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Stability of Swirling Flows

A swirling flow is one having both azimuthal and axial velocity components, $V(r)$ and $W(r)$, say, with radial velocity $U = 0$. The stability of such flows is pertinent to many applications in engineering and meteorology such as tornadoes and the trailing vortices behind aircraft. In this talk, the theorems governing the linear stability of such flows will be briefly reviewed and some new numerical results will be presented. An analysis describing the propagation of vortex Kelvin waves with nonlinear critical layers will then be outlined and a solution given that is valid in the large Reynolds number limit.