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Mechanisms of Vortex Evolution in Unsteady Stalled Flows¹ JAMES BUCHHOLZ, KEVIN WABICK, JAMES AKKALA, AZAR ESLAM PANAH, University of Iowa — Formation of a leading-edge vortex is considered on plunging and rotating flat plates at a chord-based Reynolds number of 10^4 . In all cases, a concentrated leading-edge vortex is formed. The physical mechanisms of vorticity transport governing the growth and evolution of the vortex are investigated within selected spanwise regions. It is demonstrated that the net flux magnitude of (opposite-sign) secondary vorticity is often significant during formation of the leading-edge vortex, in comparison to that of the leading-edge shear layer, suggesting that the secondary flux plays a substantial role in regulating the growth and evolution of leading-edge vortex circulation. Other mechanisms of vorticity transport will also be discussed, including the importance of spanwise flow to vortex circulation, and the roles of vortex tilting and stretching on the evolution of the vorticity field.

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James Buchholz University of Iowa

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