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Simulation of Barotropic and Baroclinic Tides off Northern British Columbia

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ABSTRACT

The tidal response of northern British Columbia coastal waters is studied through simulations with a three-dimensional, prognostic, primitive equation model. The model is forced at the boundaries with the leading semidiurnal and diurnal constituents and experiments with stratified and homogeneous fluid are compared. The barotropic response shows good agreement with previously published studies of tides in the region. A comparison with tide gauge measurements indicates that average relative rms differences between observations and the model surface elevation field are less than 5% for the largest constituents.

An internal tide is generated in cases where the model is initialized with a vertical stratification. Diagnostic calculations of the baroclinic energy flux are used to identify regions of generation and propagation of internal tidal energy. With a representative summer stratification, the integrated offshore flux is about 0.5 gigawatts, higher than previously estimated from theoretical models. Comparisons between observed and modeled M_2 current ellipses are discussed for several moorings and demonstrate the significant influence of the internal tide.

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