Abstract View

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Oceanic Subarctic Fronts of the Central Pacific: Structure of and Response to Atmospheric Forcing

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ABSTRACT

The oceanic fronts in the subarctic region of the central North Pacific are investigated and related to atmospheric forcing. The thermohaline structure indicates a near balance between horizontal temperature and salinity gradients, resulting in weak density gradients and the absence of baroclinic jets. Large temperature inversions are found inside the permanent subarctic halocline and pycnocline, which are attributed to overrunning of cool, low-salinity water from the north over warmer, more saline water from the west. During summer, a shallow SOFAR channel is found between the bottom of the seasonal pycnocline and the top of the permanent pycnocline. The frontal structure in the latitude belt between 39° and 47°N is complicated and is characterized by multiple thermohaline and sound velocity fronts.

Frontogenesis in the mid-Pacific depends strongly upon differential advection of the Ekman type. During fan, characteristic magnitudes of temperature frontogenesis due to this cause are 1°C (100 km)$^{-1}$ per week and those of salinity frontogenesis are 0.1‰ (100 km)$^{-1}$ per week. Differential radiative heat flux reinforces temperature frontogenesis during fall. The magnitudes of frontogenesis expected from atmospheric forcing agree with those seen by satellite, in the case of sea surface temperature fronts.