

عنوان مقاله:

Turbulent Drag Reduction by Spanwise Wall Oscillations

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خلاصه مقاله:

The objective of this paper is to examine the effectiveness of wall oscillation as a control scheme of drag reduction. Two flow configurations are considered: constant flow rate and constant mean pressure gradient. The Navier-Stokes equations are solved using Fourier-Chebyshev spectral methods and the oscillation in sinusoidal form is enforced on the walls through boundary conditions for the spanwise and streamwise (for the case of inclination cycle) velocity components. Results include the effects of oscillation frequency, amplitude, oscillation orientation, and peak wall speed on drag reduction at a Reynolds number of 180 based on wall-shear velocity and channel half-width as well as the Reynolds number dependency in both flow configurations. Drag reduction as a function of peak wall speed is compared with both experimental and numerical data and the agreement is good in the trend and in the quantity. Comparison between these two flow configurations in the transient response to the sudden start of wall oscillation, turbulence statistics, and instantaneous flow fields is detailed and differences are clearly shown. This analysis and comparison have allowed some light to be shed on the way that oscillations interact with wall turbulence.

کلمات کلیدی:

Turbulence, Drag Reduction, Spanwise Wall Oscillation

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