Comment on ‘A Semi-Analytical Solution for Large-Scale Injection-Induced Pressure Perturbation and Leakage in a Laterally Bounded Aquifer–Aquitard System’ by Quanlin Zhou, Jens T. Birkholzer and Chin-Fu Tsang, Transport in Porous Media, doi:10.1007/s11242-008-9290-0

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Received: 19 October 2010 / Accepted: 27 October 2010 / Published online: 17 November 2010
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In the paper ‘A Semi-Analytical Solution for Large-Scale Injection-Induced Pressure Perturbation and Leakage in a Laterally Bounded Aquifer–Aquitard System’ by Quanlin Zhou, Jens T. Birkholzer and Chin-Fu Tsang, Transport in Porous Media (2009), vol. 78, pp. 127–148 (doi:10.1007/s11242-008-9290-0) the authors study nicely the influences of pressure perturbations on a system of an aquifer and an overlying or underlying aquitard. In the sequel, we denote by Zh(*i*) equation (*i*) in their paper.

In this Comment, we shall point out a serious mistake in the derivation of their results. The authors scale their dependent (*h*, *h'*) and independent variables (*r*, *z* and *t*) and subtract from *h*(*r*, *t*) (head in the aquifer) and *h'*(*r*, *z*, *t*) (head in the aquitard) the corresponding initial conditions *h_i*(*r*), *h_i*(*r*, *z*), respectively, as

$$h_D(r_D, t_D) = \frac{4\pi K B}{Q} (h(r, t) - h_i(r)), \quad \text{for the aquifer, Zh(3),}$$
$$h'_D(r_D, z_D, t_D) = \frac{4\pi K B}{Q} (h'(r, z, t) - h'_i(r, z)), \quad \text{for the aquitard, Zh(3).}$$

Indeed, now they have

$$h_{Di}(r_D) = h_D(r_D, 0) = \frac{4\pi K B}{Q} (h(r, 0) - h_i(r)) = 0, \quad \text{for the aquifer, Zh(4e),}$$
$$h'_{Di}(r_D, z_D) = h'_D(r_D, z_D, 0) = \frac{4\pi K B}{Q} (h'(r, z, 0) - h'_i(r, z)) = 0, \quad \text{for the aquitard, Zh(5d),}$$

but insertion of *h*(*r*, *t*) in terms of *h_D*(*r_D*, *t_D*) into Zh(1a), Zh(1c), Zh(1d) and insertion of *h'*(*r*, *z*, *t*) in terms of *h'_D*(*r_D*, *z_D*, *t_D*) into Zh(1b), Zh(2a), Zh(2b), Zh(2c, Case 2) will give rise to additional terms into equations Zh(4a), Zh(4c), Zh(4d), Zh(4b), Zh(5a), Zh(5b), and Zh(5c, Case 2), respectively. In this way, the influence of the initial conditions has been

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disappeared totally, which is mathematically inconsistent. Only, if the authors should have assumed that both $h_i(r)$, $h_i(r, z)$ were equal constants, the conclusions of the paper remain valid, but according their notation “ $h_i(r)$ ” in Zh(1e), and in the line below Zh(2c) “ $h_i(r, z)$ ” they apparently did not assume this simplification.

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