Abstract View

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The Anticyclonic, Baroclinic Eddy off Sitka, Alaska, in the Northeast Pacific Ocean

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ABSTRACT

Among the many mesoscale eddies found in the northeast Pacific Ocean is a well-developed, anticyclonic baroclinic eddy, situated within a few hundred kilometers of Sitka, Alaska (57°N. 138°W). It has definitely been observed during spring and summer 1958, summer 1960 and summer 1961. Observations made at other times show some evidence of its occurrence also. The trajectories of three NORPAX drifting buoys for April–May 1977 also indicated the probable presence of an eddy there. The eddy, whose diameter ranges from 200 to 300 km and whose depth extends to 100 m and probably to as much as 2000 m, recurs at the same location. The center of the eddy is characterized by the following features: the surface water is less saline and only somewhat warmer than at its periphery; at depths within and below the halocline it is warmer, less saline and contains more dissolved oxygen than at the periphery; and a warm core is situated within the halocline. The halocline is usually depressed by less than 100 m but the isopycnals below the halocline are depressed by as much as 185 m. The average surface speed of the eddy, at about 50 km from center, is approximately 15 cm s^{-1}, with the maximum reaching almost 40 cm s^{-1} (relative to 1000 db surface) while the average baroclinic transport in the upper 1000 db layer is 5×10^6 m^3 s^{-1}, with maximum approaching $8\times10^{6,}$ m^3 s^{-1}. On the other hand, the average surface speed of the eddy at about 70 km from center, according to drifting-buoy trajectories, is 70 cm s^{-1} with the maximum daily speed of 110 cm s^{-1}.

The eddy appears to have formed locally and persisted for about one-half year and there is evidence that it had persisted even longer. Attempts to relate the eddy to the distribution of wind-stress curl in the region and to the variability of mean sea levels observed along the nearby coast did not yield conclusive results. It is probable that the main generating mechanism for the eddy is the atmospherically-forced planetary waves that undergo reflection in the vicinity of the eddy. Topographic interaction may also contribute to the production of the eddy. The lack of systematic data with adequate spatial and temporal coverages does not permit drawing firm conclusions regarding generation, maintenance and dissipation of the eddy. Further studies are needed to understand the dynamics associated with the eddy.

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