



Applied and Computational Mathematics Seminar

Title: Interfacial instability of turbulent two-phase stratified channel flow

Speaker: Dr Lennon O Naraigh (Imperial College London)

Date: Thu 19th November 2009 at 2:15PM

Location: Mathematical Sciences Seminar Room

Abstract: We consider the motion of a deformable interface that separates a fully-developed turbulent gas flow from a denser, more viscous bottom layer. We outline a hierarchy of linear models to describe the interaction between the turbulent gas flow and the interfacial waves. This is a two-step approach, wherein we write down constitutive laws for the turbulent stresses. A flat-interface "base state" is derived, followed by an Orr-Sommerfeld type analysis of the Reynolds-averaged Navier-Stokes equations. Our model facilitates a definition of 'slow' and 'fast' waves. We use our linear stability analysis to determine the factors that affect the wave speed. For bottom layers that comprise thin liquid films, the waves are always slow, and the instability occurs by the viscosity-contrast mechanism. Our results for this case compare excellently with experiments. We also discuss the case of deep-water waves, wherein we investigate the effects of rapid distortion on the wave growth, and make an oceanographical connection to the generation of waves by wind.

mailto: Peter.Lynch@ucd.ie