

A Particular Class of Partially Invariant Solutions of the Navier—Stokes Equations

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Abstract:

One class of partially invariant solutions of the Navier—Stokes equations is studied here. This class of solutions is constructed on the basis of the four-dimensional algebra L_4 with the generators

$$\begin{aligned} X_1 &= \phi_1 \partial_x + \phi_1' \partial_x - x \phi_1'' \partial_p, & X_2 &= \phi_2 \partial_x + \phi_2' \partial_x - x \phi_2'' \partial_p, \\ Y_1 &= \psi_1 \partial_y + \psi_1' \partial_y - y \psi_1'' \partial_p, & Y_2 &= \psi_2 \partial_y + \psi_2' \partial_y - y \psi_2'' \partial_p. \end{aligned}$$

Systematic investigation of the case, where the Monge—Ampere equation (10) is hyperbolic ($Lf_z + k + l \geq 0$) is given. It is shown that this class of solutions is a particular case of the solutions with linear velocity profile with respect to one or two space variables.

Keyword : Group classification - group stratification - invariant and partially invariant solutions - Navier—Stokes equations