

Variation of the Thermohaline Structure in the Western
Equatorial Pacific Upper Ocean

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Abstract

Processes which control the upper ocean thermohaline structure in the western equatorial Pacific are examined using the available hydrographic data, surface forcing data and a simple mixed layer model.

A thick isothermal layer is frequently found in the region of the South Equatorial Current. Analyses of surface forcing data have indicated that the thick isothermal layer in the western equatorial Pacific is found during periods of light precipitation, strong winds and downward Ekman pumping in the central Pacific. These results are consistent with the subduction mechanism hypothesized by Lukas and Lindstrom (1991).

A Lagrangian mixed layer model is used to investigate the hypothesis. The one-dimensional bulk mixed layer model is integrated along the trajectories derived from a non-linear 1-1/2 layer reduced gravity model forced with actual wind fields. This simple model is able to simulate the isothermal layer and its variation. The subduction mechanism is evident in the model results. During the period of strong South Equatorial Current, the warm and salty mixed layer waters in the central Pacific are subducted below the fresh shallow mixed layer in the western Pacific. However, the subduction mechanism is not evident when upwelling Rossby waves reach the western equatorial Pacific or when a remarkable deepening of the mixed layer occurs due to the strong wind and light precipitation in the western equatorial Pacific.