Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Dynamics of Quasi 2D and 3D Co-rotating Vortex Merger AKSHAY KHANDEKAR, JAMEY JACOB, Oklahoma State University — Merger of vortices is examined experimentally to compare the merger of slender parallel vortices generated either coincidentally or continuously. It is known that like-sign vortices rotate around a common center of circulation and merger between the vortices may occur under certain conditions. This merger is dependent on the strength of the vortex circulation, distance of separation between the centers of the two vortices, Re_Γ, and vorticity distribution. Quasi-2D and 3D experimental data is examined and merger relations are derived. The former uses high aspect ratio rotating paddles in a tank and while the latter are from wing-tip vortices in a wind tunnel. The vortex merger tank generates slender co-rotating vortices and are examined using PIV, while in the wind tunnel two opposing wings are arranged at opposite angles of attack to generate a pair of vortices that merge downstream. A 5-hole probe is used to obtain 3D velocity vectors via wake survey, along with PIV. The procedure is performed in the wake at different distances to observe merger under different conditions. Temporally and spatially dependent relations in quasi-2D and 3D vortex merger are derived. Merger behavior is generally similar between the cases, but instabilities along quasi-2D vortices may affect

Jamey Jacob
Oklahoma State University

Date submitted: 02 Aug 2013 Electronic form version 1.4