

Using multiple scales asymptotics in the construction of low Mach number numerics ?

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Many low Mach number flows are characterized well by an asymptotic limit with a single time, but multiple spacial scales. A related multiple scales asymptotic analysis (JCP, Vol. 121, 1995) revealed the essence of the interaction of small scale vortical flows and entropy transport with long wavelength acoustics in this regime.

This lecture will first summarize this asymptotic analysis. Then we describe recent efforts at extending a Godunov-type compressible flow solver to efficiently capture this flow regime. The strategy is to combine the asymptotic considerations with geometric multigrid ideas such that the multiscale features of the flow are sampled automatically.