EGU24-1749, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-1749
EGU General Assembly 2024

Seasonality of Feedback Mechanisms Involved in Pacific Coastal Niño Events

Daniel Rudloff, Sebastian Wahl, and Joke Lübbecke
GEOMAR Helmholtz Centre for Ocean Research Kiel, Physical Oceanography, Germany (drudloff@geomar.de)

The 2017 Pacific Coastal Niño Event was the strongest of its type. It caused torrential rainfall and devastating flooding in Peru and Ecuador and thus rapidly caught the attention of the scientific community. Multiple studies have been conducted focusing on the causes and consequences of this event. While the strong connection between SST anomalies and local rainfall, especially during boreal spring, is well established, the causes of the extreme warming are still a subject of discussion. In this study, we focus on the seasonality of the effectiveness of mechanisms and feedbacks involved in coastal Niño Events, utilising reanalysis products and historical model simulations from the Flexible Ocean and Climate Infrastructure (FOCI).

The 2017 event stands out due to its strength and timing as it occurred earlier in the year than most other events. We find that the atmospheric conditions during this time of year are very different due to the presence of atmospheric convection which modulates the SST-cloud feedback. Further, the event coincided with the season of strongest wind-driven upwelling. This combination enables a different forcing of a short but strong event. Additional model sensitivity experiments are performed for a better understanding of underlying mechanisms. We show how the same local wind stress forcing acts differently in different seasons, with its strongest impact during the months of strongest entrainment. Events forced by local heat fluxes and wind stress forcing only do not show any subsurface warming, which is found to be the main reason for their rapid decay. Even though the atmospheric response to a coastal warming varies seasonally, without any subsurface forcing, e.g., the events cannot be sustained through atmospheric feedbacks.