Abstract View

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Satellite Observations of the Influence of Bottom Topography on the Seaward Deflection of the Gulf Stream off Charleston, South Carolina

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ABSTRACT

High-resolution thermal infrared data from the NOAA polar orbiting satellites are studied for the Gulf Stream between Florida and Cape Hatteras from the fall of 1974 to the spring of 1977. The sea surface temperature boundaries of the current are detectable in infrared images from fall to spring of each year. Seasonal changes in air-sea temperatures appear to limit the detection of the surface temperature gradients during the warmer months. A persistent seaward deflection of the western boundary is found southeastward of Charleston, South Carolina, in the vicinity of a bulge in the continental slope. The maximum deflection angle is time dependent and varies from 60° to 120° from true north. Downstream from the initial deflection, the western boundary is often wave-like. Several distinct and repeatable wave patterns are described. The separation between adjacent wave crests (wavelength) averages 150 km and the waves appear to move northward at an average phase speed of 40 km day^{-1}. Monthly frequency distributions of wavelength show that values range from 90 to 260 km downstream from the deflection and wavelengths increase between February and April of 1977. The phase of the low-frequency wave motion is illustrated in space-time diagrams during February 1976 and April 1977. The small-scale cyclonic spin-off eddies previously described by Lee and Mayer (1977) as forming off Florida appear to increase in amplitude downstream from the deflection. On a seasonal time scale, the variability of the position of the western boundary of the Gulf Stream increases by a factor of 3 downstream from the deflection. This suggests that the current is forced by the change in the depth at the bulge in the continental slope off Charleston.

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