FM25L_12275

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Coherent Structure of Point Vortices Influenced by Uniform Straining Flow

Marcin Kurowski, Konrad Bajer

Institute of Geophysics, Warsaw Uniwersity, Warszawa, Poland

Numerical simulations of motion of an elliptic vortex patch modelled by a group of identical point vortices in an inviscid uniform straining flow is given. The strength of the external flow modifies the angular velocity and amplitude of oscillations of the axes. The density of vortices becomes non-uniform, and disturbances created at the edge of the structure penetrate inside. Fluctuations can be the reason of loosing a little groups of vortices. The decay of the cloud can go slowly (single vortices are being ‘scraped’ by the flow) or rapidly (vortices leave the structure and the flow can penetrate the cloud deeper to pull out more vortices). The elliptic shape of the cloud can evolve. At a critical strain the axes are rotated by $\pi/4$ and two little streaks of vortices flow out from the cloud (quasi-steady state). As a consequence of the Kelvin-Helmholtz instability the cloud comes apart and the big structure becomes a vortex street.

View the extended summary