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Van Der Waal gaz and direct simulation for thermoacoustics

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Thermoacoustic refrigerators work with high amplitube acoustic waves and lead to high thermal local gradient near the stack. In order to understand nonlinear thermoacoustic effects, an acoustic plane wave is propagated in a model with a specific geometry. It is a two-dimensional channel with adiabatic walls, including two conductive plates whose thickness is not regarded as null.The fluid is supposed to be a real gaz with thermodynamic properties described by a Van Der Waals law. A two-dimensional direct numerical model for compressible flow is used to investigate unsteady dynamic and energetic behaviours in the channel. This model relies on a finite volume formulation of the mass, momentum and energy equations for compressible flow. Thermal equilibrium between gaz and plates is assured by a Dirichlet boundary condition for the interface temperature and a thermal conduction equation in the plate. Adiabatic walls are described by a Neumann boundary condition for the temperature on the wall.The acoustic wave is generated at the input. Perfectly Matched Layer (PML) is used on input and output as a boundary condition to deal with wave reflections. Numerical investigation will be presented and compared with linear classical model.