Keynote Talk 02

Rayleigh-Benard Convection in Viscoelastic Liquids: New Results in Rectangular and Cylindrical Geometries

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ABSTRACT

Certain two-dimensional linear and nonlinear regimes of the Rayleigh-Benard convection problem shall be discussed in rectangular and cylindrical geometries. Similarities and differences between the results of the two problems shall be brought out. Jeffrey, Maxwell, second-order, Walters' liquid B and Newtonian fluids shall be considered for comparison of their results in rectangular and cylindrical geometries. An alternative to the consideration of the normal stress shall be presented to derive elegant Lorenz models for Jeffrey and Maxwell fluids. This novel approach concerning the decomposition of the differential equation with second order time derivative into two first order ones shall be elaborated. In the process how the viscoelastic effect gets segregated from the viscous one shall be made clear. Exploration of regular, chaotic and hyperchaotic convection shall be explored in detail using Lyapunov exponents and bifurcation diagram. Applications of various problems considered shall be highlighted together with future possibilities with the novel idea shall be discussed.

Keywords: Lorenz model, Walter's liquid, Rayleigh-Benard convection, Lyapunov exponents.

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