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A Semi-Implicit Two-Dimensional Model of Estuarine Circulation

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ABSTRACT

A semi-implicit, two-dimensional (in a vertical plane) model is developed for circulation in the partially mixed estuary. Comparisons between the semi-implicit and explicit method are made in the simulation of tidal, wind-driven and density-driven circulations. In general, the two model results are in good agreement in velocity and density computation; the semi-implicit method, however, fails to simulate the surface seiche oscillation. On the other hand, the semi-implicit method is more efficient; depending on the horizontal space resolution, the semi-implicit method can result in orders of magnitude saving in computer time. Application of the semi-implicit model to the Potomac River indicates large longitudinal and vertical changes in tidal, density-driven and wind-driven circulations, which suggests that two-dimensional (in a vertical plane) modeling is essential in the transport and mixing study.

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