



Partial Differential Equations Seminar

Title Stability/instability of Hill's vortex

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Location Zoom 강연

Abstract

We study stability of a spherical vortex introduced by M. Hill in 1894, which is an explicit solution of the three-dimensional incompressible Euler equations. The flow is axi-symmetric with no swirl, the vortex core is simply a ball sliding on the axis of symmetry with a constant speed, and the vorticity in the core is proportional to the distance from the symmetry axis. We use the variational setting introduced by A. Friedman and B. Turkington (Trans. Amer. Math. Soc., 1981), which produced a maximizer of the kinetic energy under constraints on vortex strength, impulse, and circulation. As a consequence, the stability up to a translation is obtained by using a concentrated compactness method. As an application, we prove linear in time filamentation near Hill's vortex: there exists an arbitrary small outward perturbation growing linearly for all times. These results rigorously confirm numerical simulations by Pozrikidis in 1986. The second part is joint work with In-Jee Jeong(SNU).