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LES-COAST: a large eddy simulation tool for coastal hydrodynamics

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We discuss a LES methodology for large-scale, environmental problems. Specifically we discuss peculiar features of the model LES-COAST, developed by IE-*Fluids*, University of Trieste, for the Italian Agency of Environmental Protection (APAT). The model is suited for marine, complex-geometry, anisotropic problems, typically occuring in coastal engineering. The model solves the curvilinear-coordinate formulation of the filtered Navier-Stokes equation using finite differences over structured grids. Geometrical complexity is managed using immersed boundaries as described in Roman et al. (Computer & Fluids, in press, 2009). A new wall-layer parametrization is used to model the near wall layer which cannot be directly resolved in applicative high Reynolds number applications. Due to grid anisotropy occurring in coastal problems a two-SGS eddy viscosity model has been developed.

Examples of application of the model are also discussed. Specifically we show some results of the simulation of the Tevere river runoff in the Tyrrhenian sea and of the three-dimensional transport and mixing in the Muggia Bay (Gulf of Trieste) under breeze forcing. The numerical model is presently used for research as well for consultant activity for the prediction of dispersion phenomena in shallow-water near-shore areas.