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## Comment on hess-2021-380

Frederick L Paillet (Referee)

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Referee comment on "Advances in the Hydraulic Interpretation of Water Wells Using Flowmeter Logs" by Jesús Díaz-Curiel et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-380-RC1>, 2021

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My review has been cursory as per your request for rapid response. In looking at the manuscript the main thrust is given as including a correction for the effect of hydraulic head variation between otherwise isolated contributing aquifers in well production testing. The many factors acting to confound stepped drawdown tests are cited such as non-linearity caused by turbulence and "skin" losses. Hydraulic head differences certainly contribute to this problem. However, the subject of head differences in assessing the permeability of aquifers in multi-zone wells has been treated in elaborate detail by my USGS colleagues. Exactly 20 years ago I published an article (Paillet, Ground Water, v 39, no 5, p 667) that addresses just this problem. The theoretical background for this analysis was presented by Paillet, Water Resources Research, v 34, no 5, p 997. Comparison of head interpretations were quantitatively compared to multi-zone piezometer data by Paillet et al, 2000, Journal of Hydrology, v 234, p 208. Since then my colleagues and I have been advocating the use of flowmeters to determine hydraulic head differences within heterogeneous formations as being more indicative of large-scale connections within fracture flow systems than the local transmissivity of specific flow zones where they intersect boreholes. Not long ago the USGS made a numerical code package (FLASH) available online for this analysis. The authors cite LeBorgne 2006 and that study uses the heads inferred from aquifer testing (using flowmeter data) in multi-zone wells to track the expansion and contraction of the cone of drawdown as a supply pump was cycled off and on.

That said, the topic is treated in the context of high-resolution (EM and HP) flowmeters where other sources of nonlinearity are usually limited. Adding head difference considerations to the interpretation of impeller flowmeter logs in the presence of sources of non-Darcyian flow would still be of interest. Just not as such a novel approach as implied here.