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Impingement of a Vortex Pair on a Wavy Wall[1] SARAH MORRIS, C.H.K. WILLIAMSON, Cornell University — In this research we examine the impingement of a vortex pair onto a wavy wall. Isolated vortex pairs, not in ground effect, can become unstable to short-wave (Widnall, 1974) or long-wave instability (Crow, 1970). When a vortex pair approaches a ground plane, the boundary layer that forms on the surface separates, generating secondary vorticity and causing the primary pair to 'rebound'. When a vortex pair with the long-wave instability interacts with a flat boundary, the topology of the pair changes, resulting in rebounding vortical structures whose form is dependent on the extent of the instability prior to wall interaction (Asselin & Williamson, 2013, 2016). By using PIV and LIF to consider the "complementary" experiment, a straight vortex pair encountering a wavy wall (rather than a wavy pair impinging on a flat wall), certain critical features of the two flows are found to be similar. The 2D vortex pair first interacts with the "hills" of the boundary, triggering accelerated vorticity cancellation in this area compared to the corresponding "valley" regions. An axial pressure gradient forms between the two regions, giving rise to strong axial flow. This leads to the interaction of primary and secondary vortices in the valleys, wherein reconnection results in "rebounding" vortex rings, two per fundamental wavelength. The resulting flowfield forms distinctly different vortex structures than are classically found for 2D vortex pair wall impingement or for the long-wave instability out of ground effect.

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