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Eddy-Potential vorticity Fluxes in the Gulf Stream Recirculation

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ABSTRACT

The local effect of the mesoscale eddy field on the mean potential vorticity distribution of the Gulf Stream recirculation region is determined from the quasi-geostrophic eddy potential vorticity flux. This flux is calculated by finite difference of current and temperature time series from the Local Dynamics Experiment. This long-term array of moorings is the only experimental data from which the complete eddy flux can be calculated. The total eddy flux is dominated by the term due to the time variation in the thickness of isopycnal layers. This thickness flux is an order of magnitude larger than the relative vorticity flux. The total flux is statistically significant and directed 217°T to the southwest with a magnitude of $1.57 \times 10^{-5} \text{ cm s}^{-1}$. The direction of the eddy flux with respect to the mean large-scale potential vorticity gradient from hydrographic data indicates that eddies in this region tend to reduce the mean potential vorticity gradient.

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