Abstract View

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The K_1 Tide on the Continental Shelf from Nova Scotia to Cape Hatteras

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ABSTRACT

A description is given of the K_1 tide over the northeast continental shelf off North America from Nova Scotia to Cape Hatteras. Analyzed pressure data obtained from W. Brown and J. Irish (University of New Hampshire) have been used to draw up the K_1 cotidal map and existing current data have been analyzed to give the associated velocity map. Offshore, there is a sweep of the tide from north to south, in general agreement with what is known of the oceanic K_1 tide in the North Atlantic. On the shelf, there is a trapping of phase lines to the coast, creating, in particular, a virtual amphidrome south of Cape Cod. Maximum amplitudes of around 15 cm are found in the Gulf of Maine, lowest around 7 cm south of Cape Cod. The K_1 currents are generally barotropic and current ellipses are aligned with the local topography. Maximum currents of about 10 cm s^{-1} are found south of Cape Cod.

A simple model for the K_1 pressure field is developed using the free and forced inviscid barotropic waves on a two-dimensional shelf. The theoretical solutions are fitted to the K_1 pressure data using a least-squares method. The model results confirm that the K_1 tide is composed of both a Kelvin wave and a shelf wave, with the Kelvin wave dominating the pressure field, and the shelf wave dominating the current field. The two free waves account for 99% of the variance of the difference of the observed pressures and the calculated forced wave, but unfortunately some of the observed features are not accurately reproduced. Possible model improvements should include the addition of bottom friction and longshore topographic variations (especially the changes in shelf geometry associated with the Gulf of Maine).

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