Response to comments from Anonymous Referee #2

Ward et al., have compiled a uniquely thorough dataset and compiled a number of analyses to better explain the effect of river corridor exchange across a range of scales up to the river network scale and specifically to test Wondzell's conceptual model. The work shows systematic changes in a variety of metrics moving downstream through the watershed. Interestingly, the study found an increase in K in the downstream direction, which defied initial expectations. The work also verified that discharge is an inappropriate scaling metric for prediction of river corridor exchange because it is dependent on a variety of forcing mechanisms operating across a range of scales. This paper will be a significant contribution to the field once it is in print.

The authors have made revisions to the manuscript based on comments from a fellow reviewer and myself. I am generally happy with their responses and how the edits addressed the comments, but have a few remaining concerns--most of which are minor. I think they would all help improve the paper and broaden its accessibility for those who are not engaged in this immediate field.

> No modification required based on the comments above.

My largest remaining concern is the justification for the large number of authors included on this paper. Most top-tier journals (e.g. Science and Nature, as well as many others) have begun to require a thorough justification for the inclusion of each author that includes some description of how each author contributed. However this goal is met, I think it worthwhile to have something more descriptive than the current three-line 'author contribution' section, which only mentions two of the 37 authors. Generally, my understanding of authorship is that each author has contributed significantly to at least two of the four tiers of authorship – funding, writing, conception, work. I believe the authors that they have all met this requirement, but I think it is generally worthwhile to explicitly describe the ways in which each contributed, especially when so many authors are included and when the alphabetical listing confuses the amount of contribution that each made. I previously suggested the model of Clement (2014) to show how justification could be demonstrated, but additional models exist. If length is a concern, justification could be included in the supplement.

> We have added a detailed listing of contributions to the manuscript using the Contributor Role Taxonomy (CRediT) scheme.

Minor comments:
Page:line
8:40 I appreciate how the authors presented their justification for basing field-estimation of mixing lengths based on experience, rather than an empirical estimate. I think it would be helpful to report the mixing lengths that were actually used for each of the streams, perhaps only as a scatter plot showing q vs mixing length. This is a helpful metric to show to readers less-familiar with this field.

> Mixing lengths were not recorded in the field. While we agree this could be informative, we do not have the data to provide this visualization.

10-11:section 2.2. This section is very helpful for putting the authors goals and the limitations of this approach in perspective.

Thank you. No modifications in response to this comment.

12:1 Table is cut-off and I could not evaluate fully, but I think this is a worthwhile addition in response to one of the reviewer comments. This summary of "key metrics" and approaches helps with clarity of purpose. The included subset of abbreviations are helpful for the reader to decipher the large number of terms included in this paper. That said, I still find it difficult to wade through the large number of terms included in the equations of this paper and think a single table of variable definitions would be very useful--similar to that included in engineering-focused journals. Someone more familiar with the field will find this less-difficult than I did, most likely, however, the task of sorting through so many equations across so many pages of text to identify the meaning of each term and equation is a barrier for entry for those less familiar with this topic.

We have added a table including symbols, definitions, and units as a new section following the conclusions of the study.

14:20 I think it might be easier to follow notation if the normalized breakthrough curve (concentration) notation were also capitalized ('c' --> 'C') as the other concentration notations are.

We use the lower case "c" to differentiae the normalized concentration from the observed concentration ("C"). The alternative here would be to replace "c" with "C_{norm}" at all instances, which we believe is more confusing to the reader. We have elected not to modify the text in response to this point.

20:20 I wonder why the references to panels in figure 3 are out-of-order.

We have reorganized the paragraph in question to present the panels of Fig. 3 in order.

23:20/Figure 4 It would be helpful to include r2 values on the plots, especially since they're referenced here.

We have added r^2 to each panel of the figure as suggested.

27:Figure 5 I still disagree that adding lines of best fit on this plot is useful or appropriate. I think they imply trends that I do not see in the data—especially in panel A. I think the authors should at least include an r2 value to emphasize the poor fit.

We have added r^2 to each panel of the figure as suggested.

28:28, a reference back to figure 3 would be helpful here

Reference to Fig. 3D added as suggested.

27:7 & 30:Fig. 6. I think it would be helpful to walk the reader through panels b-f of figure 6. I'm not sure the points that are being made in the figure besides that there's some goodness of fit.

We have added a sentence to section 4.1 to further explain these panels.