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Mechanisms of the transport height of water vapor by tropical cyclones on heavy rainfall

Abstract

The moisture transport by tropical cyclones is characterized by high intensity and altitude, which may influence the microphysical processes of heavy rainfall triggered by tropical cyclones. In this study, authors use the Weather Research and Forecasting (WRF) model to conduct numerical simulations on a heavy rainfall event around the Yangtze River Delta induced by Super Typhoon Mangkhut (2018). The vertical distribution of water vapor was adjusted to emphasize the impact of moisture transport at various heights. If the water vapor in the column kept constant, the total amount of precipitation in the region was greatest when the transport occurred mainly at low levels, and it was smallest when the transport occurred mainly at low levels.

Detailed analysis of hydrometeors indicated that liquid- (ice-) phase processes were the dominant microphysical processes when the transport height is low (mid-to-low). The deposition and riming contributed to heavy precipitation when the transport height was at the mid-to-upper levels. The findings of authors highlight the influence of moisture transport with high intensities and altitudes by tropical cyclones on microphysical processes, ultimately leading to changes in the distribution and intensity of heavy rainfall.

Keywords

Microphysical process (微物理過程)

Water vapor transport (水氣傳輸)

Reference

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