropical western north Pacific synoptic-scale disturbances. *J. Atmos. Sci.*, **60**, 2153-2168.