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The Impact of Outer-Core Surface Heat Fluxes on the Convective Activities and Rapid Intensification of Tropical Cyclones

Abstract

This study investigates the role of wind-induced surface heat fluxes (WISHE), particularly the WISHE feedback mechanism, outside the inner core of rapidly intensifying TCs. Typhoon Soudelor (2015) is selected as an example for the model simulations due to the apparent RI phenomenon with active rainbands in its lifetime. To investigate how the outer-core surface heat fluxes affect tropical cyclone (TC) structure and RI processes, a series of numerical experiments are performed by suppressing surface heat fluxes between various radii.

The results show that suppression of WISHE in the radial interval from 150-km radius to the outer region results in a greater intensification rate than that of CTRL during RI, while TCs do not undergo RI if the suppression of WISHE is simultaneously performed in the area between 60- and 150-km radii. For those sensitivity experiments with capped surface heat fluxes, the members with greater intensification rate show higher heating efficiency prior to the RI periods and strong members also show more consolidated eyewall structure with less active rainband convection than CTRL during RI. Although the outer-core surface heat fluxes in these members are suppressed, the inner-core winds become stronger, extracting more ocean energy from the inner core.

Keyword:

Rapid intensification (RI)

Wind-induced surface heat fluxes (WISHE)

Reference:

Peng, C. H., & Wu, C. C. (2020). The impact of outer-core surface heat fluxes on the convective activities and rapid intensification of tropical cyclones. *Journal of the Atmospheric Sciences*, 77(11), 3907-3927.