عنوان مقاله:

On the Mechanism of Drag Reduction in Fully-Developed Turbulent Channel Flow with a Streamwise Micro-featured Superhydrophobic Wall

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی, دوره 10, شماره 5 (سال: 1396)

تعداد صفحات اصل مقاله: 12

نویسندگان:

M. Saadat-Bakhsh - *Mechanical Engineering, Iran University of Science and Technology*

N. M. Nouri - *Mechanical Engineering, Iran University of Science and Technology, Tehran, Iran*

H. Norouzi - *Mechanical Engineering, Iran University of Science and Technology*

خلاصه مقاله:

The superhydrophobic drag reduction changes the structures of turbulent flow. However, the underlying mechanism is not clear. The aim of this study is to determine the alternations of turbulent flow due to applying a streamwise micro-featured superhydrophobic wall. Large eddy simulations are performed to explore the effect of micro-features on near-wall behaviors. The results indicate that the outward motion of the lifted low-speed streaks is restricted to the lower wall layers, and the region of maximum production of streamwise vorticities is shifted toward the micro-featured wall. The quadrant analysis of Reynolds stress shows that there is a stronger increase in outward motion of high-speed fluid and inward motion of low-speed fluid than ejection and sweep.

کلمات کلیدی:

Drag reduction mechanism, Superhydrophobic surface, Coherent structures, Streak strength