Abstract Submitted
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Direct simulation of a separated boundary layer under the influence of large-scale forcing.[1] AYSE G. GUNGOR, MARK P. SIMENS, JAVIER JIMÉNEZ, U. Politecnica Madrid — The effect of large-scale forcing mimicking incoming wakes on a separated turbulent boundary layer over a flat plate is investigated by direct numerical simulation. The flow separates due to a strong adverse pressure gradient induced by suction along the upper simulation boundary, and the forcing Strouhal number $St = fl_x/U_0$ ranges from 0.25 to 2.9. The forcing, in which all the turbulent fluctuations except for the mean velocity defect are neglected, triggers the transition of the separated shear layer, and modifies the separated region. Each forcing pulse generates three roll-up vortices, which originate near the separation point and convect with approximately half the local free-stream velocity. The separation and reattachment points vary with the forcing frequency, but no other significant variations of the mean boundary layer properties are observed unless the separation bubble is allowed to fully reform. The separation lengths of the periodic cases can be estimated from a single recovery experiment in which the forcing is suddenly removed.

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