

Nonsimilarity solutions for mixed convection from horizontal surfaces in a porous medium-variable wall temperature

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**Abstract:** Mixed convection in a porous medium from horizontal surfaces with variable wall temperature distribution is analyzed. The entire mixed convection regime is divided into two regions. The first region covers the forced convection dominated regime where the dimensionless parameter  $\eta = \text{Rax}/\text{Pex}^{3/2}$  is found to characterize the effect of buoyancy forces on the forced convection. The second region covers the free convection dominated regime where the dimensionless parameter  $\eta = \text{Pex}/\text{Rax}^{2/3}$  is found to characterize the effect of the forced flow on the free convection. To obtain the solution that covers the entire mixed convection regime, the solution of the first region is carried out for  $\eta = 0$ , the pure forced convection limit, to  $\eta = 1$  and the solution of the second region is carried out for  $\eta = 0$ , the pure free convection limit, to  $\eta = 1$ . The two solutions meet and match at  $\eta = 1$ . Numerical results for different wall temperature variations are presented. In addition, correlation equations for the local and average Nusselt numbers are obtained.