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[Volume 12, Issue 8 \(August 1982\)](#)

Journal of Physical Oceanography

Article: pp. 851–861 | [Abstract](#) | [PDF \(740K\)](#)

Lateral Mixing Processes in the Gulf Stream

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(Manuscript received March 12, 1979, in final form May 4, 1982)

DOI: 10.1175/1520-0485(1982)012<0851:LMPITG>2.0.CO;2

ABSTRACT

An oceanographic section across a large Gulf Stream meander was completed in April 1974. Evidence is presented for at least two mechanisms of cross-stream exchange. Intrusions of warm Gulf Stream water into the Slope Water region in the upper 50–100 m are documented and compare well with surface temperature patterns observed by satellite. A crude estimate based on 18 satellite observations over two periods, each of two-months duration, suggests that this mechanism may extrude as much as $4 \times 10^5 \text{ m}^3 \text{ s}^{-1}$ into the Slope Water. This could produce a cross-stream temperature transport of as much as $1.6^\circ\text{C cm s}^{-1}$. Temperature structure in the main thermocline of the front between 10 and 19°C sums to indicate strong cross-stream interleaving. One possible interpretation is that there is a cross-stream cellular circulation with a vertical length scale of ~ 250 m. Such a circulation could be induced by cross-stream accelerations due to curvature in the meander.

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