

Circulation, eddies and trends in the oxygen minimum zone off Peru

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A strong oxygen minimum zone (OMZ) is located in the tropical eastern South Pacific off Peru. Recent observations show that on the equatorial side of the OMZ zonal current bands dominate the oxygen budget, while on the poleward side eddies contribute considerably. The circulation in the OMZ off Peru is investigated based on cruises in January/February 2009 and November/December 2012 and is compared to model results. A hindcast experiment for the period 1948 to 2009, forced by atmospheric reanalysis products, merged with satellite data (CORE v.2) of the 0.1° high-resolution model of the Tropical Pacific (TROPACO1) is used. The modelled circulation is subject to strong interannual variability and agrees remarkably well with observations, when comparing them at the same point in time. In the equatorial channel oxygen-rich water is transported to the eastern Pacific by the zonal equatorial current bands. Near the American continent this water is transported poleward by subsurface currents near the shelf. In many regions of the OMZ the circulation is sluggish. Hydrographic and biogeochemical measurements in eddies as well as float tracks show that eddies transport anomalous water masses and biogeochemical properties offshore. Available oxygen deficits in anticyclonic eddies compared to the surrounding water are about $10 \times 10^{16} \mu\text{mol}$. From repeat hydrographic and historical data trends in oxygen can be determined. In most tropical regions oxygen has decreased in the last decades. However, in the eastern tropical Pacific Ocean oxygen trends are not everywhere negative, there are also regions with increasing oxygen. Typical oxygen trends for the last few decades in the upper ocean range from -0.5 to $+0.4 \mu\text{mol kg}^{-1} \text{yr}^{-1}$.