



An analytical solution of groundwater level fluctuation in a U-shaped leaky coastal aquifer

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Tide-induced groundwater level fluctuations in coastal aquifers have attracted much attention in past years, especially for the issues associated with the impact of the coastline shape, multi-layered leaky aquifer system, and anisotropy of aquifers. In this study, a homogeneous but anisotropic multi-layered leaky aquifer system with U-shaped coastline is considered, where the subsurface system consisting of an unconfined aquifer, a leaky confined aquifer, and a semi-permeable layer between them. The analytical solution of the model obtained herein may be considered as an extended work of two solutions; one was developed by Huang et al. (Huang et al. Tide-induced groundwater level fluctuation in a U-shaped coastal aquifer, *J. Hydrol.* 2015; 530: 291-305) for two-dimensional interacting tidal waves bounded by three water-land boundaries while the other was by Li and Jiao (Li and Jiao. Tidal groundwater level fluctuations in L-shaped leaky coastal aquifer system adjacent to a cross-shore estuary, *J. Hydrol.* 2002; 268: 234-243) for two-dimensional interacting tidal waves of leaky coastal aquifer system adjacent to a cross-shore estuary. In this research, the effects of leakage and storativity of the semi-permeable layer on the amplitude and phase shift of the tidal head fluctuation, and the influence of anisotropy of the aquifer are all examined for the U-shaped leaky coastal aquifer. Some existing solutions in literatures can be regarded as the special cases of the present solution if the aquifer system is isotropic and non-leaky. The results obtained will be beneficial to coastal development and management for water resources.