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Vertical structure variability of the OMZ in the Eastern Tropical Pacific

Boris Dewitte (1), Ivonne Montes (2), Aurélien Paulmier (3), Andreas Oschlies (2), and Véronique Garçon (4)
(1) LEGOS/IRD, Toulouse, France, (2) GEOMAR, Kiel, Germany, (3) IMARPE/LEGOS/IRD, Lima, Peru, (4) LEGOS/CNRS, Toulouse, France

The processes maintaining the Oxygen Minimum Zone (OMZ) of the Eastern Tropical Pacific are still uncertain. This region is embedded into the so-called shadow zone of the eastern Pacific so that the weak thermocline ventilation is the background mechanism that explains to some extent its mean spatial structure. However biogeochemical processes take place in regions where the environment is highly variable leading to characteristic vertical scales of variability of the minimum O_2 concentration that do not necessarily reflects the ocean dynamics. This can be the case for instance near the coast in the vicinity of the thermocline which is connected to the remote equatorial variability (Kelvin wave) or/and locally wind forced. Here we document the vertical structure variability of the OMZ from regional biogeochemical coupled model simulations. We use the linear formalism of the ocean dynamics to define metrics of the O_2 vertical structure variability in order to compare the different timescales and support the interpretation. The model is forced by climatological boundary conditions but, due to the non-linear nature of the coupled system, it also allows assessing the vertical structure variability associated to intraseasonal and interannual timescales. The results indicate that at seasonal timescale the relatively large vertical scales of variability of the O_2 can be interpreted to some extent as resulting from the advection of the minimum O_2 concentration by the vertically propagating oceanic variability. At intraseasonal (interannual) timescales, within the model configuration, the minimum O_2 concentration variability is confined within the oxycline, with vertical scales of the order of $\sim$ 200m. We also illustrate the sensitivity of the results to the resolution and model configuration (location of boundaries).