

Drag reduction and relaminarization of wall-turbulence by traveling wave control

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Energy saving is important to reduce transportation costs of vehicles as well as their impact on the environment. In this context, because skin-friction drag increases significantly in turbulent flow, it is important to

study flow control techniques for turbulent flow.

Turbulent [flow](#) is a strongly nonlinear phenomenon having a very complex structure consisting of i.e., vortical and velocity streak structures. Therefore, it is difficult to decrease the skin-friction drag in [turbulent flow](#).

In a recent report, Hiroya Mamori and colleagues showed traveling wave control of turbulent flow. The traveling wave control is the blowing and suction from the wall in the form of the traveling waves.

They performed [direct numerical simulations](#) of the fully developed turbulent channel flow controlled by traveling wave-like blowing and suction. Furthermore, the effect of control parameters on the drag reduction effect was also extensively investigated.

They found that the turbulent flow becomes the laminar flow with positive [energy](#) saving when waves travel in the same direction as the base flow, and they reveal the parameter range of relaminarization phenomenon.

Traveling wave control is very simple, and attractive for control effects. Notably, the control is expected to be extended in wider situations, including separation flow control.

More information: H. Mamori et al. Effect of the parameters of traveling waves created by blowing and suction on the relaminarization phenomena in fully developed turbulent channel flow, *Physics of Fluids* (2014). [DOI: 10.1063/1.4851256](https://doi.org/10.1063/1.4851256)

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