Eckhaus instability of the compressible Taylor vortices

Yoshiyuki Kagei

Tokyo Institute of Technology

This talk is concerned with the bifurcation and stability of the compressible Taylor vortex. Consider the compressible Navier-Stokes equations in a domain between two concentric infinite cylinders. If the outer cylinder is at rest and the inner one rotates with sufficiently small angular velocity, a laminar flow, called the Couette flow, is stable. When the angular velocity of the inner cylinder increases, beyond a certain value of the angular velocity, the Couette flow becomes unstable and a vortex pattern, called the Taylor vortex, bifurcates and is observed stably. This phenomenon is mathematically formulated as a bifurcation and stability problem. In this talk, the compressible Taylor vortices are shown to bifurcate near the criticality for the incompressible problem when the Mach number is sufficiently small. The localized stability of the compressible Taylor vortices is considered under axisymmetric perturbations and it is shown that the Eckhaus instability of compressible Taylor vortices occurs as in the case of the incompressible ones.