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Implicit and explicit subgrid-scale modeling in discontinuous Galerkin methods for large-eddy simulation PABLO FERNANDEZ, NGOC-CUONG NGUYEN, JAIME PERAIRE, MIT — Over the past few years, high-order discontinuous Galerkin (DG) methods for Large-Eddy Simulation (LES) have emerged as a promising approach to solve complex turbulent flows. Despite the significant research investment, the relation between the discretization scheme, the Riemann flux, the subgrid-scale (SGS) model and the accuracy of the resulting LES solver remains unclear. In this talk, we investigate the role of the Riemann solver and the SGS model in the ability to predict a variety of flow regimes, including transition to turbulence, wall-free turbulence, wall-bounded turbulence, and turbulence decay. The Taylor-Green vortex problem and the turbulent channel flow at various Reynolds numbers are considered. Numerical results show that DG methods implicitly introduce numerical dissipation in under-resolved turbulence simulations and, even in the high Reynolds number limit, this implicit dissipation provides a more accurate representation of the actual subgrid-scale dissipation than that by explicit models.

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