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Low-oxygen subsurface eddies in the eastern South Pacific

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Modeling studies have shown that mesoscale eddies significantly contribute to modulate the variability of the oxygen minimum zone (OMZ) of the eastern South Pacific at seasonal and interannual time scales. Nevertheless, only few observations have shown the properties of these eddies. Particularly subsurface (intrathermocline) eddies may play an important role in the dynamics of the southern tip of this OMZ. In this work we analyze the characteristics of these eddies based on underwater glider observations, along with oceanographic cruises and satellite data. We also combine our observations with results from a high resolution numerical model to analyze the generation mechanism of these subsurface eddies. Observations show that the eddies are characterized by a core with high salinity (SA > 34.6 g kg^{-1}), low oxygen (DO < 0.5 mL L^{-1}) and relatively low potential vorticity ($f\,PV < 10^{-13}$ s^{-4}, where f is the Coriolis parameter). The eddy core is typically centered around σ_θ ~ 26.5 kg m^3 (150-200 m depth) and their diameters are about 50 km, transporting typically ~0.2 Sv of very low-oxygen (< 0.5 mL L^{-1}) waters offshore. The eddy core properties coincide with the water mass that is transported by the Peru-Chile Undercurrent. Our modeling study shows that the generation of the subsurface eddies is associated with the separation of the Undercurrent from the slope and current reversals (northward subsurface flow) close to the slope.