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Finite-Volume Optimal LES Formulations for Coarsely Resolved Channel Flows[1] HENRY CHANG, ROBERT MOSER — In finite-volume formulations of optimal LES (OLES), the effects of unresolved turbulence are represented in terms of models for the momentum fluxes through the finite-volume cell boundaries. The models are quadratic in the velocities of the cell volumes, and given the finite-volume stencil to be used are optimized using stochastic estimation. The resulting model is effectively a finite-volume scheme that has been designed to represent the effects of subgrid turbulence. This approach has been found to be highly effective in isotropic turbulence, but in a wall-bounded flow, new complications arise. These include the treatment of the mean velocity, subgrid anisotropy and the momentum flux to the wall. In this study, correlations derived from DNS of turbulent channel flow are used to perform the stochastic estimation for a number of model dependencies (stencils), and the properties of the resulting OLES models are evaluated. Of particular interest are stability of the schemes, energy transfer to the small scales, and the *a posteriori* accuracy of the resulting LES. Schemes that correctly represent energy transfer can easily be constructed, but stable and accurate LES results are more sensitively dependent on the formulation of the schemes and their interaction with models for the wall shear stress. The properties of models that perform well *a posteriori* will be discussed.

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