Abstract View

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Ventilation of the Subtropical North Pacific: The Shallow Salinity Minimum

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ABSTRACT

The shallow salinity minimum of the subtropical North Pacific is shown to be a feature of the ventilated, wind-driven circulation. Subduction of low salinity surface water in the northeastern subtropical gyre beneath higher salinity water to the south causes the salinity minimum. Variation of salinity along surface isopycnals causes variations in density and salinity at the minimum.

A model of ventilated flow is used to demonstrate how the shallow salinity minimum can arise. The model is modified to account for nonzonal, realistic winds; it is also extended to examine the three-dimensional structure of the western shadow zone. The boundary between the subtropical and subpolar gyres is given by the zero of the zonal integral of Ekman pumping. The western shadow zone fills the subtropical gyre at the base of the ventilated layers and decreases in extent with decreasing density. For parameters appropriate to the North Pacific, the eastern shadow zone is of very limited extent.

Observations of salinity and potential vorticity within and below the ventilated layer bear out model predictions of the extent of the western shadow zone.