

## ***Interactive comment on “Mesoscale connectivity through a natural levee” by A. E. Newman and R. F. Keim***

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This is an interesting paper describing the role of a natural levee on the subsurface connectivity between floodplains and river channels, a topic very suitable to readers of HESS. I found the manuscript to be technically sound in general. While there are a few debatable technical assumptions underlying this work, I appreciated the fact that the authors addressed their limitations in the Methods and Discussion sections. Still, there are some items the authors should put their attention to in order to improve the paper:

\* The definition of connectivity throughout the manuscript evolves quite a bit and the authors should make it more focused. The definitions of chemical and hydraulic connectivity at the end of the Introduction are nicely laid out; however at the beginning

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of the Introduction, it is unclear whether connectivity refers to exchanges of water in broad terms, or to the connectedness of high-conductivity flow-paths (sensu Knudby and Carrera, 2005 and 2006). I feel that most of the manuscript is aligned with the latter definition but this is something that the authors should clarify right at the beginning of the Introduction.

\* Page 7763, line 12: I assume the authors meant “hydraulic conductivity” rather than “hydrologic conductivity” (?).

\* Page 7764, line 10: I would not call soil moisture the “preferred metric”. It is one of the many hydrological state variables used to estimate connectivity, and in the last two to three years most papers on subsurface flow connectivity have relied on shallow water table data (e.g., Jencso et al., 2009 WRR, Detty and McGuire, 2010 HP and WRR, etc.).

\* Page 7766, line 6: There is a space missing.

\* Page 7767, line 26: The authors mentioned the wells were installed to a depth of 2m with no justification for that choice. Was that depth chosen based on the textural analysis on the natural levee soils?

\* Page 7768, line 1 and on: I am a bit perplexed about the two types of well screens. Why were those two types used and especially where is each type located on Figure 1? Does the type of well screen influence the research results in any way?

\* Page 7773, lines 20-23: What do the opposite directions of the EC and chloride responses say about the (spatial) variability of the new versus old water influences on connectivity?

\* Page 7774, lines 7-10: Please expand on this explanation and refer to specific wells rather than referring to the bulk of Figs 7-9.

\* Page 7774, line 8: There is a full stop missing.

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- \* Page 7776, lines 26-27: I assume that literature values for K are based on matrix flow-prone conditions. However the authors strongly insist on the predominance of preferential flow in the text; what would be their estimation as to how preferential flow might have resulted in K values superior to those previously published?
- \* Page 7777, lines 5-6: Would it not have been possible to estimate flow path lengths from GIS analyzes conducted on high resolution levee topographic data?
- \* Page 7777, lines 22-24: The argument made here should be a hypothesis mentioned in the introduction to justify the relevance of the present study.
- \* At no point did the authors discuss the potential effects of the size and the location of the berm on their research results.
- \* Throughout the text, it is unclear how (if) the authors quantified antecedent moisture conditions. Antecedent precipitation indices could have been computed rather than referring to antecedent moisture conditions in a qualitative manner.
- \* No explicit link is made between water table dynamics, tracer dynamics and individual rainfall events.
- \* While the spatial variability of subsurface hydrochemistry is often mentioned throughout the manuscript, no spatial correlations to local levee topography or local levee stratigraphy were investigated.
- \* The authors should revise their reference list as well as all their in-text citations. Papers are cited in the text but missing from the reference list (or vice versa) on at least two occasions (e.g., Malard et al., 2002 in-text citation; Zeleke and Si, 2005 contribution in the reference list). Also, it too often happens that the bibliography lists several authors for a given contribution while only one author is cited in the text (e.g., “Johnston, 2001” rather than “Johnston et al., 2001”).

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