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Impacts of Numerical Discretization on Large Eddy Simulation GOPAL YALLA, ROBERT MOSER, TODD OLIVER, Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin — In practical Large Eddy Simulation (LES), the filter is often implicitly defined through a projection onto the finite-dimensional solution space that is inherent in numerical discretization. Therefore, the interaction between the underlying numerics and the dynamics of the resolved turbulence must be taken into account during the formulation of LES models. However, this interaction is not well understood and is often neglected. Most LES models are developed under the assumptions of homogeneous isotropic resolution, and accurate representation of all scales by the underlying numerics. In this talk, we focus on the effects of resolution inhomogeneity and discretization error on LES. This is examined in the context of homogeneous, isotropic turbulence convecting through an inhomogeneous grid with a range of higher and lower order numerics. A model formulation to correct for such numerical issues is also presented. This model is based on the difference between the numerical second derivative operator and repeated application of the numerical first derivative operator, which acts as a filter for the insufficiently resolved scales of motion. As such, the model is designed to be applicable for a wide range of numerical methods so that it may be broadly and easily adopted.

Gopal Yalla
Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin

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