Abstract View

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Subtidal Sea Level Fluctuations and Their Relation to Atmospheric Forcing along the North Carolina Coast

David A. Brooks

Department of Geosciences, North Carolina State University, Raleigh 27607

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ABSTRACT

Coastal sea level fluctuations in Onslow Bay are selectively coupled with local atmospheric forcing variables. The coupling is strongest in period bands of 2.5–3.5 and ≳10 days, which span absolute zero group speed, barotropic continental shelf wave periods. The phase of the sea level disturbances propagated upstream from Beaufort to Wilmington, N. C., as expected for stable discrete shelf waves, consistent with earlier results by Mysak and Hamon (1969). The “barometric function”, when corrected for coherent wind stresses, indicated selective, super barometric atmospheric-pressure-to-sea-level coupling in the zero group speed period bands. Stochastic models of atmospheric cold front wind stress and wind stress curl fields were found to selectively force barotropic shelf wave responses near zero group speed periods and wavelengths. A strong Onslow Bay response to the model cold front occurred near the second harmonic forcing frequency, the wind stress curl contributed importantly to the shape and the amplitude of the response spectrum. The results suggest that shelf waves forced by the atmosphere contribute to the Gulf Stream meander field off North Carolina.