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Scale-by-scale energy budget equations for large-eddy simulations MICHAEL GAUDING, JENS HENRIK GOEBBERT, ROBERT FLESCH, CLAU-DIA GUENTHER, NORBERT PETERS, RWTH-Aachen University — A detailed study of scale-by-scale energy budget equations of homogeneous shear turbulence is performed. The energy budged equations are formulated in terms of structure functions and involve the balance of turbulent kinetic energy production, energy transfer and energy dissipation. In the context of large-eddy simulation (LES) the transfer of energy towards small scales must be correctly satisfied in order to preserve statistically properties of the turbulent flow field. In this work a comparison of filtered DNS data with various LES models is performed in order to assess the performance of the models. Particular emphasis is laid on anisotropic effects. A closure for the subgrid term is proposed based on an eddy-viscosity ansatz. The analysis is performed by means of direct numerical simulations of homogeneous shear turbulence at Taylor-Reynolds number of 120. Homogeneous shear turbulence reveals effects such as large-scale vortex dynamics and anisotropy.

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