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Indo-Pacific Climate Interactions in the Absence of an Indonesian Throughflow

Abstract

The Pacific and Indian Oceans are linked by the Indonesian Throughflow (ITF), an oceanic passage that allows climate variability in the two basins to interact. ENSO events can generate sea surface temperature anomalies (SSTAs) in the Indian Ocean, which feed back onto ENSO. This raises the question of whether such Indo-Pacific feedback would still occur in the absence of the ITF. To address this, this study uses a coupled climate model with the ITF artificially closed, together with partially decoupled experiments designed to isolate the role of air–sea interactions.

Blocking the ITF leads to substantial changes in the mean climate of both oceans. In the Pacific, ENSO-like variability remains, but its center shifts eastward. In the Indian Ocean, however, the IOD and IOBM collapse into a single dominant mode with a very different structure. Results from the decoupling experiments show a mutual damping effect between the Pacific and Indian Ocean modes. Even though the Indian Ocean SSTAs become weaker and more distant from the ENSO core, the interbasin interactions persist. These findings demonstrate that the atmospheric bridge is a robust mechanism of the Indo-Pacific climate system, maintaining cross-basin connections even without the ITF.

Keywords

Indo-Pacific Climate Interactions

Refereance

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