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Three Regimes of Laminar Drag Modification via Travelling Wave Forcing[1] TAPISH AGARWAL, BENI CUKUREL, IAN JACOBI, Technion — Spatially-localized drag modification for a laminar boundary layer is predicted for travelling-wave flow actuation at specific wave speeds. In the past, asymptotically high-speed travelling waves have been used to modify a base laminar flow by Stokes streaming, but the effect of lower-speed disturbances has not been fully explored. We present a numeric solution of the full momentum balance for the streaming flow induced in a laminar boundary layer, based on Lin's Reynolds decomposition analysis, and identify three distinct regimes of drag modification. In addition to the traditional high speed case, we report on a critical-layer dominated regime and a low-speed, limiting regime which induce significant but divergent changes to the skin friction over a range of streamwise locations downstream of the leading edge. We characterize the extent of the drag modification in all three regimes as a function of the disturbance speed and streamwise location, providing a framework for practical implementation of streaming drag-reduction techniques.

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