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[Volume 8, Issue 6 \(November 1978\)](#)

Journal of Physical Oceanography

Article: pp. 946–951 | [Abstract](#) | [PDF \(506K\)](#)

On the Mid-Depth Circulation of the North Pacific Ocean

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(Manuscript received February 27, 1978)

DOI: 10.1175/1520-0485(1978)008<0946:OTMDCO>2.0.CO;2

ABSTRACT

The large-scale oxygen distribution within the upper 1500 m of the North Pacific Ocean reveals an extra zone of low oxygen near 30–40°N in the east that is not easily compatible with a simple large-scale subtropical anticyclonic flow at mid-depth. Further examination of the relative flow patterns suggests that the large subtropical gyre generally supposed to obtain at the sea surface has a very strong return flow southward, just east of the Kuroshio, and that this flow turns eastward near 20–25°N and extends eastward at least as far as 16°E. At greater depths, near 1000 m, it continues eastward all across the Pacific. The area of high steric height within the anticyclonic gyre at this depth is thus shaped like the letter C, with two branches extending eastward from the western boundary. Each branch has an eastward flow on its north side and a westward flow on its south side. The highest oxygen values at mid-depth are found near the western boundary, deriving from the South Pacific, and the two eastward flows carry the higher oxygen waters eastward as two tongues of higher oxygen values, leaving an area of lower oxygen near 30–40°N in the east.

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