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The Inviscid Criterion for Scale Decomposition in Variable Density Flows DONGXIAO ZHAO, HUSSEIN ALUIE, Univ of Rochester — The proper scale decomposition in flows with significant density variations is not as straightforward as in incompressible flows, with many possible ways to define a 'length-scale.' A choice can be made according to the *inviscid criterion*, which requires a scale decomposition to guarantee that viscous effects are negligible at large enough 'length-scales.' This is necessary to unravel inertial-range dynamics and the cascade in variable density turbulence. It has been proved recently that a density-weighted decomposition, or a Favre decomposition, satisfies the inviscid criterion. Here, we present numerical verification of that result. We also show that two other commonly used decompositions violate the inviscid criterion and, therefore, are not suitable to study inertial-range dynamics in variable-density turbulence. Our results have practical modeling implication in showing that viscous terms in Large Eddy Simulations do not need to be modeled if the smallest resolved scale is large enough.

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