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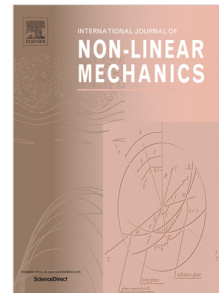
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# On exact analytical solutions of equations of Maxwell incompressible viscoelastic medium

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## Abstract

Unsteady two-dimensional flows of incompressible viscoelastic Maxwell medium with upper, low and corotational convective derivatives in the rheological constitutive law are considered. A class of partially invariant solutions is analyzed. Using transition to Lagrangian coordinates, an exact solution of the problem of unsteady flow near free-stagnation point was constructed. For the model with Johnson-Segalman convected derivative and special linear dependence of the vertical component of velocity, the general solutions were derived.

*Keywords:* Viscoelastic fluid; Johnson-Segalman convected derivative, UCM, Lie group; Invariant solution; Lagrangian coordinates; Stagnation point flow

*Subject Classification (MSC 2010):* 76A10, 34A34

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## 1. Introduction

Models of a viscoelastic Maxwell medium have been the subject of numerous mathematical studies (see monographs [1, 2, 3, 4], survey [5], papers [6, 7, 8, 9], and references cited therein). The mathematical theory of viscoelastic fluids is much more complicated than the theory of Newtonian fluids. The study of equations modeling viscoelastic fluids tends to be complicated by the fact that the equations of motion contain a larger number of unknown functions. The system of equations corresponding to an incompressible flow loses important properties such as hyperbolicity for example, and has no definite type [10, 11]. Therefore, it is of particular importance to obtain exact solutions which depend on at least two space variables and time. Exact analytical solutions corresponding to different flows of viscoelastic

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