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Experimental investigation for drag reduction effect by traveling wave-like wall deformation in turbulent channel flow HIROYA MAMORI, Keio University, YUHO ISHIWATA, KAORU IWAMOTO[1], AKIRA MURATA, Tokyo University of Agriculture and Technology — A traveling wave-like control for wall-turbulence is known to have a potential to relaminarize a turbulent flow to a laminar flow, which has been confirmed by means of a direct numerical simulation. Especially, a wall deformation is one of the methods to realize this traveling wave-like control. The objective of the present study is an investigation for the drag reduction effect due to the traveling wave-like wall deformation experimentally. An elastic rubber is used for a vibrating plate and an oscillator is composed by an amplified piezoelectric actuator. The parameter of the traveling wave is preliminary determined by the direct numerical simulation, which induces the relaminarization at low-to-moderate Reynolds numbers. The drag coefficient is measured in the range of $2000 < \mathrm{Re_b} < 10000$, where $\mathrm{Re_b}$ is the bulk Reynolds number. The traveling wave-like wall deformation is found to decrease the drag below the uncontrolled turbulent flow level. The dependency of the drag coefficient for the frequency of the vibrating of the actuator is also investigated. The flow field is visualized by a Particle Image Velocitmetry measurement, and the drag reduction mechanism is discussed by using the turbulent statistics of the controlled flow.

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