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Fluid dynamics code verification based on linear stability analysis GEORGIOS MATHEOU, CARLOS PANTANO, PAUL DIMOTAKIS, California Institute of Technology — Verification of fluid dynamics solvers is the process of demonstrating that a model, such as a set of partial differential equations with its boundary and initial conditions, is solved correctly by a computer code. Computational fluid dynamics code verification techniques include grid convergence, order of accuracy, Richardson extrapolation, and comparison to benchmark solutions. While the latter is particularly valuable, the number of analytical solutions of the Euler or Navier-Stokes equations is limited. The alternative approach employed here utilizes linear stability analysis results. Unfortunately, such solutions can exhibit spatially or temporally localized variations that are much larger than the typical values in most of the domain. For these cases, the usual error metrics tend to perform poorly. We discuss alternative metrics that can be used for code verification in the case of unstable flows and demonstrate this with the spatial instability of a compressible shear layer.

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