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A revisit of the equilibrium assumption for prediction of near-wall turbulence¹ FARID KARIMPOUR, SUBHAS VENAYAGAMOORTHY, Colorado State University — Assuming equilibrium between the rates of production (P) and dissipation (ϵ) of the turbulent kinetic energy (k) is widely employed for prediction and modeling of turbulent flows. In this study, we revisit the consequence of using equilibrium assumption for prediction of near-wall turbulence. To this end, the relevant scales inherent in the turbulent viscosity (ν_t) formulation of the standard k - ϵ model is derived. We show that such turbulent viscosity formulations are not suitable for modeling near-wall turbulence. Furthermore, by using the turbulent viscosity (ν_t) formulation suggested by Durbin, we also show that the anisotropic Reynolds stress is correlated with the wall-normal, isotropic Reynolds stress. ‘*A priori*’ tests are performed to assess the validity of the propositions using the direct numerical simulation (DNS) data of unstratified channel flow. The comparisons with the data are excellent and confirm our findings.

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