On the performance of a generic length scale turbulence model within an adaptive mesh finite element ocean model

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A two-equation turbulence model, the Generic Length Scale (GLS) model as proposed by Umlauf and Burchard, 2003 [J. Marine Research 61 (2003) 235] is implemented in a finite-element, unstructured mesh, non-hydrostatic, 3D ocean model (ICOM). These two equations, along with several stability functions, can represent many popular mixed layer turbulence closures, including the k-kl (cf. Mellor-Yamada Level 2.5), k-ϵ, and k-ω schemes. The implementation adds flexibility to the model by providing a range of turbulence closure selections in a single oceanographic model and allows comparison and evaluation of turbulence models in an otherwise identical numerical environment.

This talk describes the GLS model as implemented in ICOM and shows how it compares to the leading 1D turbulence model, GOTM. We show that the seasonal mixed layer depth cycle can be accurately modelled at Ocean Weather Station PAPA on both fixed and adaptive meshes, where adaptive meshes reduce the computational time whilst maintaining or improving the best fixed mesh result.

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