Analysis of Multi-scale Circulation Characteristics Affecting the Multiple Tropical Cyclogenesis in Midsummer of 2018

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This study investigates the impact of multi-scale circulations (including large-scale circulation, intra-seasonal oscillation (ISO) and tropical waves) on the multiple tropical cyclogenesis (MTC) and discusses the deviation of vertical disturbance field of the whole atmosphere in the MTC active and inactive phases by taking a typical MTC in midsummer of 2018 as an example. The results are as follows. (1) The Western North Pacific (WNP) undergoes a 16-days MTC active phase with eight tropical cyclones (TCs) generated in sequence and a 19-days MTC inactive phase with only one TC generated in midsummer of 2018. (2) During the MTC active phase, the cross-equatorial airflow strengthens and monsoon trough extends eastward. The atmospheric circulation configuration of the low-level convergence and the upper level divergence in South China Sea (SCS) and WNP is conducive to TC formation. (3) The northward propagation of Eastern Asia and WNP ISO in summer has a significant modulation effect on the MTC sub-seasonal changes. The SCS and WNP are just in a northward wet (dry) phase of a strong ISO during the MTC active (inactive) phase. (4) The generation of the eight TCs in the MTC active phase is all related to tropical fluctuation, five of which are affected by two kinds of tropical waves at the same time. Tropical fluctuation provides the trigger conditions for the TC generation by changing local thermal and dynamic conditions. (5) The common influence of multi-scale circulation eventually leads to significant differences in the vertical structure characteristics of temperature-pressure disturbance field configuration, vertical motion disturbance and specific humidity disturbance in the MTC active and inactive phase. The application of the disturbance analysis method provides a new idea for the extended range forecast.

Keywords: multiple tropical cyclogenesis, multi-scale oscillation, tropical waves, perturbation analysis

