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New boundary layer structures due to wall slippage HSIEN-HUNG WEI, National Cheng Kung University, Department of Chemical Engineering — We demonstrate that wall slip can significantly modify temporal and spatial structures of boundary layer flows. Two benchmark problems for flow generated by a moving plate are re-investigated to reveal how the boundary layer thickness δ and the slip length λ determine flow characteristics: (i) Stokes's first problem, and (ii) Blasius's problem. In (i), the solution is found to combine the features of two problems: (a) simple vorticity diffusion driven by a constant wall stress created by strong wall slippage, and (b) the classical Stokes first problem driven by a no-slip moving plate, characterizing short time and long time solution behaviors, respectively. A similar slip-to-no-slip transition can occur *spatially* to (ii), leading the friction law to change from the well-known Blasius law $C_{\mathrm{f}} \sim Re^{-1/2}$ to the free-surface-like result $C_{\mathrm{f}} \sim (L/\lambda)Re^{-1}$ when the Reynolds number Re (based on the plate length L) is greater than $(L/\lambda)^2$.

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