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Artificial neural network mixed model for large eddy simulation of compressible isotropic turbulence. CHENYUE XIE, JIANCHUN WANG, Southern University of Science and Technology,Shenzhen 518055, P. R. China, HUI LI, Wuhan University, Wuhan 430072, P. R. China, MINPING WAN, SHIYI CHEN, Southern University of Science and Technology,Shenzhen 518055, P. R. China — The subgrid-scale (SGS) stress and the SGS heat flux of compressible isotropic turbulence are modeled by an artificial neural network(ANN) mixed model(ANNMM), which maintains both functional and structural performances. The functional form of the mixed model combining the gradient model and the Smagorinsky's eddy viscosity model is imposed and the ANN is used to calculate the model coefficients of the SGS anisotropy stress, SGS energy and SGS heat flux. It is shown that the ANNMM model can reconstruct the SGS terms more accurately than the gradient model in the *a priori* test. Specifically, the ANNMM model almost recovers the average values of the SGS energy flux and SGS energy flux conditioned on the normalized filtered velocity divergence. In an *a posteriori* analysis, the ANNMM model shows advantage over the dynamic Smagorinsky model (DSM) and dynamic mixed model (DMM) in the prediction of spectra of velocity and temperature, which almost overlap with the filtered DNS data while the DSM and DMM models suffer from the problem of the typical tilted spectral distribution. Besides, the ANNMM model predicts the PDFs of SGS energy flux much better than DSM and DMM models.

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