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Statistical properties of the 3-D poor man's Navier–Stokes equation J.M. MCDONOUGH, University of Kentucky — The poor man's Navier–Stokes (PMNS) equation is an efficiently-evaluated discrete dynamical system (DDS) derived directly from the Navier–Stokes (N.–S.) equations via a Galerkin procedure. The 2-D version of this DDS was introduced by McDonough and Huang, *Int. J. Numer. Meth. Fluids* (2004), where it was thoroughly analyzed for values of bifurcation parameters that might be associated with isotropic turbulence. Yang *et al.*, *AIAA J.* (2003), demonstrated that the PMNS equation could be employed to accurately fit experimental data. These results suggest possible use of the PMNS equation as part of a subgrid-scale (SGS) model for LES formulated to capture effects of interactions between turbulence and other physics on unresolved scales. Here, we consider statistical properties of the 3-D PMNS equation to ascertain whether they are sufficiently close to those of physical N.–S. flows to warrant development of such models. In particular, we will present auto and cross correlation of velocity components, probability density functions, flatness and skewness of velocity derivatives, and scaling of longitudinal velocity structure functions of orders two, three, four and six. It will be demonstrated that PMNS equation statistics are generally in accord with those of the full N.–S. equations, and as a consequence this DDS could lead to very efficient LES SGS models able to replicate small-scale turbulence interactions with other physics.

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