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Development of a subgrid-scale similarity model for LES based on the physics of interscale energy transfer in turbulence BRIAN W. ANDERSON, JULIAN A. DOMARADZKI, University of Southern California — It is well known that scale-similarity models suffer from an insufficient SGS dissipation which causes them to fail in actual, time evolving LES of turbulent flows. We determine that this failure is due to the representation of the interscale energy transfer among the resolved scales which is incorrect for purposes of LES. Alternatives to previous forms of similarity models have been evaluated with the intent of improving upon the deficiencies of these models in predicting subgrid-scale energy dissipation. Expressions describing interscale turbulence interactions have been constructed using test-filtered velocity fields and these terms have been used to formulate an alternative model that offers improvements on the predictions of global energy flux from resolved to subgrid scales. Results for wall-bounded flow simulations indicate that improved predictions of mean and RMS flow quantities are possible.

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