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Dynamic Bridging Modeling for Coarse Grained Simulations of Shock Driven Turbulent Mixing. FERNANDO GRINSTEIN, JUAN SAENZ, RICK RAUENZAHN, LANL, MASSIMO GERMANO, Duke U. — We focus on simulating the consequences of material interpenetration, hydrodynamical instabilities, and mixing arising from perturbations at shocked material interfaces, as vorticity is introduced by the impulsive loading of shock waves – e.g., as in Inertial Confinement Fusion (ICF) capsule implosions. Such complex flow physics is capturable with coarse grained simulation (CGS) – classical and implicit LES (ILES), where the small-scale flow dynamics is presumed enslaved to the dynamics of the largest scales. Beyond the complex multiscale resolution issues of shocks and variable density turbulence, we must address the difficult problem of predicting flow transitions promoted by energy deposited at the material interfacial layers during the shock interface interactions. Transition involves unsteady large-scale coherent-structure dynamics resolvable by CGS but not by RANS modeling based on equilibrium turbulence assumptions and single-point-closures. We propose a dynamic blended hybrid RANS/ILES bridging strategy for applications involving variable-density turbulent mixing applications, and report progress testing its implementation for relevant canonical problems. Test cases include the Taylor-Green vortex – prototyping transition to turbulence, and a shock tube experiment – prototyping shock-driven turbulent mixing.

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