

Title:

Nonlinear wave theory for transport phenomena

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Abstract:

In this talk, we discuss a unified first order hyperbolic formulation for momentum, heat and mass transport phenomena in the continuum mechanics settings. An important key feature of our approach is its ability to describe at the same time the behavior of inviscid and viscous compressible Newtonian and non-Newtonian fluids with heat conduction, as well as the behavior of elastic and visco-plastic solids. Because the proposed model is hyperbolic, it treats all transport phenomena from the wave propagation viewpoint in contrast to the classical parabolic diffusion theory which based on phenomenological transport laws. We discuss application of our approach to modeling of Newtonian flows and wave propagation in poroelastic saturated media.