Numerical Modeling of the Near-Subsurface Temperature Distributions in the Presence of Time Varying Air Temperature in the Boundary Condition and Space Varying Temperature for the Initial Condition

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Abstract

The subsurface thermal structure in presence of groundwater recharge/discharge has been obtained by applying the Robin type boundary condition at the earth's surface. The Robin type boundary condition involves the effect air temperatures at the surface which are taken as exponentially varying with time and the initial condition which is taken as exponential function of depth. The numerical results have been obtained using COMSOL Multiphysics® software. For simple initial and boundary conditions, the analytical solutions are available (Kumar et al 2012) and the algorithm has been used to reproduce these analytical results. The effects of various parameters such as heat transfer coefficient (H), groundwater velocity (v) on the thermal evolution have been studied. These studies are useful to set the numerical results for the complex problems where it is not possible to get analytical solutions. These solutions are further useful in understanding the nature of near surface climatic conditions.

Reference

Rajeev Ranjan Kumar, D V Ramana, and R N Singh.
Modelling near subsurface temperature with mixed type boundary condition for transient air temperature and vertical groundwater flow.
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