

EGU24-2166, updated on 20 May 2024

<https://doi.org/10.5194/egusphere-egu24-2166>

EGU General Assembly 2024

© Author(s) 2024. This work is distributed under the Creative Commons Attribution 4.0 License.



Mechanisms of Tropical Pacific Decadal Variability

Antonietta Capotondi¹ and the CLIVAR Tropical Pacific Decadal Variability Working Group*

¹University of Colorado, CIRES, and NOAA/PSL, Boulder, United States of America (antonietta.capotondi@noaa.gov)

*A full list of authors appears at the end of the abstract

Naturally-occurring variability in the Tropical Pacific at timescales in the 7-70 years range, defined here as Tropical Pacific Decadal Variability (TPDV), modulates ENSO characteristics and its global impacts, and is linked to the rate of change of the globally-averaged surface temperature. Thus, understanding TPDV is integral to robustly separate the forced climate response from internally-generated climate variability and thereby produce reliable projections of the tropical Pacific and global climate. Several oceanic mechanisms have been proposed to explain TPDV, including off-equatorial Rossby wave activity, propagation of spiciness anomalies from the subtropical to the tropical regions, and changes in the strength of the shallow upper-ocean overturning circulations, known as "Subtropical Cells". However, uncertainties remain on the relative importance of these oceanic mechanisms. Another critical source of uncertainty concerns the nature and origin of the atmospheric forcing of those oceanic processes. Anomalous wind forcing could arise as a response to tropical Pacific sea surface temperature (SST) anomalies, be induced by Pacific extra-tropical influences or result from tropical basin interactions. This presentation critically reviews the nature and relative importance of the oceanic and atmospheric processes driving TPDV. Although uncertain, the tropical oceanic adjustment through Rossby wave activity is likely a dominant source of variability at decadal timescales. A deeper understanding of the origin of TPDV-related winds is a key priority for future research.

CLIVAR Tropical Pacific Decadal Variability Working Group: Shayne McGregor, Michael J. McPhaden, Sophie Cravatte, Neil J. Holbrook, Yukiko Imada, Sara C. Sanchez, Janet Sprintall, Malte F. Stuecker, Caroline C. Ummenhofer, Mathias Zeller, Riccardo Farneti, Giorgio Graffino, Shijian Hu, Kristopher B. Karnauskas, Yu Kosaka, Fred Kucharski, Michael Mayer, Bo Qiu, Agus Santoso, Andréa S. Taschetto, Fan Wang, Xuebin Zhang, Ryan M. Holmes, Jing-Jia Luo, Nicola Maher, Cristian Martinez-Villalobos, Gerald A. Meehl, Rajashree Naha, Niklas Schneider, Samantha Stevenson, Arnold Sullivan, Peter van Rensch, Tongtong Xu