

Aerosol Effects on the Intensity of Tropical Cyclone and the Development of Clouds in Its Outer Region

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Aerosols have great impacts on air quality, clouds, precipitation and the energy balance of the earth. Recently studies show that aerosol can invigorate the convection near the periphery away from the eyewall, enlarge the cloud area and decrease the maximum sustained wind (MSW) of the tropical cyclone (TC). This 10 years observational study shows that aerosol has different effects to the intensity of TC and development of clouds in its outer region between TC's growing and dissipating stages. Moderate Resolution Imaging Spectroradiometer (MODIS) aerosol optical depth (AOD) and best track dataset for TCs from 2000 to 2009 in the West Pacific (WP) region are analyzed statistically. The result shows opposite correlations between AOD and MSW have been found in the two stages of TC which MSW is negatively (positively) related to AOD in the TC growing (dissipating) stage in the WP region. Similarly, in the North Atlantic region. Further analyses show that, as a low-pressure vortex with a warm core structure, TC has different responses due to the cold or warm air flow intrude. It will damage the warm core and weaken the TC when strong cold air intruding the TC. But it is favorable to the development of TC when warm air flow come into it. The outer region cloud effect by aerosol can protect the structure of warm core away from the impact of cold air flow, and AOD and MSW shows positively relationship in dissipating stage. But in growing stage, invigoration of convection draws more warm ascending air at the periphery of the storm, less air ascends in the eyewall which makes AOD and MSW negatively correlated.