2020-10-16, 350 words

Research Brief: Vertical Mixing and Air-Sea Heat Fluxes Play a Key Role in Driving ENSO-related Ocean Heat Content Changes

Since the beginning of October this year, the equatorial Pacific has transitioned into a La Niña state. La Niña and El Niño are the two phases of El Niño-Southern Oscillation (ENSO) and are associated with a change in Pacific Ocean temperatures that affects global weather. La Niña conditions this summer are expected to bring colder temperatures, more rainfall, an increased chance of flooding and more tropical cyclones to Northern and Eastern Australia. But what controls whether the Pacific is in an El Niño or La Niña state – or neutral?

An integral part of forecasting ENSO is the analysis of the equatorial Pacific's warm water volume (WWV). This quantity is defined as the volume of water above 20°C close to the Equator in the Pacific Ocean. WWV is particularly useful in ENSO forecasting because it often reveals the likelihood of an upcoming event 6-8 months in advance. However, knowledge of the precise mechanisms that influence WWV remains limited.

In a recent study, CLEX researchers simulated El Niño and La Niña events over the 1979-2016 period in a high-resolution global ocean model. Their aim was to examine the individual contribution of processes associated with (1) the heating and cooling of water in the equatorial band through exchange of heat with the atmosphere and with deeper, cooler layers, and (2) the movement of WWV toward or away from the Equator.

Typically, in ENSO research, WWV variability has been thought to be dominated by exchanges of warm water between the Equator and high latitudes. However, in this study, the researchers showed that the processes associated with the heating and cooling of water can be just as important, and often initiate changes in WWV. This has implications for how models represent the variability of recent ENSO events and their projected changes under a future climate.

- Paper: Huguenin, M. F., Holmes, R. M., & England, M. H. (2020). Key Role of Diabatic Processes in Regulating Warm Water Volume Variability Over ENSO Events. *Journal of Climate*, 1-61. https://doi.org/10.1175/JCLI-D-20-0198.1.