Hydrology and Earth System Sciences Discussions

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2022-298

Anonymous Referee #1

Referee comment on "Technical note: Displacement variance of a solute particle in heterogeneous confined aquifers with random aquifer thickness fields" by Ching-Min Chang et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-298-RC1, 2022

I have tried to read this paper multiple times now and every time find myself frustrated. I am highly litterate in terms of mathematically dense papers, but I found this paper next to impossible to make my way through. I do not usually write grumpy reviews, but this will be one. I have three major concerns that lead me to recommend that this paper be rejected.

(1) My first and likely biggest issue is going from equation (1) to (2). Any time you average and ADE equation like the one the authors have you will have a mean and fluctuation of the things that vary. In this case concentration, velocity and depending on the nature of the dispersion coefficient that also. Where are all of these gone? They don't just dissappear as it seems that they do in equation (2) - i.e. it's fine to say that the average of the fluctuation of concentration is zero, but the average of the product of concentration and velocity fluctuations is not. Indeed this is exactly what leads to things like macrodispersion and deviations from standard behaviors. Where have these gone here? There is no discussion of them and none of the assumptions I see in the problem setup suggest they do not exist or are negligible. This is the starting point of the paper and frankly makes me feel like the authors are departing from a faulty point from the getgo.

(2) As I noted I am someone who writes and reads a lot of papers with pretty dense and complex mathematics in it, but I found a lot of what the authors present extremely hard to follow, where in some places there is abundant detail and in others serious gaps.

(3) Last but not least, even if everything is right (which I cannot verify) I struggle to see the real importance of this paper and thus am hesitant to see it published in such a high level journal such as HESS which is one of the top journals in our field. Much of the paper feels a little archaic in nature and while I love theoretical papers with full mathematics I also feel that something clear should be gained by ellaborating it and I just do not see

that here.

I'm sorry for being grumpy, but I also feel that the authors put me in this place with poor presentation and a lack of clear motivation and setup of the problem they're really trying to tackle. Based on my reading I believe the paper should be rejected and not published in HESS. Perhaps with some rewriting and really ensuring all the presentation is correct and consistent another more specific journal would be better suited to this type of work.