

On Specification of Initial Conditions in Turbulence Models

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Recent research has shown that initial conditions have a significant influence on the evolution of a flow towards turbulence. This important finding offers a unique opportunity for turbulence control, but also raises the question of how to properly specify initial conditions in turbulence models. We study this problem in the context of the Rayleigh-Taylor instability. The Rayleigh-Taylor instability is an interfacial fluid instability that leads to turbulence and turbulent mixing. It occurs when a light fluid is accelerated into a heavy fluid because of misalignment between density and pressure gradients. The Rayleigh-Taylor instability plays a key role in a wide variety of natural and man-made flows ranging from supernovae to the implosion phase of Inertial Confinement Fusion (ICF). Our approach consists of providing the turbulence model with a predicted value of its key parameters at the appropriate time in accordance to the initial conditions of the problem. We report recent results and future opportunities.