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Effects of hydrophobic surface on stability and transition TAEGEE MIN, JOHN KIM, University of California, Los Angeles — Effects of hydrophobic surface on stability and transition in wall-bounded shear flows are investigated. Hydrophobic surface is represented by a slip-boundary condition on the surface. Linear stability analysis with slip-boundary conditions shows that the critical Reynolds number increases with streamwise slip. Effects of slip-boundary conditions on transient growth of initial disturbances are investigated through the singular value decomposition (SVD) analysis of the linearized Navier-Stokes equations. The maximum transient growth (i.e., the amplification factor for the optimal disturbance) is reduced with streamwise slip, indicating that non-normality of the linearized Navier-Stokes equations is reduced with streamwise slip. Spanwise slip, on the other hand, increases the non-normality. Finally, it is shown that transition to turbulence is delayed significantly with streamwise slip, whereas spanwise slip induces earlier transition. The present results suggest that it is desirable to develop a hydrophobic surface with specified directional sensitivity in order to meet a particular need for specific applications.

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