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Verification of a Dual-Scale Approach to Modeling Sub-Filter Shear-Induced Instabilities[1] AUSTIN GOODRICH, MARCUS HERRMANN, Arizona State University — A method to predict sub-filter shear-induced velocities on a liquid-gas material interface for use in a dual-scale LES-DNS method is verified with Direct Numerical Simulations. The dual-scale method maintains both an LES flow solver grid and an additional Refined Local Surface Grid (RLSG) in flow solver cells that contain a material interface. The RLSG is tasked with maintaining a fully resolved realization of the material interface and transporting the interface with sub-grid velocities that model sub-grid physical effects. The sub-grid model reconstructs velocities due the shear-induced instabilities using the Orr-Sommerfeld equations and appropriate boundary and interface conditions. The Orr-Sommerfeld equations are then solved by a Chebyshev collocation method and the results are compared against DNS solutions of the same flow conditions. The sub-grid model is shown to accurately predict the dynamics of the filtered material interface in the presence of unstable sub-filter corrugations within a linear regime of growth, and the model is shown to be well suited in predicting the dynamics of an interface with small random fluctuations.

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