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A subgrid-scale similarity-like model for LES with improved subgrid-scale dissipation B.W. ANDERSON, J.A. DOMARADZKI, University of Southern California — The scale-similarity model in LES is based on the intuitive assumption that the velocities associated with different scales in the flow give rise to turbulent stresses that have a similar character, leading to the attractively simple functional form of the model. However, it is well known that scale-similarity models suffer from an insufficient SGS dissipation which causes them to fail in actual LES, negating advantages of the functional simplicity. We have developed a model given by an expression reminiscent of the classic similarity model in its functional simplicity but which also provides the adequate SGS dissipation. The proposed model is constructed by applying an explicit filter to the resolved velocity and splitting it into components associated with the largest and smallest resolved scales. Terms describing specific interscale interactions are then constructed using the test-filtered velocity field and these terms are used to formulate an alternative expression for SGS stress that predicts correctly the global energy flux from the resolved to subgrid scales. Results for wall-bounded flow simulations performed with this model indicate that accurate predictions of mean and rms flow quantities as well as SGS dissipation and energy budget are possible.

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