UNIVERSITY of HAWAI'I MĀNOA

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SCHOOL OF OCEAN AND EARTH SCIENCE AND TECHNOLOGY

Department of Atmospheric Sciences Seminar Announcement

Hybrid Seminar: In-Person & Virtual

Where does the recharge really takes place for ENSO preconditioning?

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Research Institute for Development (IRD)
Presently at UMR EIO (Oceanian Island Ecosystems) lab.

You are invited to our hybrid Atmospheric Sciences Spring 2022 seminar at PHYSCI 217 or via Zoom.
When: March 2, 2022 at 3:30PM HST
Meeting admission: 3:15PM HST

Register in advance for this meeting:
https://hawaii.zoom.us/meeting/register/tJcof--qqjMiEtXX9J8yHV3K8NrAjdJsakyN

After registering, you will receive a confirmation email containing information about joining the meeting.
Please save this information for future seminars.

Abstract:

The El Niño Southern Oscillation (ENSO) is the leading mode of interannual climate variability, with large socioeconomical and environmental impacts. The Recharge Oscillator (RO), one of the two main ENSO conceptual models, considers two independent modes: the fast zonal tilt mode in phase with central-eastern Pacific Temperature (T_E), and the slow recharge mode in phase quadrature. However, usual metrics do not orthogonally isolate the slow recharge mode, being correlated with T_E. Furthermore the optimal Oceanic Heat Content (OHC) region is currently debated.

Here, through an objective approach to optimize RO equations fit to observations, we develop a new recharge index based on T_E-independent OHC_{ind} (T_E-variability regressed out). The optimal region is the western and southwestern Pacific (5°N-15°S,120°E-155°W) where the long-term OHC recharge occurs, integrating ENSO windstress anomalies: OHC_{ind_w+sw}. Southwestern Pacific OHC anomalies are due to the meridional asymmetry of ENSO-related Ekman pumping, associated with the South Pacific Convergence Zone.

The naturally-emerging question is then: why would a recharge of the southwestern Pacific favor an El Niño onset? Sensitivity experiments with a Linear Continuously Stratified (LCS) model suggest the following answer. The anomalous windstress curl in the Southwestern Pacific forces off-equatorial downwelling (in the La Niña case) Rossby waves, which propagate to the Pacific equatorial band as coastal and then equatorial Kelvin waves. They progressively favor positive OHC anomalies there (rather than zonal current).

To conclude, the OHC_{ind_w+sw} index is more physically and statistically coherent, could reconcile RO conceptual model with observations and climate models, and is more relevant for ENSO operational forecasts diagnostics.