Calculation of Low Mach Number Acoustics: A comparison of MPV, EIF and linearized Euler Equations

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Abstract

The calculation of sound generation and propagation in low Mach number flows requires serious reflections on the characteristics of the underlying equations. Although the compressible Euler equations cover all effects, an approximation via standard compressible solvers does not have the ability to represent acoustic waves correctly. Therefore, different methods have been developed to deal with the problem. In this talk, three of them are to be presented and compared to each other. They are the Multiple Pressure Variables Approach (MPV), the Extension about Incompressible Flow (EIF) and a coupling method via heterogeneous domain decomposition, using the non-linear Euler equations in a domain as small as possible to cover the sound generation, and a second domain where the locally linearized Euler equations, approximated with a high-order scheme, are used to deal with the sound propagation. Comparisons will be given in construction principles as well as implementational effort and computational costs on actual numerical examples.