Abstract View

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Deep Currents in the Central Subarctic Pacific Ocean

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ABSTRACT

Sections of closely spaced CTD stations along Longs. 165°W, 175°W and 175° E, in combination with 14-month current records from the central longitude, define two deep, nearly zonal currants, with speed increasing upward, in the subarctic Pacific. One flows eastward above the Aleutian Rise and Aleutian Trench, and appears to be a concentration of geostrophic flow forced by the bottom topography. The other flows westward along the Aleutian Island Arc, and is the northern-boundary current predicted by deep-circulation theory. Both currents reach to the sea surface, the boundary current being simply the deep part of the Alaskan Stream. The current records were too few to permit better than rough estimates of volume transports but to the extent that they could be combined with thermal-wind calculations they suggest, at 175°W, (1) a transport of 28 × 10^6 m^3 s^{-1} for the Alaskan Stream, of whch 5 × 10^6 m^3 s^{-1} was found below 1500 m, and (2) a transport of around 20 × $1O^6$ m^3 s^{-1} for the eastward jet, of which some 5 × 10^6–10 × 10^6 m^3 s^{-1} was estimated below 1500 m.

The deep water in the area surveyed was so nearly homogeneous that salinity, oxygen, and nutrients could generally be calculated from potential temperature within measurement error, these additional properties were therefore of only limited use in tracing the deep flow. However, temperature maps at depths of 2 and 4 km demonstrate continuity of the two deep currents across the 60° of longitude between Japan and the Gulf of Alaska. The eastward jet can be tracked back through the Emperor Seamount chain to the Zenkevich Rise off Japan, while the deep Alaskan Stream can be followed downstream to Long. 180°, where it separates from the boundary and flows due westward to the Emperor Seamount chain, which it rounds to the north, prior to its becoming the southward flowing deep western boundary current of the subarctic Pacific. Other details of the water-property fields are described in the text, and comparisons are made with the deep subpolar boundary flow of the North Atlantic.

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