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The South Pacific Meridional Mode: A Mechanism for ENSO-like Variability

Abstract

This study explores the relationship between atmospheric variations in the South Pacific and the tropical Pacific climate using climate models. The research identifies a variability pattern known as the "South Pacific Meridional Mode" (SPMM), which is clearly observed in climate models that consider only atmospheric and upper-ocean heat exchange. The SPMM operates similarly to the "North Pacific Meridional Mode" (NPM); when the southeast trade winds vary, they influence ocean evaporation and sea surface temperature (SST), thereby triggering the wind-evaporation-SST feedback mechanism, which transmits signals to the tropics.

Additionally, the study finds that cloud feedback may contribute to the development of SPMM, although this effect varies across different models. Despite the similarity in physical mechanisms between SPMM and NPM, SPMM has a stronger impact on the equatorial Pacific, directly altering the zonal variations in sea surface temperature and sea level pressure. Even in the absence of full ocean-atmosphere dynamic coupling, SPMM can still generate ENSO-like variability. Further analysis reveals that SPMM is also present in fully coupled climate models and observational data. This study highlights the importance of the Southern Hemisphere in tropical climate variability and suggests incorporating more observational data from the South Pacific to improve the accuracy of ENSO predictions.

Keyword

South Pacific Meridional Mode(SPMM)

Reference

Zhang, H., A. Clement, and P. Di Nezio, 2014: The South Pacific Meridional Mode: A Mechanism for ENSO-like Variability. *J. Climate*, **27**, 769–783, <https://doi.org/10.1175/JCLI-D-13-00082.1>.