

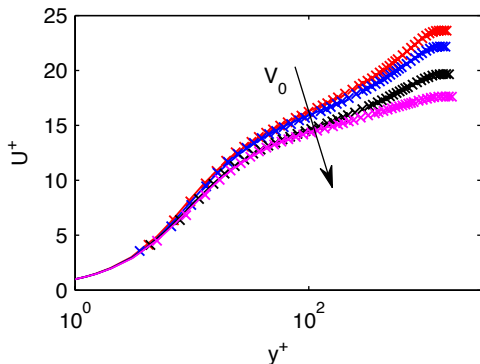
Experimental Study of Boundary Layer with Wall-Normal Mass Transfer

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Boundary layer control by means of a wall-normal mass suction or injection has been studied for many years, in the former case to delay boundary-layer transition or separation, in the latter to reduce skin friction.

It is well established, both theoretically and experimentally, that when a constant suction velocity is applied on a laminar boundary layer, the velocity profile develops into a streamwise invariant profile, the so called Asymptotic Suction Boundary Layer (ASBL). The situation becomes less clear when the turbulent regime is considered: whether the boundary layer always reaches an asymptotic state or whether this occur just for some specific ratio between the free stream velocity and the suction velocity is still not completely understood. Moreover, the scaling of even the basic quantities as the mean velocity remains an open question. In the figure the effects of different suction velocities on the mean velocity profile of a turbulent boundary layer are illustrated.



This project is devoted to the experimental study of the boundary layer with wall-normal mass suction or injection. A new porous plate to be installed in the MTL wind-tunnel will be designed and manufactured. It will be characterized by a large suction area and will allow the application of the mass suction/injection for about 6 metres in the streamwise direction. This apparatus will give us unique possibilities for the experimental studies of such flows with different measurement techniques such as hot-wire anemometry, particle image velocimetry and direct shear-stress measurement with oil-film interferometry.