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Flow-Dependence and Non-Universality of the von Kármán "Constant" HASSAN NAGIB, IIT, KAPIL CHAUHAN, CATERPILLAR — The overlap parameters of the logarithmic region in turbulent pipe, channel, and boundary-layer flows are established using a composite profile approach which incorporates the influence of the outer part. The composite profile incorporates κ, B and Π as the varying parameters and their resulting behavior with Reynolds number is examined and compared for these flows. The *Re*-specific von Kármán coefficient for channel flows decreases with Reynolds number to a level below the well defined value of $\kappa_{BZ} = 0.384$ for ZPG TBLs. The proper limiting value of κ_C for the channel flow could not be established with a high confidence because of the limited range of available Reynolds numbers, but the best projected value is near $\kappa_C \sim 0.37$. For the pipe flow, reprocessing of the Superpipe data indicates that $\kappa_P \sim 0.41$, which is on the opposite side of the boundary layer value compared to the channel flow. This collective "non-universal" behavior of κ in boundary layers, pipes and channels suggests that the von Kármán coefficient is not universal, and exhibits dependence on not only the pressure gradient but also on the flow geometry, thereby raising fundamental questions regarding turbulence flow theory and modeling for all wall-bounded flows. In contrast, a wide range of data from such canonical flows reveals a universal relation between the overlap parameters; i.e., the von Kármán coefficient and the intercept B.

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