Asymptotic preserving schemes for fluid flows in low-Mach regimes

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Abstract:

In this talk, I will start by explaining the aims and principle of asymptotic preserving schemes. Then I will detail the particular case of low Mach asymptotic preserving schemes for Euler equations. I will present the difficulties encountered in the numerical simulations of compressible flows at low Mach numbers. I will show how these difficulties can be overcome by using asymptotic preserving (AP) schemes. These schemes are uniformly stable with respect to the Mach number: they allow the use of time steps independent of the Mach number. Moreover, they preserve the asymptotic limit: we recover an approximation of the asymptotic model when the Mach number is small. Finally, I will present the properties and results of our first and second-order linear AP schemes.