Comments on Feng et al.
By Shlomo P. Neuman

This manuscript provides a mathematical solution to Hankel and Laplace transformed equations describing flow to a line sink of variable strength partially penetrating a hydraulically anisotropic aquifer of finite thickness, confined above and below by anisotropic aquitards of finite thickness, all three layers extending horizontally to infinity. Horizontal boundaries at the top and bottom of this three-layer system are assigned prescribed head (Case 1), zero flux (Case 2), or prescribed head at top and zero flux at bottom (Case 3). The solutions are transformed back into real space-time coordinates numerically.

Although the authors consider their model to represent a general three-layer aquifer system, there are two indications that the top and bottom layers must be aquitards: 1) Pumping takes place only from the middle layer, suggesting that the top and bottom layers are not productive, and 2) top and bottom boundary conditions are those of the classical Hantush-Jacob "leaky aquifer" model, which the authors consistently compare with theirs. This comparison leads the authors to conclude that theirs is a more general model because it allows for partial penetration, anisotropy, multidirectional flow and variable pumping rate.

In reality, the proposed solution is severely limited by the replacement of aquifers above and below the two aquitards with artificially imposed boundary conditions and by treating the top and bottom layers as aquitards rather than, potentially, productive aquifer layers. The authors forget to mention that analytical solutions exist for more realistic multiaquifer systems with aquifers above and below their aquitards (replaced in their model by artificial Hantush-Jacob boundary conditions); see Neuman (1968), Neuman and Witherspoon (1969) and Li and Neuman (2007). Though it is true that these models restrict flow in aquifers to horizontal, flow in aquitards to vertical, and flow to a fully penetrating well, those restrictions have been demonstrated by Neuman (1968) and Neuman and Witherspoon (1969) to be much less severe than implied by the authors.

The authors likewise forget that any analytical expression for constant pumping rate is easily generalized to the case of variable pumping rate through the temporal superposition of elementary expressions; this has been done routinely for years in software packages such as Aqtesolv.

In summary, I find the manuscript to be somewhat misleading in its claim of providing a useful general solution to well flow in a multilayer aquifer system, and the proposed solution to be at best of marginal interest to hydrologists.