

Thermal convection in an infinite porous medium due to a source in sphere

R. Ganapathy

Department of Mathematics, National College, Tiruchirapalli-620 001, India

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A simple mathematical theory is proposed using the Brinkman model, for the analysis of the free convection motion in an unbounded porous medium, induced by an instantaneous point heat source which is enveloped by a solid sphere. The theory consists of retaining only the leading terms of the series expansions of the dependent variables in terms of the Rayleigh number and is valid in the limit of small Rayleigh number only. The heat generating rate is assumed to be not excessive so that the induced flow is slow. The evolution of the flow field is demonstrated by drawing the streamlines at various times and the results are delineated by comparing them with those of the Darcy flow model. The significance of the presence of the enveloping solid sphere is highlighted.

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