Abstract

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Numerical Solution of the Rotating Shallow Water Flows with Topography Using the Fractional Steps Method

The two-dimensional nonlinear shallow water equations in the presence of Coriolis force and bottom topography are solved numerically using the fractional steps method. The fractional steps method consists of splitting the multi-dimensional matrix inversion problem into an equivalent one dimensional problem which is successively integrated in every direction along the characteristics using the Riemann invariant associated with the cubic spline interpolation. The height and the velocity field of the shallow water equations over irregular bottom are discretized on a fixed Eulerian grid and time-stepped using the fractional steps method. Effects of the Coriolis force and the bottom topography for particular initial flows on the velocity components and the free surface elevation have been studied and the results are plotted.