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ENSO-driven fluctuations in the vertical extent of oxygen-poor waters in the oxygen minimum zone of the Eastern Tropical South Pacific

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The El Niño Southern Oscillation (ENSO) with its warm (El Niño) and cold (La Niña) phase has strong impacts on marine ecosystems off Peru. This influence extends from changes in nutrient availability to productivity and oxygen levels. While several studies have demonstrated the influence of ENSO events on biological productivity, less is known about their impact on oxygen concentrations. In situ observations along the Peruvian and Chilean coast have shown a strong water column oxygenation during the 1997/1998 strong El Niño event. These observations suggest a deepening of the oxygen minimum zone (OMZ) along the continental shelf. However, due to reduced spatial coverage of the existing in situ observations, no studies have yet demonstrated the OMZ response to El Niño events in the whole Eastern Tropical South Pacific (ETSP). Herein, we provide a comprehensive analysis of the ENSO influence on OMZ dynamics. Interannual variability of the OMZ during the period 1990-2010 is derived from a coupled physical-biogeochemical model. Our results show a reduction of the vertical extent of the OMZ during the El Niño phase. During La Niña phase, there is a vertical expansion of oxygen-poor waters. These fluctuations in OMZ extent are due to changes in oxygen supply into its core depth from both lateral and vertical margins of the OMZ.

Position

Postdoc

Affiliation

GEOMAR Helmholtz Centre for Ocean Research Kiel

Email Address

yjose@geomar.de

Are you a SFB 754 / Future Ocean member?

Yes

Primary author(s) : Dr JOSE, Yonss (GEOMAR Helmholtz Centre for Ocean Research Kiel); Dr SCHMIDTKO, Sunke (GEOMAR Helmholtz Centre for Ocean Research Kiel); Dr STRAMMA, Lothar (GEOMAR Helmholtz Centre for Ocean Research Kiel); Prof. OSCHLIES, Andreas (GEOMAR Helmholtz Centre for Ocean Research Kiel)

Presenter(s) : Dr JOSE, Yonss (GEOMAR Helmholtz Centre for Ocean Research Kiel)

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