

# 國立中央大學大氣物理研究所書報討論

Date : 2024/12/06

Location : S1-713

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## Mechanisms of Global Warming Impacts on Regional Tropical Precipitation

### Abstract

Mechanisms that determine tropical precipitation anomalies under global warming are examined using an intermediate atmospheric model. To compensate for the warmer tropospheric temperature, atmospheric boundary layer (ABL) moisture must increase to maintain positive convective available potential energy (CAPE) in convective regions. However, in non-convective regions, ABL moisture does not increase as much, thereby creating a spatial gradient of ABL moisture anomalies associated with two main mechanisms: the “upped-ante mechanism” and the “anomalous gross moist stability mechanism.”

In the “upped-ante mechanism,” increasing ABL moisture is counteracted by the import of dry air from non-convective regions to the margins of convective regions. As a result, ABL moisture cannot meet the higher “convective ante” under global warming, leading to negative precipitation anomalies.

In the “anomalous gross moist stability mechanism,” increased ABL moisture reduces gross moist stability. Consequently, convection is enhanced, inducing positive precipitation anomalies within convective regions.

### Keyword

Precipitation anomaly

### Reference

Chou, C., and J. D. Neelin, 2004: Mechanisms of Global Warming Impacts on Regional Tropical Precipitation. *J. Climate*, 17, 2688–2701, [https://doi.org/10.1175/1520-0442\(2004\)017<2688:MOGWIO>2.0.CO;2](https://doi.org/10.1175/1520-0442(2004)017<2688:MOGWIO>2.0.CO;2).