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The Structure of Three-Dimensional Tide-Generating Currents. Part I: Oscillating Currents

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ABSTRACT

A simple method for computing first-order three-dimensional tidal currents is presented. The method involves solving separately the equations for the depth-averaged velocity and the vertical velocity gradient. The interaction between these two equations is through the bottom friction. For the depth-averaged velocity, it was found that the equation of motion could be approximated by the shallow-water equation and thus could be solved easily by a numerical method. The vertical variations of the tidal current, which are functions of the depth-averaged velocity, were computed for various forms of the vertical eddy viscosity and compared to observations.

The dynamics of the tidal current are discussed and explained through the variation in acceleration that results from the frictional and Coriolis forces, and in terms of the interaction between these two forces.

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