

## **Coherent Structures in Wall Turbulence and Drag Reduction Control**

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The production of high skin friction in wall-bounded turbulent flows is closely related to the near-wall coherent structures. Herein is introduced the mechanism for active control influencing the generation of streamwise vortices by performing direct numerical simulation to the streak transient growth process in the minimal channel flow. A new opposition control scheme with adjusting control amplitude is proposed and evaluated in full-scale turbulent channel flow by direct numerical simulations. The maximum drag reduction rate can be greatly enhanced by the strengthened control. A formula to predict the drag reduction rate is proposed based on the similarity in the Reynolds shear stress.

**Keywords:** wall turbulence, coherent structure, drag reduction, active control, direct numerical simulation