Responses to Comments of Referee #1

The authors have addressed my comments fully and clearly. I have a very minor point that came out while re-reading the manuscript and author responses.

In the response to my comment about the non-dimensionalization (my comment 6 -- covered on pages 3-4 of the author rebuttal document) the authors' mention they selected y_0 as a characteristic length, but actually they used 2 characteristic lengths (they used H in the vertical direction). This leads to κ_z including not just the permeability ratio K_y/K_z (similar to κ_x), but also the squared length scale ratio y_0^2/H^2. Because of this choice, one cannot disentangle the effects of changing κ_z that are due to permeability changes, or due to the square root of length scaling changes.

I understand it is too late in the process to change this sort of detail (and it does not change the results or impact of the manuscript), but a consistent single characteristic length scale would have been a bit simpler.

Response: Thanks for the comment. The definition of $\kappa_z = K_z\, y_0^2/(K_y\, H^2)$ can explicitly demonstrate that both K_z/K_y and y_0^2/H^2 are crucial factors in neglecting the effect of the vertical flow on stream filtration/depletion rate (SDR) (Huang et al., 2014). Such definition is similar to the work of Neuman (1975) in which he defined dimensionless parameter $\beta = K_z\, r^2/(K_r\, H^2)$ with K_r representing the hydraulic conductivity in the radial direction and r denoting a radial distance measured from a pumping well to an observation point. He used the parameter to examine the validity of neglecting the effect of the vertical flow on time-dependent drawdown at the observation point (see Figure 1 in Neuman, 1975).

In our definition, the effect of K_z/K_y on SDR can be clearly explored once the value of y_0 is selected. On the other hand, the effect of y_0^2/H^2 on SDR can also be assessed if the value of K_z/K_y is known.

References

Huang, C. S., Lin, W. S., and Yeh, H. D.: Stream filtration induced by pumping in a confined, unconfined or leaky aquifer bounded by two parallel streams or by a stream and an impervious stratum, J. Hydrol., 513, 28−44, doi:10.1016/j.jhydrol.2014.03.039, 2014.

Neuman, S. P.: Analysis of pumping test data from anisotropic unconfined aquifers considering delayed gravity response, Water Resour. Res., 11, 329−342, 1975.