Solution of Burger's Equation in a One-Dimensional Groundwater Recharge by Spreading Using Q-Homotopy Analysis Method

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Abstract

The ground water is recharged by spreading of the water in downward direction and the moisture content of soil increases. The mathematical formulation of the phenomena leads to the governing equation, which is a nonlinear partial differential equation in the form of Burger's equation which has been solved by using q-homotopy analysis method with appropriate initial and boundary conditions. The average diffusivity coefficient over the whole range of moisture content is regarded as constant. It is concluded that the moisture content of soil increases with the depth \(Z\) and increasing time \(T\). The numerical solutions of the governing equation have been obtained in the form of tables and graphs by using Mathematica coding. The numerical solution represents moisture content distribution in the vertically downward direction at any depth \(Z\) for time \(T > 0\). This type of problems appears particularly in soil mechanics, hydrology, ceramic engineering and petroleum technology.

Keywords: Moisture Content, Unsaturated Porous Medium, Burger's Equation, q-homotopy analysis method

Contribution of Study

Because of the ground water recharge the salinity of the soil can be reduced because of the increase of moisture content. due to the increase in moisture content the fertility of soil increases which helps the farmer in growing up a qualitative crop and in this case production of the crop will also increase and quality of the ground water also increase.