Penetrative convection induced by an exponentially temperature dependent viscosity under the action of an internal heat sink

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Abstract

The penetrative convection in a fluid-saturated porous medium with an exponentially temperature dependent viscosity and an internal distributedconstant heat sink, according to the Darcy-Boussinesq model, is considered. In order to find conditions under which the penetrative convection cannot occur, a nonlinear stability analysis of the motionless state solution, via the Lyapunov direct method, is performed. By using an a priori estimate, a global stability condition for the motionless state solution guaranteing that the penetrative convection cannot occur, is obtained.