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Inverse energy cascade in rotational turbulence HUIDAN (WHITNEY) YU[1], College of Metrology & Measurement Engineering, Zhongguo Jiliang University, Hangzhou, China, ROU CHEN[2], Indiana University-Purdue University Indianapolis (IUPUI), HENGJIE WANG, Peking University, China — Rotation influences large-scale motions in the Earth's atmosphere and oceans and it is also important in many industrial applications such as turbo machinery, rotor-craft, and rotating channel etc. We study rotation effects on decaying isotropic turbulence through direct numerical simulation using lattice Boltzmann method. A Coriolis force characterized by the angular velocity of the frame of reference Ω is included in the lattice Boltzmann equations. The effects of rotation on fundamental turbulence features such as kinetic energy and enstrophy decay, energy spectrum, etc. are studied. The decay laws are quantitatively captured. Inverse energy cascade are observed in the 3D turbulence with and without rotation. The scaling of the inverse energy cascade and its relation to initial energy spectrum are explored.

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