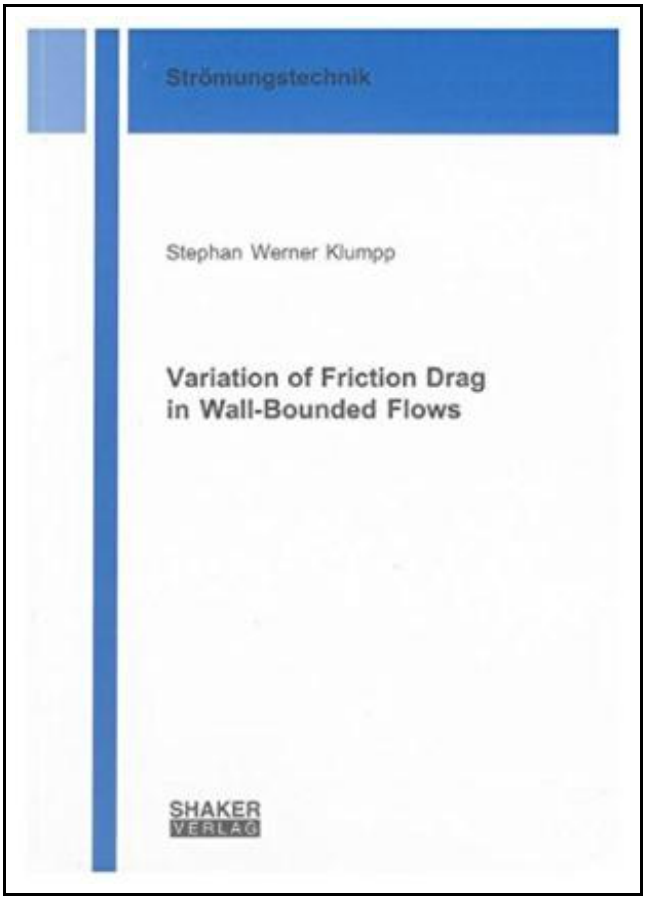
Variation of Friction Drag in Wall-Bounded Flows



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VARIATION OF FRICTION DRAG IN WALL-BOUNDED FLOWS

Shaker Verlag Aug 2010, 2010. Taschenbuch. Book Condition: Neu. 208x149x10 mm. Neuware - One of today's major issues in the development of new fluid application, e.g., airplanes, turbo engines, and high speed trains, is to achieve a high efficiency at a low consumption of energy by reducing the fluid dynamical drag. Besides other options, the reduction of wall-shear stress in wall bounded flows, which determines, e.g., about 50% of the total drag of the flow field around aircraft, is a promising approach to increase the overall efficiency. In the current study the application of a surface structure consisting of tiny grooves aligned in the main flow direction, so-called riblets, on technical components such as compressor blades is investigated. Although the basic drag reducing effect of riblets in turbulent flows is well-known the impact of riblets on the skin friction under realistic flow conditions is still unclear. Therefore large-eddy simulations (LES) of riblet covered surfaces in flow states as occurring on technical components, namely turbulent adverse-pressure gradient flow and transitional flow, are performed. Since the drag reducing effect of a certain riblet surface is limited to a narrow range of flow parameters in the second part of the current work an active mean of drag reduction is investigated. A numerical simulation of a turbulent boundary layer flow over a transversal traveling surface wave realized by a wall-normal actuation of the surface is performed. The potential to reduce friction drag in turbulent flows turns out to be in the same order of magnitude for the actuated surface as for the riblet covered surface. However, the adaptation of the wall actuation to the actual flow parameters allows a reduction of friction drag at all operation points. 119 pp. Englisch.

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