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Sub-laminar drag in fully developed channel flow by stationary distributed blowing and suction.[1] JOOHYUN KIM, HAECHEON CHOI, Seoul National University, JOHN KIM, UCLA — Min *et al.* (2006, JFM, vol. 558, p. 309) showed that the skin-friction drag in a fully developed channel can be sustained below that corresponding to the laminar profile when blowing and suction is provided in the form of an upstream travelling wave. In the present study, we apply a stationary distributed blowing and suction (steady in time, sinusoidal along the streamwise direction, zero-net mass flux) to the same flow to see if sub-laminar drag is achieved using the stationary blowing and suction. The skin friction changes significantly depending on the blowing/suction wavelength and amplitude. Blowing and suction profiles at small wavelength and large amplitude produce sub-laminar drag. In some case, drag reduction amounts to 70% at the optimum wavelength and amplitude. As observed in Min *et al.*, negative Reynolds shear stress is created in the near-wall region due to the blowing and suction when drag reduction is achieved. Although the control efficiency is low, it is still very interesting to note that one can indeed obtain sustainable drag below than that of fully developed laminar channel flow by a stationary zero-net mass-flux blowing and suction.

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Haecheon Choi
Seoul National University

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