



# Hydrodynamics of Time-Periodic Groundwater Flow: Diffusion Waves in Porous Media (Geophysical Monograph Series)

*Joe S. Depner, Todd C. Rasmussen*

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*Hydrodynamics of Time-Periodic Groundwater Flow* introduces the emerging topic of periodic fluctuations in groundwater. While classical hydrology has often focused on steady flow conditions, many systems display periodic behavior due to tidal, seasonal, annual, and human influences. Describing and quantifying subsurface hydraulic responses to these influences may be challenging to those who are unfamiliar with periodically forced groundwater systems. The goal of this volume is to present a clear and accessible mathematical introduction to the basic and advanced theory of time-periodic groundwater flow, which is essential for developing a comprehensive knowledge of groundwater hydraulics and groundwater hydrology.

Volume highlights include:

- Overview of time-periodic forcing of groundwater systems
- Definition of the Boundary Value Problem for harmonic systems in space and time
- Examples of 1-, 2-, and 3-dimensional flow in various media
- Attenuation, delay, and gradients, stationary points and flow stagnation
- Wave propagation and energy transport

*Hydrodynamics of Time-Periodic Groundwater Flow* presents numerous examples and exercises to reinforce the essential elements of the theoretical development, and thus is eminently well suited for self-directed study by undergraduate and graduate students. This volume will be a valuable resource for professionals in Earth and environmental sciences who develop groundwater models., including in the fields of groundwater hydrology, soil physics, hydrogeology, geoscience, geophysics, and geochemistry. Time-periodic phenomena are also encountered in fields other than groundwater flow, such as electronics, heat transport, and chemical diffusion. Thus, students and professionals in the field of chemistry, electronic engineering, and physics will also find this book useful.

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