

Scale-truncating relaxation models for large eddy simulations

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Abstract This paper discusses novel relaxation models for large eddy simulation (LES) of turbulent flows. To verify that the scales of motion are truncated properly by the LES-model an explicit box filter is introduced. The relaxation parameter is then determined such that the production of all box-fitting scales is counterbalanced by the dissipation associated with the relaxation model. This balance is imposed at the discrete level; here using a second-order finite-volume discretization. Notice that the approach can in principle be applied to any discretization method. The resulting relaxation parameter depends on the invariants of the discrete velocity gradient. The model is successfully tested for canonical turbulent flows (isotropic turbulence, turbulent channel flow, mixing layer).

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