Abstract View

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The Frequency-Dependent Structure and Dynamics of Flow Fluctuations in the Strait of Belle Isle

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ABSTRACT

We present an analysis of 84 days of current meter, sea level and hydrographic data collected in the Strait of Belle Isle, a long, narrow strait which connects the Atlantic Ocean and the Gulf of St. Lawrence. Along-strait currents are highly coherent throughout the entire cross section of the strait at all frequency, but the ratio of near-bottom to near-surface flows shows a well defined increase with increasing frequency. This frequency dependence is compared to the model of Garrett and Petrie after modification to allow for the finite thickness of the bottom Ekman layer. The model can best account for the frequency-dependent amplitude ratio if the spindown time in the strait is 4 hours.

We also compare the model predictions to observations of the ratio of the surface minus bottom pressure fluctuation on the north side of the strait to the pressure fluctuation difference across the strait at the surface. We again find reasonable agreement with theory for a friction parameter corresponding to a spindown time of 4–6 hours, equivalent to a quadratic bottom drag coefficient of about 5–8 × 10^{-3}.

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