

Process-Oriented Tests to Validate Baroclinic Shallow Water Transport Models.

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ABSTRACT

A first step often taken to validate baroclinic codes is a series of process-oriented tests, as those suggested by Haidvogel and Beckman¹, among others. One of these is the so-called “lock-exchange” test, wherein water of different densities is separated by a vertical barrier, which is removed at time zero. Until now, validation has primarily consisted of comparing the propagation speed of the wave front, as predicted by simplified theory, to model results. In addition, inter-model comparisons of the lock-exchange test have been used to validate codes. Indirect measures, such as mass balance residuals and time to equilibrium, have also been employed. Herein, we present a high resolution data set, taken from a lab-scale model, for direct and quantitative comparison of experimental and numerical results. Data is captured every 0.2 seconds using high resolution digital photography, with salt concentration extracted by comparing pixel intensity of the dyed fluid against calibration standards. Two scenarios were considered: symmetric and asymmetric mixing, depending on the position of the vertical barrier. Model comparison for a continuous and discontinuous Galerkin transport code coupled to the continuous Galerkin ADCIRC hydrodynamic model will be presented, along with parameter sensitivity studies.

1. D. Haidvogel and A. Beckman. *Numerical Ocean Circulation Modeling*, Imperial College Press, 320 pp. 1999.