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Short Communication

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On The Regime of Ground Water During Filtration from Channels in the Soil Layer with the Underlying Pressure Horizon

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Summary

In the hydrodynamic formulation, the problem of liquid filtration from a channel filled with water through a soil layer with an underlying pressure horizon of relatively high permeability in the presence of evaporation from the free surface of groundwater is solved

When considering flows from channels, it is usually assumed that filtration occurs only through their bottom, which is usually taken as a horizontal segment [1-5]. Taking into account the influence of the depth of water in the channels, that is, the study of movement not only through the bottom, but also through the slopes of the channels makes an additional angular special point in the physical area, which significantly complicates the solution of the problem. In this paper, the method developed earlier is used to study the regime of ground water when filtering from such channels filled with water, in the presence of evaporation from a free surface [6].

In the framework of the theory of plane steady filtration of an incompressible fluid according to Darcy's law deals with the flow of rectangular channel of width 2l with water depth H in the soil capacity T, underlain by the well permeable pressurized horizon is relatively high permeability, the pressure of which is equal to H0 ($0<H0<T$), in the presence of a uniform intensity of evaporation ε ($0<\varepsilon<1$) with a free surface.

To study the flow formulates a combined multi-parameter boundary problem of the theory of analytic functions which is solved using the method of P.Y. Polubarinova-Kochina [1-5]. Based on the application of the analytic theory of linear differential equations of Fuchs class [7]. And the method of integrating such equations with four regular singularities [8-10]. Which is characteristic for problems of underground hydromechanics [11-15]. It should be noted that taking into account the specific features of the movements under consideration allows you to get solutions to problems in a closed form through elementary functions, which makes its use the most simple, convenient and effective.

On the basis of the model the algorithm of calculation of the size of the zone of saturation and the desired filtration flow rate in the case where filtering of the channels have to evaluate the joint impact on the pattern of such important factors as the filtration capacity of the reservoir and backwater from the deep artesian horizon of relatively high permeability, channel width and depth of the water in the evaporation from the free surface of groundwater.

On the basis of the obtained exact analytical dependences and by means of numerical calculations, the hydrodynamic analysis of the influence of all the specified physical parameters of the studied model is carried out. We compare the results of mathematical modeling with the same filtration characteristics for the flow pattern in the case when H=0, that is, when filtering only through the bottom of the channels.

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