Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Reorientation of Vorticity on a Rapidly Accelerating Finite Aspect Ratio Plate JOCHEN KRIEGSEIS, University of Calgary, MATTHIAS KINZEL, California Institute of Technology, DAVID RIVAL, University of Calgary — In recent studies the competition between the developing leading-edge vortex (LEV) and tip vortex (TV) has been considered from an Eulerian perspective. Such analyses are limited in that little is understood regarding the reorientation of vorticity layers from the attached boundary layers (BL). The vortex formation is fed by both the shear layers as well as the original BL vorticity. The purpose of the present work, therefore, is to uncover the influence of the BL on the formation of these vortices. 3D Particle Tracking Velocimetry (PTV) experiments have been performed so as to measure the flow around a low aspect ratio plunging flat plate. From the PTV results, Lagrangian structures have been identified that originate from the plate surface. The mass contribution of the boundary layer to the formation of the LEV and TV is discussed. Moreover, the reorientation of the BL vorticity during the process is tracked. By studying the reorientation of mass-containing vorticity, the close connection between the BL at the first instant of motion, and the salient vortices at later stages of the formation process is illustrated. Finally, the Lagrangian structures are compared with direct-force measurements to elucidate the influence of the BL vorticity distribution on the unsteady loadings.

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Date submitted: 03 Aug 2012 Electronic form version 1.4