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Wall-modeled large-eddy simulation of a turbulent channel flow based on artificial neural network[1] YOUNG MO LEE, UNIST, JUNGIL LEE, Ajou University, JAE HWA LEE, UNIST — Because the computational cost of large-eddy simulation (LES) in the near-wall region of wall-bounded flows is proportional to approximately square of the friction Reynolds number (Re_τ), utilizing wall-modeled LES (WMLES) is promising to simulate a turbulent flow at sufficiently high Reynolds number with a reasonable cost. The most widely used wall model is an equilibrium stress model (i.e., wall-stress model) based on the momentum conservation. However, this method still needs to improve the accuracy and applicability for complex flows (e.g., swirled or separated flow) due to the limitations of the equilibrium assumption. In the present study, we employ an artificial neural network (ANN) to obtain information of the wall shear stress for WMLES. The proposed method shows good prediction on the mean velocity and Reynolds stress profiles compared to previous models in a turbulent channel flow in the range of the friction Reynolds numbers ($395<Re_\tau<5200$), even though the turbulent statistics at untrained Reynolds numbers are predicted.

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