

# Chaotic convection of viscoelastic fluids in porous media

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## Abstract

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Buoyancy-induced convection in a viscoelastic fluid-saturated porous medium was analyzed using an Oldroyd-type constitutive relation. An autonomous system with four differential equations was deduced by applying the truncated Galerkin expansion to the momentum and heat transfer equations. The four-dimensional system can be reduced to many systems provided in the literature such as the Lorenz system, Vadasz system, Khayat system, and Akhatov system. Depending on the flow parameters, the asymptotic behavior can be stationary, periodic, or chaotic. Generation of a four-scroll, or two- 'butterfly', chaotic attractor was observed. Results also show that stress relaxation tends to precipitate the onset of chaos.

Keyword : porous medium

Khayat system

Vadasz system

Lorenz system