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The Role of the Indonesian Throughflow on ENSO Dynamics in a Coupled Climate Model

Abstract

This study investigates the impact of the Indonesian Throughflow (ITF) on ENSO characteristics by comparing two model simulations: one with an open ITF (ITF_open) and one with a closed ITF (ITF_clsd). The analysis focuses on the changes in the mean climate state and ENSO variability.

The results show that closing the ITF leads to an El Niño-like mean climate state, with warming in the eastern Pacific, cooling in the western Pacific, an eastward shift of heat content, weakened trade winds, a flatter equatorial thermocline, and reduced equatorial upwelling. The spatial pattern of ENSO variability is also altered, with the ENSO SST anomaly core shifting from the Niño-3.4 region to the Niño-3 region. Additionally, both advection and thermodynamic processes shift eastward, suggesting that ITF_clsd ENSO variability is more influenced by thermocline recharge–discharge processes rather than zonal advection. The interdecadal component of ENSO variability collapses, but higher-frequency interannual variability (with periods shorter than five years) is maintained. Moreover, ENSO variability exhibits smaller amplitude changes. These findings highlight the critical role of ITF in modulating ENSO characteristics through changes in the mean state and associated feedback processes.

Keywords

Indonesian Throughflow (ITF)

Refereance

Santoso, A., W. Cai, M. H. England, and S. J. Phipps, 2011: The Role of the Indonesian Throughflow on ENSO Dynamics in a Coupled Climate Model. *J. Climate*, **24**, 585–601, <u>https://doi.org/10.1175/2010JCLI3745.1</u>.