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A dynamic globalization subgrid-scale model for large eddy simulation of complex turbulent flows HAECHEON CHOI, NOMA PARK, JIN-SEOK KIM, JUNGIL LEE, Seoul National University — In the present study, a dynamic subgrid-scale model is proposed for large eddy simulation of turbulent flows in complex geometry. The eddy viscosity model recently proposed by Vreman [Phys. Fluids, 16, 3670 (2004)], which guarantees theoretically zero SGS dissipation for various laminar shear flows, is considered as a base model. A priori tests with the original Vreman model show that it predicts the correct profile of subgrid-scale dissipation in turbulent channel flow but the optimal model coefficient is far from universal. Dynamic procedures of determining the model coefficient are proposed based on the global equilibrium between the subgrid-scale dissipation and the viscous dissipation. An important feature of the proposed procedures is that the model coefficient determined is globally constant in space but varies only in time. A posteriori tests of the proposed dynamic model are conducted through large eddy simulations of forced isotropic turbulence, turbulent channel flow, flow over a sphere, and flow over a three-dimensional model vehicle. The proposed dynamic model produces excellent performance for all flows considered. The proposed model is quite robust and it can be readily applied to complex flows without homogeneous direction.

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