STEVENS
Institute of Technology

Seminar Series in Applied Mathematics

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Long-wave unstable thin film equations – singularities, steady states, and heteroclinic orbits

Tuesday, October 3, 2000
3:15 pm
Morton 103

Abstract: We consider long-wave unstable interface models of the type

$$h_t = -(h^n h_{xxx})_x - B(h^m h_x)_x$$

where $B > 0$, and n and m are constants. One interesting aspect of these equations is that there is a range of long-time behavior. One would suspect that the destabilizing second-order term could overwhelm the stabilizing fourth-order term. We present a conjecture concerning when this is possible, and give analytical and numerical evidence supporting the conjecture, including a proof of finite-time blow-up (joint work with Andrea Bertozzi of Duke University).

Also, we have classified a large class of nontrivial steady states of PDEs of the above type. There are three types of bounded steady states: constant; non-constant periodic and C^∞; and compactly supported with lower regularity. We present the linear stability of the smooth steady states and use a Liapunov function to consider the nonlinear stability of steady states. We use the Liapunov function to consider the energy landscape – to determine what steady states might have heteroclinic orbits between them. We numerically demonstrate the presence of these heteroclinic orbits and show they are robust under perturbation (joint work with Richard Laugesen of the University of Illinois of Champaign-Urbana).

Refreshments will be available starting at 3:00pm.

For additional information contact Patrick Miller (216-5452) or Yi Li (216-5433).