Abstract View

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Modeling the Benthic Boundary Layer

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ABSTRACT

A second-order turbulence closure model is used to study the development of the benthic boundary layer. Results are presented on the effects of a time-dependent oscillatory forcing flow and an initially stably stratified density gradient. Using typical values for the deep ocean, the model suggests a development time for the layer of ~ 10 days.

The results of the model show that for a neutrally stratified layer, although the flow is oscillating, the turbulence is essentially in local equilibrium and that an eddy viscosity approach is appropriate to determine the equilibrium boundary-layer height. The time development of the two models was however different. For an initially stratified case, although local shear production of turbulence is suppressed nest the top of the layer, diffusive effects enable the boundary layer to continue growing past a height set by a critical value of the Richardson number based on shear flow stability arguments.

Attempts to relate the growth rate of the boundary layer to the integral properties of the flow have not been totally successful and highlight the difficulties in doing so. They are, however, consistent with experimental results.