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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A fluid-mechanics-based classification scheme for surface transient storage in riverine environments: quantitatively separating surface from hyporheic transient storage" *by* T. R. Jackson et al.

Anonymous Referee #2

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This paper lays out a well-organized classification scheme of the in-channel features and locations that can cause water and solutes to be temporarily 'stored' or their downstream transport delayed, compared to the bulk flow in the thalweg of the channel. The authors go to great lengths to organize this scheme and to summarize what is known already from the hydraulics and river mechanics literature about the flow dynamics in these features. Thus, the paper's main contribution is to organize and present these findings in a single paper. The paper is very well-written and well-organized. I especially like the detailed figures that go with the descriptions of each feature. The impact

of this paper will be to bring a hydraulics perspective to hydrologists who have ignored these details in past efforts (myself included), and possibly the inverse as well. Linking process to residence time dynamics (as inferred from solute transport studies) has long been a goal of hydrologists and ecologists, and this paper serves to significantly inform the in-channel portion of this grand connundrum.

While this is a huge step forward, I was a little disappointed that there was no further attempt to compare or contrast these features. I recognize that this is a first step, and that the paper is pretty long as it stands, and I appreciate the current state of the paper as it seems to fulfill the objective set by the authors. However, I'm left feeling like this is the introduction chapter to a book that contains subsequent chapters on each of these. I would encourage the authors to consider one or two additional (short) subsections that might explore the likely relationships between the parameters and residence times in the many equations presented. For example, will tau for lateral cavities increase or decrease with an increase in W, L, or u*? Many of the equations presented are very general relationships. Which way should a change in each parameter influence residence time? I think that this could be done succinctly in table format and would provide another layer of complexity that could essentially provide hypotheses for how these parameters relate to or influence residence time in each feature type. That would be useful for hydrologists seeking to relate form to function in their streams, without having to develop exact equations (which are yet to be published, apparently).

I look forward to this paper being published as I believe it will be a significant spark to inspire further research into linking environmental fluid mechanics with solute transport interpretations in streams.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 4133, 2013.