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The role of subgrid-scale models near the turbulent/nonturbulent interface in free shear flows CARLOS B. DA SILVA, IDMEC/IST Technical University of Lisbon — This work addresses a challenging new problem for large-eddy simulations (LES) that exists in free shear flows where there are two distinct regions: the outer region where the flow is irrotational and the inner region where the flow is turbulent. The two regions are separated by a sharp interface: the turbulent/nonturbulent (T/NT) interface. It has been shown that important Reynolds stresses exist near the T/NT interface and that these stresses determine in part the mixing and combustion rates in jets. In the present work the role of several subgrid-scale models near the T/NT is analyzed in detail by using direct numerical simulations (DNS) and LES. The subgrid scales of motion near the T/NT interface are far from equilibrium and contain an important fraction of the total kinetic energy. Model constants used in several subgrid-scale models such as the Smagorinsky and the gradient models need to be corrected near the jet edge. The procedure used to obtain the dynamic Smagorinsky constant is not able to cope with the intermittent nature of this region. Both a-priori tests and LES show that near the jet edge the Smagorinsky model is superior both to the dynamic Smagorinsky and to the gradient models.

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