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The low-frequency undulation mechanism in a open cavity shear layer flow[1] XIAOFENG LIU, JOSEPH KATZ, Johns Hopkins University — The unsteady flow and pressure field in an open cavity shear layer has been investigated using time resolved PIV measurements. Here, we focus on the closed-loop feedback mechanism that causes low-frequency undulation in the location of the shear layer relative to the cavity trailing corner. It is found that impingement of high momentum fluid on the forward-facing surface of this corner, when the shear layer is low, periodically increases the pressure there, and the inward flow along this wall. The latter re-circulates back to the leading corner of the cavity, increasing the pressure there, and imposing adverse pressure-gradients on the boundary layer upstream of the cavity. The resulting increase in boundary layer thickness starts an upward shift in the elevation of the shear layer, which reduces the momentum, pressure and jetting into the cavity at the downstream corner. This reduced backflow decreases the pressure at the inlet corner and the incoming boundary layer thickness, causing a downward shift in elevation of the shear layer. This low-frequency undulation has substantial impact on the turbulence and noise generations by the cavity corner.

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