

Numerical study on TC-induced oceanic carbon system changes

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Recent observations have indicated that strong surface winds during the passage of tropical cyclones (TC) lead to rapid TC-induced carbon dioxide outgassing. Understanding the local carbon system is important for estimating the climatological impact of the TC on the annual global carbon dioxide effluxes. In order to understand TC-induced local carbon system and to estimate their impact on the annual global carbon dioxide effluxes, the comprehensive interdisciplinary approach is needed. Among various approaches, numerical modeling studies help understand interdisciplinary processes in both the atmosphere and the ocean.

This study presents the development of the Meteorological Research Institute Community Ocean Model coupled with a carbon equilibrium model to investigate rapid TC-induced carbon dioxide outgassing observed at a moored buoy in the East China Sea during the passages of T9711 (Tina) and T9713 (Winnie). The carbon equilibrium model was also incorporated into an atmosphere-wave-ocean coupled model to examine variation in the partial pressure of surface ocean carbon dioxide by passage of T0914 (Choi-wan) observed at the Kuroshio Extension Observatory moored buoy. These numerical results indicated that variations in the partial pressure of surface ocean carbon dioxide are affected by variations in not only water temperature but also salinity and dissolved inorganic carbon caused by TC-induced advection and vertical turbulent mixing.

Keywords: Typhoon, Carbon dioxide efflux, Moored buoy