

Effect of viscosity on free convection boundary layer in porous media with Newtonian heating on a vertical surface

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Abstract: Free convection on a vertical surface with Newtonian heating of the form proposed by Merkin [1994] in the fluid-filled porous medium is considered on the basis of the full equations of a viscous liquid. With the help of dimensional analysis a set of criteria that define the characteristics of flow and heat transfer was derived. Asymptotic analysis of the full equations allowed us to determine the region of applicability of the boundary layer approximation, which was used in the previous studies of this problem. Darcy parameter influence was studied, the composite numerical and analytical solution for stream function and temperature was derived.