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Interactions of Vortex Pairs with Flat and Wavy Walls SARAH MORRIS, C.H.K. WILLIAMSON, Cornell University — In this research we examine the interaction of a vortex pair with flat and wavy walls. When a vortex pair approaches a ground plane, the boundary layer that forms on the surface between the vortices and the wall separates, generating secondary vorticity and causing the primary pair to 'rebound' from the wall. When a vortex pair with the long-wave "Crow" (1970) instability interacts with a flat boundary, rebounding vortical structures are produced, the form of which is distinctly different to that seen in long-wave instability out of ground effect (Asselin & Williamson, 2017). Similarly, when the "complementary" experiment of a straight vortex pair encounters a wavy wall, the topology of the pair changes significantly. By using PIV and LIF to study these structures, certain characteristic features can be seen. The 2D vortex pair first interacts with the "hills" of the boundary, resulting in earlier localized secondary vorticity generation. This leads to the formation of secondary vortex loops in the "valleys", wherein these loops pinch off into rising vortex rings, two per fundamental wavelength. We also observe an increased rate of circulation decay compared to a 2D pair impinging on a flat wall. Research has also been undertaken on delta wings in ground effect. Some features of the spatially developing vortex pair in the wake of a delta wing are seen to relate to our previous results with a temporally developing vortex pair impinging on a wall.

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