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The Role of WISHE in the Rapid Intensification of Tropical Cyclones

Abstract

This study explores the impact of surface heat fluxes, particularly the wind-induced surface heat exchange (WISHE) mechanism, on the rapid intensification (RI) of tropical cyclones (TCs). Sensitivity experiments reveal that limiting surface heat fluxes and reducing WISHE result in delayed RI and weaker peak intensity. Before RI, stronger WISHE accelerates the increase of equivalent potential temperature at lower levels, enhancing convection and allowing TCs to reach a certain strength earlier. During RI, higher surface heat fluxes promote convective instability, leading to more active convection, faster intensification, a stronger warm core, and greater axisymmetrization of convection.

Across both stages, different levels of WISHE influence the thermodynamic environment and convective processes, ultimately affecting TC evolution. The findings underscore the crucial role of WISHE in governing the intensification rate of TCs undergoing RI, emphasizing its importance in shaping their development and final intensity.

Keyword

Wind-induced surface heat exchange (WISHE)

Reference

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