# Final Report
# for
# A study of continental shelf nonlinear internal-wave propagation: Simulation and comparison with experiment

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For this internal wave study we have analyzed data from the summer shelfbreak primer which was conducted on the New England continental shelf in July of 1996. The principal internal wave observations from this experiment were collected from an upward looking ADCP and two densely instrumented thermistor moorings spanning 9.1 km distance from the 145 m isobath to the 120 m isobath. A third mooring with a sparse distribution of thermistors was located 42 km away from the ADCP. The observations show rapid evolution of the internal tide into an internal tide bore with associated high frequency internal solitons (i.e. the appellation solibore ). The observations also reveal a high degree of variability in solibore development with some tide cycles showing strong solibores and other showing no solibores. There is evidence of correlations between solibore formation and the shelfbreak front jet with strongest solibore development occuring when the jet is oppositely directed to the internal tide propagation, reducing the effective group velocity of the wave packet and allowing more time for non-linear steepening. Estimates of the energy transfer rate between the geostrophic shear of the shelfbreak front jet and the internal tide are in-sufficient to explain the solibore variability. Average vertically integrated potential energy density is roughly 0.7 $kJ/m^2$ and average vertically integrated kinetic energy densities are roughly 1.8 $kJ/m^2$ which is consistent with WKB scaling. For a group velocity of 0.7 m/s shoreward energy fluxes are roughly 1.75 kW/m. Time separations between solibores have a mean of roughly 12.4 hrs and a variance of 2 hrs, consistent with a 15% variability in the group velocity or a 5 km variation in the generation region location.

For this study we created a numerical model of the inviscid Navier-Stokes equations in 2-D with rotation and with a flat bottom. Our code is capable of modeling solibore evolution from arbitrary initial conditions but it is limited in applicability to the PRIMER data because of the flat bottom assumption and the absence of a geostrophic ambient field (i.e. a shelfbreak front jet).

We have written a paper on the primer data analysis which has been submitted to the JGR special issue on the Coastal Mixing and Optics, and shelfbreak primer experiments.

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