Vorticity separations as viscous flow past a wedge

Ling Xu, Department of Mathematics, University of Michigan, Ann Arbor, MI, United States

Vorticity separations in viscous flow past a sharp wedge is a fundamental process of intrinsic interest. In this work, we are studying the starting vortex as viscous flow past a wedge using direct numerical simulations. The wedge angle is 120 degrees, the Reynolds number is Re=500, and the fluid flow is impulsively started. Three vorticity separations at the wedge tip are observed.

Six subplots on the right are enlargements near the wedge tip. It shows the formation of these three vorticity separations, as labeled by (1), (2), and (3) . The contours are negative in blue and positive in black.

Three plots at below show vorticity (left), streamlines (middle), streaklines (right) at t=2.5. In association with three separations in vorticity, there are three recirculation regions in streamlines and a kink in streaklines.