UCCS Mathematics Colloquium

Thursday, March 4th
12:30 pm – 1:30 pm
(Refreshments at 12:15)
UC Room 307

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Supersonic Dispersive Fluid Dynamics

Abstract: Recent experimental and theoretical research in Bose-Einstein condensation and nonlinear optics have demonstrated novel supersonic, fluid-like phenomena. Supersonic dynamics in these, and other, systems can be modeled by Euler's equations modified by weak dispersion and negligible dissipation. For certain initial data, Euler's equations can lead to nonlinear self-steepening and singularity formation (gradient catastrophe). Thus the dominant regularizing mechanism in these systems is dispersion which can give rise to rapidly oscillatory, coherent, nonlinear wave structures termed dispersive shock waves. This talk will present recent advances in the understanding of supersonic flows for dispersive Eulerian fluids (e.g. Nonlinear Schrödinger models). The Whitham averaging technique, a modulation theory for slowly varying nonlinear waves, will be used to approximately solve several fundamental problems of dispersive fluid dynamics including the piston problem, blast waves, and supersonic flow over a corner.