Heat transfer in a slip-flow past a sphere

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Convective heat transfer from a sphere in a streaming flow of a viscous incompressible fluid is studied under mixed slip-stick boundary conditions. Using the method of matched asymptotic expansions, analytical expression for the mean Nusselt number \( \text{Nu} \) is obtained up to \( O(\sigma^2 \text{Re}^2) \), where \( \text{Re}<1 \) is the Reynolds number based on uniform streaming and \( \sigma \) of \( O(1) \) is the Prandtl number. The results show that for a given \( \text{Re} \), heat transfer decreases with increasing slip. When a meridional spin is given to the body, it further decreases the heat transfer, though, quantitatively it is very marginal. This feature is in sharp contrast to the increased heat transfer due to rotation, observed in the absence of slip. © 1998 The Japan Society of Fluid Mechanics Incorporated and Elsevier Science B.V. All rights reserved.

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