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Numerical simulation of internal wave generation and propagation in the South China Sea: sensitivities to forcing, grid resolution, ambient field and nonhydrostatic effects

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The effects of different tidal forcings, ambient hydrography, 2D vs 3D and grid size were studied in numerical simulations of internal bore and soliton generation and propagation. In addition, differences obtained with hydrostatic and nonhydrostatic models were also examined. The experiments were carried out in the Luzon Strait and the eastern part of the South China Sea. Internal wave generation was forced by various components of the barotropic tide passing over the sills between the islands in the Luzon Strait. Initial density profiles were derived from climatology, CTD observations collected between April and July of 2001, and model results obtained with the POM model. High resolution 3-D simulations focussed on subregions centered on the Luzon Strait, in the 118E-122E and 19N-22N geographic domain. Model resolutions varied from 100m to 1 km in the horizontal and 5m to 100m in the vertical (using sigma-coordinates). Whereas the propagation speed of the hydrostatic and nonhydrostatic bores were close, only the latter developed into solitons. To seek an explanation, relevant analytical solutions are examined. For a barotropic forcing amplitude of 25 cm/sec, the maximum velocities over the shallow sills exceeded 2 m/sec.