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Bypass transition delay via oscillating Stokes layers PHILIPP HACK, LUCA BURINI, TAMER ZAKI, Imperial College London — The breakdown of laminar boundary layers to turbulence is accompanied by a large increase in skin friction drag. Therefore, flow modification strategies are sought in order to delay transition and reduce drag. Our work addresses the influence of wall oscillation on the proceedings of bypass transition, and in particular on the amplification of boundary layer streaks. Direct numerical simulations demonstrate that appropriate choice of oscillation amplitude and frequency can yield a considerable reduction in local skin friction, and thereby drag. Linear, transient analyses are performed in order to explain the physical mechanism and the optimal parameters of wall oscillation. Finally, it is shown that an overall energetic advantage is possible, where the reduction in theoretical propulsion power outweighs the required input into the wall movement.

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