

Reply to Reviewer 1

I miss a reference to: Huang, C.-S., Tsai, Y.-H., Yeh, H.-D., and Yang, T.: Analysis of Groundwater Response to Oscillatory Pumping Test in Unconfined Aquifers: Consider the Effects of Initial Condition and Wellbore Storage, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-199>, 2018. which is closely related.

Response: This paper is actually a revised version because Huang et al. (2018) of the previous manuscript with no. hess-2018-199 was “rejected with invitation to resubmit”. Frankly speaking, we think that previous reviewers’ comments were full of personal prejudices. The previous manuscript, reviewers’ comments, our replies, and editor’s decision letter are available through the link (<https://doi.org/10.5194/hess-2018-199>).

Note that the present version has following two major changes:

- (1) Prof. T. C. Rasmussen provided us raw data of hydraulic head fluctuation taken from field oscillatory pumping tests at the Savannah River site (Rasmussen et al., 2003). The data from the Boise Hydrogeophysical Research Site reported in Rabinovich et al. (2015) and its associated analyses had been removed.
- (2) Different from the previous model, the present analytical model considers the effect of delayed gravity drainage (DGD) on water table motion in a new free surface equation. The present model can also deal with the case that the groundwater flow is subject to the effect of instantaneous gravity drainage (IGD). Head responses to the DGD and IGD effects are compared and discussed in the current version.

References

- Huang, C.-S., Tsai, Y.-H., Yeh, H.-D., and Yang, T.: Analysis of Groundwater Response to Oscillatory Pumping Test in Unconfined Aquifers: Consider the Effects of Initial Condition and Wellbore Storage, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2018-199>, 2018.
- Rabinovich, A., Barrash, W., Cardiff, M., Hochstetler, D., Bakhos, T., Dagan, G., and Kitanidis, P. K.:

Frequency dependent hydraulic properties estimated from oscillatory pumping tests in an unconfined aquifer, *J. Hydrol.*, 531, 2–16, 2015.

Rasmussen, T. C., Haborak, K. G., and Young, M. H.: Estimating aquifer hydraulic properties using sinusoidal pumping at the Savannah River site, South Carolina, USA, *Hydrogeol. J.*, 11(4), 466–482, 2003.