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 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 $Q_{i,\text{routed}}$ is introduced, but not told what it represents; this would be help-
ful 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 $Q_{I,\text{routed}}$ and $Q_{O,\text{flood}}$ 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 Âžapplication
of ADE is not so obviousÂ„. Does this mean that equation itself is Âžnot obviousÂ„
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 mag-
nitude higher than sensitivity to diffusivity?