Joint Event

NUMERICAL METHODS FOR PDEs SEMINAR

and

PHYSICAL MATHEMATICS SEMINAR

Buckling of a thin, viscous film in an axisymmetric geometry

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ABSTRACT:

By adapting the Foppl-von Karman equation, which describes the deformation of a thin elastic membrane, we present an analysis of the buckling pattern of a thin, very viscous fluid layer subject to shear in an axisymmetric geometry. A linear stability analysis yields a differential eigenvalue problem, whose solution, obtained using spectral techniques, yields the most unstable azimuthal wave-number, m^*. Contrary to the discussion of Slim et al. (J. Fluid Mech., 694, pp. 5-28, 2012), it is argued that the axisymmetric problem shares the same degeneracy as its rectilinear counterpart, i.e. at the onset of instability, m^* is indefinitely large. Away from this point, however, a comparison with analogue experimental results is both possible and generally favorable. In this vein, we describe the laboratory apparatus used to make new measurements of m^*, the phase speed and the wave amplitude; note that no prediction concerning the latter two quantities can be made using the present theory. Experiments reveal a limited range of angular velocities wherein waves of either small or large amplitude may be excited. Transition from one to the other regime does not appear to be associated with a change in m^*.

MINI-BIO:

Morris R. Flynn is an assistant professor of mechanical engineering at U. Alberta. His research interests include environmental and biological fluid mechanics as well as the modeling of traffic flow. Morris received his Ph.D. in Engineering Science in 2006 from U. California -- San Diego; thereafter, he worked as an instructor in the Dept. of Mathematics at MIT in 2007 and 2008.

WEDNESDAY, NOVEMBER 14, 2012
4:00 PM
Building 2, Room 135

Reception at 3:30 PM in the Math Common Room
(Building 2, Room 290)

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