
NILIMA NIGAM, McGill University, 805 Sherbrooke West, Montreal

The nonlinear critical layer for Kelvin modes on a vortex

We consider the propagation of neutral modes along a vortex with radial velocity profile. In the linear inviscid stability theory for swirling flows, modes which become singular for some critical radial distance are significant. The singularity could be dealt with using nonlinear effects within a thin critical layer, and/or by adding viscosity. At high Reynolds number, the nonlinear effects become important. In this talk we present the scaling and equations which govern the nonlinear critical layer. We then present a solution by means of the method of characteristics of the governing inviscid system of PDE. We finally present modes which are not possible in a linear theory, and some numerical results.

This is joint work with S. A. Maslowe.