Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Formation of Small-Scale Vortex Rings from Vortex Pairs Close to the Ground DANIEL ASSELIN, CHARLES WILLIAMSON, Cornell University — In this research, we examine the effect of a solid boundary on the dynamics and instabilities of a pair of counter-rotating vortices. An isolated vortex pair is subject to a short-wave elliptic instability and a long-wave Crow (1970) 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. In contrast, in the present study we are interested in the long-wave Crow instability interrupted by interaction with a wall. This can cause significant axial flow, resulting in a periodic concentration of fluid containing vorticity at the peaks of each wavy vortex tube and a corresponding evacuation of fluid containing vorticity from the troughs. It appears that this axial flow is driven at least in part by the formation of vortex ring-like structures in the secondary vortex as it is deformed by the primary vortex. Furthermore, additional small scale-vortex rings evolve from the secondary vorticity and from the concentrated vortical regions in the primary vorticity. In both cases, these rings cause vorticity to rebound away from the ground.

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Date submitted: 01 Aug 2013 Electronic form version 1.4