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Interactive comment on "Framework for assessing lateral flows and fluxes during floods in a conduit-flow dominated karst system using an inverse diffusive model" *by* C. Cholet et al.

Anonymous Referee #4

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The manuscript introduces a new framework which enables assessment of inflows/outflows to/from the channel reach in a karst aquifer. The paper presents a nice combination of field and modelling work and is as such worth publishing. My comments are mostly related to the presentation of concepts (and to some extent results) which should be made clearer.

Here is the list of comments (P#L#) refers to the page and line number to which the comment refers to the page and line number the comment refers to:

The concept of Diffusive wave equation was first introduced at P2L35 and reintroduced at P3L5. Restructure these paragraphs.

P3L8 A statement that DW is used for mass transport is a bit misleading. Although the equation is the same as the ADE, it is built on different conservation principles and driving forces. The statement might confuse a reader. The same comment goes to P327.

P4L15: What do you mean with **without downstream boundary conditions**. Please clear up.

P4L 14-17: This paragraph is somehow awkward. What do you mean with **direct model** ? The $Q_{i,routed}$ is introduced, but not told what it represents; this would be helpful for someone not familiar with the older literature. . . The aim of 2.1.1. is somehow lost until P4L21: I miss an earlier clear statement that C_Q and D_Q are looked for. How are $Q_{I,routed}$ and $Q_{O,flood}$ compared?

P5L8 (and before): It looks like that the model allows assessment of *q(x,t)*, however as far as I understanding it allows only time dependence of the total in/out-flow between I and O. In other words, spatial distribution of in/out-flows is not obtained?

P5EQ10 and EQ11: Change $A_Q(t)$ to $Q_A(t)$.

P5L20-25: The paragraph is hard to read. 1) What do you mend by Âżapplication of ADE is not so obviousÂń. Does this mean that equation itself is Âżnot obviousÂń or that the solution is not straightforward. . . . If I understand correctly, the idea is to determine lateral flow from DW (previous chapter) and introduce it into ADE to finally get $M(t)$ and $S(t)$. Why introducing $Q(t)$ in Equation 15 ? Is this $Q_{A(t)}$? I miss clear presentation of ideas and concepts. It would be good if you put in the ADE equation.

P9L12-20: Can one infer from DW equation that sensitivity to celerity is orders of magnitude higher than sensitivity to diffusivity?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-565, 2016.