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Analysis of "Poor Man's Navier–Stokes" and Thermal Energy Equations for High-Rayleigh Number Turbulent Convection J.M. MCDONOUGH, University of Kentucky — Derivation of the poor man's Navier–Stokes (PMNS) equations (McDonough & Huang, *Int. J. Numer. Meth. Fluids* **44**, 545, 2004), along with that of the corresponding thermal energy equation, is outlined. These comprise a low-dimensional discrete dynamical system (DDS) that is closely related to the symbol of the differential system and have been shown to be able to efficiently produce any possible Navier–Stokes temporal behavior. Specific relations between the bifurcation parameters of this DDS and the physical dimensionless parameters of the governing equations are presented, and a corresponding approximate expression for the Nusselt number is obtained that can be directly evaluated from the time series of the DDS. Heat transfer correlations are then constructed and shown to compare favorably with results from the low-Prandtl number mercury experiments of Cioni *et al., J. Fluid Mech.* **335**, 111, 1997 conducted at Rayleigh numbers as high as nearly 10^{10}. Results suggest potential for use of PMNS equations as temporal part of sub-grid scale model for LES.

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