Some Specific Aspects Related To The Use Of The Artificial Compressibility Methods To Simulate Unsteady Flows

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Abstract - The artificial compressibility method is applied to simulate non-reactive and reactive flows with incompressible and infinite-rate chemistry assumptions. To validate the implemented time-accurate approach, the resulting code is used to calculate three different flow regimes: an unsteady non-reactive flow past a circular cylinder, a steady diffusion Tsuji flame and an unsteady buoyant diffusion flame. As expected, the results evidence the strong dependence of the convergence rate to the artificial compressibility factor. They also show the ability of this approach to describe the circular cylinder wake unsteadiness as well as the flame shape of the steady diffusion flame. In return, the correct prediction of the low-frequency instability known to be featured by unsteady buoyant diffusion flames is presently out of reach of the present version of the methodology.

Keywords: Inert wake, buoyant diffusion flame, Tsuji configuration, finite volume method.