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Dynamics of a Vortex Pair Impinging on a Horizontal Ground Plane DANIEL ASSELIN, CHARLES WILLIAMSON, Cornell University — We study the effect of a solid boundary on the dynamics and instabilities of a pair of counter-rotating vortices. An isolated vortex pair is typically subject to a short-wave elliptic instability and a long-wave Crow (1971) instability. Near a wall, the boundary layer between the primary vortices and the wall can separate, leading to the generation of secondary vorticity. These secondary vortices can be subject to small-scale instabilities (Harris & Williamson, 2012) as they come under the influence of the primary vortices. Using LIF, our facility is able to visualize both the primary and secondary vortices separately, depending on how we introduce the fluorescent dye. The long-wave Crow instability, when interacting with the wall, can cause significant axial flow, resulting in a periodic concentration of fluid at the peaks of each wavy vortex tube and a corresponding evacuation of fluid from the troughs. We are interested to determine the cause of these axial flows and to understand the vortex dynamics leading to what appear to be rebounding vortex ring structures. The vortex dynamics leading to strong axial flows seem to be a fundamental mechanism by which coherent vortex structures, such as vortex pairs or vortex rings (Lim, 1989), break up in the presence of a wall.

Daniel Asselin
Cornell University

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