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Impact of Intrathermocline eddies on seamount and oceanic island off Central Chile: Observation and modeling

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In the Southeast Pacific, oceanographic processes that sustain the biological production necessary to maintain the ecosystems associated to seamounts and oceanic islands are still poorly understood. Recent studies suggest that the interaction of mesoscale and submesoescale eddies with oceanic islands and seamounts could be playing an important role in the time-space variability of primary production. In this work, research cruises, satellite data and Regional Ocean Modeling System (ROMS) results have been used to describe the main characteristics of intrathermocline eddies (ITE) and their impact on the Juan Fernández archipelago (JFA), off central Chile. The JFA is located off the coast of central Chile (33°S), and is composed of three main islands: Robinson Crusoe (RC), Alejandro Selkirk (AS) and Santa Clara (SC). Between the RC and AS are located the westernmost seamounts (JF6 and JF5) of the Juan Fernández archipelago. Satellite altimetry data (sea surface height from AVISO) were used to detect and track mesoscale eddies through eddy-tracking algorithm. Physical, chemical and biological parameters as temperature, salinity, dissolved oxygen and fluorescence were measured in the water column at JF5 and JF6, and along the coast off central Chile (30-40°S).

Results from the research cruise exhibit the interaction between an ITE and the seamount JF6. Eddy-tracking results showed that the ITE observed at the JF6 was formed at the coast off central-southern Chile, traveled ∼900 km seaward and after ∼9 months reached the JF5 and JF6 region. Observations along the Chilean coast confirmed that the coast corresponds to the formation area of the observed ITE. In this region, ITEs are represented by subsurface lenses (∼100 km diameter; 400 m thickness) of homogeneous salinity, nutrient rich and oxygen-poor equatorial subsurface water mass (ESSW) which is transported poleward by the Peru-Chile undercurrent in the coastal band and seaward by ITEs. The effect of ITEs on the ecosystem productivity around the Juan Fernández archipelago (JFA) is discussed.