Special Program in Applied Mathematics and Applied Mechanics

Thermoviscous balance system of equations in nonlinear acoustics

Dr. Manuel Diaz

2018 - 03 - 14 (Wed.)
15:00 - 18:00
308, Mathematics Research Center Building (ori. New Math. Bldg.)

Using the principles of weakly nonlinear theory together with continuum equations of fluid dynamics, acoustic waves propagating in Newtownian compressible fluids are studied to the fully nonlinear approximation and to the lowest order in the dissipation. In this work, non-ideal viscous and thermally conducting (thermoviscous) fluids have been considered. Moreover, three hyperbolic balance system of equations to describe such fluids are formulated and studied. Each of the resulting system of equations is here obtained is termed thermoviscous balance law (TBL) model and are compared to other TBL's obtained from the classical finite-amplitude and weakly nonlinear theories. By comparing the here formulated TBL's to those from the above approaches, evidence of the contribution of local nonlinear effects is reported for the first time. These comparisons are carried out by using uniform framework based on the high-order non-oscillatory finite-difference approach in time and space of and illustrated for one-dimensional benchmark problems of the literature.

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