Dynamics of groundwater mounds: Analytical solutions and integral characteristics

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Abstract

Transient water table systems under the influence of decaying groundwater mounds are studied in terms of the Dupuit-Forcheimer approximation, its linearization and linear potential theory. Parabolic mounds spreading and shrinking due to gravity and evapotranspiration are derived from the general class defined by Polubarinova-Kochina (1945). The penetration curves are calculated as characteristics of the water table response at prescribed observation wells. The Polubarinova-Kochina solutions for rectangular mounds are used to derive isochrones, a "resting lens" into which a mound transforms, and a distortion picture of reference volumes. These characteristics are obtained from numerical solution of a system of ordinary differential equation. The plume illustrating the advective spread of a contaminant from a reference area is computed as a composition of all path lines passing through this area.