Numerical simulation of thermal convection of viscoelastic fluids

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Rayleigh−Benard convection of viscoelastic fluids in a cavity is investigated using a finite volume method. A very general nonisothermal constitutive equations are employed, where the thermodynamic consistency is imposed employing the WLF equation. To corroborate the accuracy of the numerical solution, a linear stability analysis has been performed for the Rayleigh−Benard convection of viscoelastic fluids using the Legendre spectral method. The results of hydrodynamic stability analysis in a cavity are compared with those of numerical results employing a finite volume method. The numerical results are found to coincide with those of linear stability analysis exactly.