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Subgrid-scale modeling for flows with strong density variations SIDHARTH GS, GRAHAM CANDLER, University of Minnesota — High-speed reacting flows exhibit strong spatio-temporal density variations that arise from heat release, compressibility and differences in composition. Strong density gradients involve baroclinic and dilatational sources of vorticity, thereby influencing the flow dynamics. The present work develops subgrid-scale models for this class of flows. We employ the formulation based on filtered velocity ($\bar{u}_i$) as the resolved-scale velocity variable. This is because the conventional Favre-filtered velocity ($\tilde{u}_i$) is deficient in capturing the resolved-scale velocity dynamics and ignores the subgrid-scale interactions of pressure gradient with density. Furthermore, we investigate the contribution of subgrid-scale density fluctuations to the local subgrid-scale stress (and subgrid-scale scalar fluxes) via generation of small-scale velocity gradients. This effect is studied in the framework of the stretched-vortex subgrid-scale model. *A posteriori* performance of the proposed modifications is analysed on large eddy simulations of inert and reacting mixing layers.

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