UNSTEADY FLOW OF A DUSTY FLUID OVER A PERMEABLE STRETCHING/SHRINKING SHEET WITH PARTICLE SLIP

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Abstract- The problem of unsteady boundary layer flow of a dusty fluid past a stretching/shrinking sheet of a fluid-particle suspension in the presence of the wall suction and dust particles slip is investigated. The governing time dependent equations of the proposed problem are transformed into the ordinary differential equations using the appropriate similarity transformations which are then solved numerically using the bvp4c function in the Matlab software. The effects of the non-dimensional physical parameters such as the unsteadiness parameter, the mass suction parameter, the viscosity ratio parameter, the particle slip parameter, the particle loading parameter and the fluid-particle interaction parameter are studied and presented in the form of tables and figures. It is found that in the decelerating shrinking flow, the surface skin friction is higher in the dusty fluid than the clean fluid. Further, dual solutions are discovered in this problem and the second solution expanded with higher suction values. Despite the fact that the problems of dusty fluid has been broadly investigated, limited discoveries can be found over an unsteady shrinking flow. On the other hand, the effect of the particle-phase viscosity is also included, which is an important term to study the particle-particle and particle-wall interactions. Very few studies in dusty fluid embedded this parameter in their problem.

Keywords- Boundary Layer, Dusty Fluid, Fluid/Particle Suction, Stretching/Shrinking Surface, Unsteady Flow.