Abstract View

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Transient Gulf Stream Meandering. Part II: Analysis via a Quasi-Geostrophic Time-Dependent Model

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ABSTRACT

Simultaneous path and bottom velocity measurements made during the Transient Meander Experiment, reported in Part I, are analyzed in terms of a quasi-geostrophic thin jet model of the meandering Gulf Stream. The theory gives an explicit representation of the velocity field which may be used to decompose the observed velocities. This representation is shown to be consistent with the observations. The dynamics of this model provides an equation of the path of the Stream, a cross-sectional average of the vorticity equation. A linearized form of this equation is used to examine the relations between the space and time scales of the variability. The historical data on the space and time scales of the meandering are shown to be consistent with those implicit in the linearized form of the path equation. The contributions to the local vorticity balance are estimated from the observations reported in Part I. The data, although complicated by observational errors, suggest a balance between the local rate of change of vorticity and the advection of vorticity. The contributions from vortex stretching due to variable topography appear to be unimportant for the scales of the meandering. The local dynamics appears to be fully time-dependent.