Dear Editor,

Thanks for your patient!

We have study all the comments carefully and have made modifications and corrections which we hope meet your/their approval. The following text marked in red is our replies.

Xiaobing

Hohai University

P-page; L-line

Anonymous Referee #2

Received and published: 20 April 2015

Overview: This paper investigates flooding patterns and processes for the McCarran Ranch reach of the Truckee River in Nevada, USA. The ADH model is applied to study flood characteristics and interactions between the main channel and the floodplain. Metrics of floodplain fluxes are studied as well as inundated areas. The results indicated an interesting hysteresis pattern to flood behavior. This is an interesting paper with several novel aspects that are worthy of investigation. However, the structure of the paper can be improved to clarify the unique contributions of this work.

Reply- thanks for the positive affirmation. We have restructured the paper as you can see in the revised manuscript.

Innovation: As commented upon by the first anonymous reviewer, the novelty of this work is not emphasized to the extent that it could be. The introduction and methods sections emphasize the study area and the modeling approach. Neither of these items are novel. The novelty of this work lies in the investigation of floodplain fluxes and the unveiling of the hysteresis type characteristics of the flood pulses. I suggest that the authors revise the paper to clarify this contribution.

Reply-We have improved the abstract and the introduction. The flux exchanges within the main channel-floodplain system is emphasized in the abstract (P2, L26-33). Also, the hysteresis characteristics of inundation is illustrated in (P2, L34-36)

Technical Quality: Unlike the first reviewer, I do not see any major issues with the technical quality of this work. The authors rightfully acknowledge that low resolution topographic data in the floodplain likely influenced the model results under high flows. However, the specific inundation patterns are not the emphasis of this work. Rather, the authors are investigating how models such as ADH can provide better insights for floodplain processes. Again, the authors should clarify this point. I have made several specific comments regarding the technical aspects of this paper below.

Reply-We appreciate the reviewer's positive comments. In this paper, we used several paragraphs to illustrate why we chose AdH to modeling the flood process (P4, L70-80; P4, L86-88) and performance of the model in modeling/predicting overbank flows (P17-18, L430-437).

Writing Quality: The paper should be thoroughly edited to improve clarity. The grammar needs to be corrected in several places.(we have checked through the text) Many of the paragraphs are much too long and need to be broken up to add clarity (We have made some changes). The opening paragraphs are too focused on the case study and should be broadened to emphasize the contribution of this work – including the inclusion of a specific objective(s)(done, see the introduction part). The background on floodplain fluxes should be moved from the results section up to the introduction section. The results and discussion should be broken into two separate

sections. Inclusion of the 2D equations is not necessary unless there is some unique aspect that is required to interpret the model results.

Specific Comments: -What was the relative area described by high-res LiDAR vs. USGS DEM?(we used the Lidar data for the bathymetry of the main channel, outside the main channel, the topography is interpolated from the USGS DEM) -At what flow does the inundated area cover the USGS DEM? (Figure 10 in the revised manuscript shows the inundation maps for a 50-yr flood event (case 7), even at the peak discharge stage (peak discharge is ~512m^3/s), the inundated area does not cover the entire domain. This suggests that a detailed bathymetry survey of the main channel is more important. Generally, based on our study on Truckee River flood, the overbank flow will occur under a 2-yr flood event at the Macrran Ranch)-The two paragraphs under the "Model Test" section are extremely long and should be broken down into separate paragraphs (done). Again, breaking out the results and discussion sections would be helpful (we prefer to keep it intact. we added the 'implications' [see section 4, P16-17, L386-428] into the text in order to extend our findings). -Figure 1. Strange elevation binning on Figure 1. For example, 1295.4, 1300.8, etc (we plotted it again, done). -Figure 2. highway is one word (done). -I'm confused by the Figure 6 results (discharge comparison). If there is only one stream gage, how was the upstream boundary condition determined? (There is only one stream gage #10350340 in our study domain, however, there is another stream gage #10350000 located on the upstream of our study reach. Records from gage #10350000 were used as inputs in a HEC-RAS simulation, and the output hydrograph was used as an upstream boundary condition of the study reach. See P8, L165-175) Was the same discharge values used for the BC and the validation? (Discharge values for BC and the validation are from different stream gage. See P8, L165-175)

P. Tarolli (Editor)
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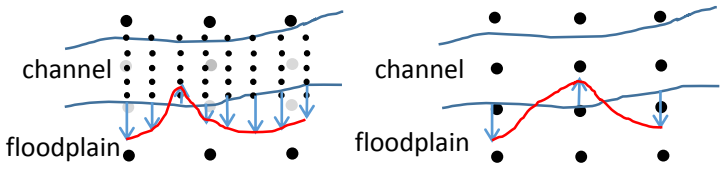
First of all I would like to thank the two referees, especially the referee #2, for providing a very useful discussion that definitely should help the authors to highlight the main critical issues of their work. The first referee recommended a rejection, while the second, underlining the fact that the paper is potentially interesting, raised a series major points that need to be clarified. I fully agree with his/her feedback. I strongly recommend at this stage of discussion, to provide a very detailed public reply to the referee #2.

From my side I recommend to check the following points, in addition to those highlighted by the reviewers:
- the introduction needs to be significantly improved in order to enlarge the perspective of the entire work. (We re-wrote the abstract and the introduction, in addition, we made many changes to the structure of the article. Following the comments from the second reviewer, we have highlighted our works on the interaction characteristics of channel-floodplain system.)
- the critical issues related to the DEM grid cell size are relevant; the authors should provide in the

text few more sentences and explanations on the limitations in using a 30m DEM (we believe that a more accurate topography data is necessary for such a detailed study on the flood interactions within the main channel-floodplain system. Since we focused on the hydraulic roles of floodplains during flood events, large inundation pictures that from satellite observations or aperture radars would be not enough for evaluating the exchanged fluxes quantitatively, for instance, to calculate the transboundary flux, we integrate the normal velocity along the bank lines. See the schematic maps below. Topography data with higher density of nodes would result in a more accurate transboundary flux when we integrate the normal velocity along the bank lines). The authors replied to the reviewer #1 that it is available a lidar bathymetric survey, right? (yes, see http://catalog.data.gov/dataset/nevada-2008-lidar-coverage-usace-national-coastal-mapping-program)Please be more specific. I would like to see in the text a sub-chapter on that.



- Where are the inundation area maps? The authors, at my eyes, did not provide a suitable answer to the reviewer #1 (inundation maps are added into the manuscript, see figure 10). Please clarify and eventually add these in the revised version of the paper (done).
- The quality of the figures needs to be significantly improved in term of dpi (we have plotted all the figures again, see the figures in the revised manuscript). Please add the scale bar in the fig. 2. (done) If you are willing to make the necessary revisions, I will be pleased to reconsider your submission, with the help of the same reviewers who examined the present work. Please note that this does not guarantee that your paper will be accepted for final publication in NHESS. A decision will be made when the revised version will be available, and will be evaluated.(thanks very much for giving us this chance.)

Anonymous Referee #1
Received and published: 15 November 2014
The manuscript describes an application of a 2-D Adaptive hydrodynamic model on a river reach of 10km length. The paper is potentially interesting, however, in the present form, it suffers of some drawbacks that do not allow me to suggest its publication. The main reason is the lack of innovative contribution indeed in the introduction there is no evidence of that. The AhD approach was previously applied in literature and it is important to underline the differences and the added values introduced in the submitted paper. Not only, since the topic is particularly important it is pivotal also to specify why the AhD approach should be preferred compared to the other tools available in literature. The second main drawback is related to the case study application and description. I am skeptical on the use of DEM at 30 meter of resolution for floodplain inundation analysis and it is not clear the AhD output since in the paper it was never shown an inundation

map, but the attention is more related to the hydrograph shape.

We appreciate the reviewer's effort in reviewing our paper, but we do not agree with the points he/she provided in the comments. This study is not only an application of the AdH model. We used the model as a powerful tool to study hydraulic features in the main channel-floodplain system during flooding events. Perhaps the title and the abstract do not fully reflect our goals and our efforts in this study. However, the added value of this study compared to a simple model application or a case study is clearly shown in the paper.

Some specific flow dynamic features that have not been examined previously were studied in this work. We have analyzed the floodplain-main channel exchange with two approaches, the proportion of flow through floodplain and the transboundary flux, i.e. the flow flux passing through the water. This feature may have a strong impact on river water quality, especially dissolved oxygen levels.

We also analyzed the temporal change of inundation area during flood events, which led to the finding that the flood inundation shows a hysteresis loop with time; in other words, the same flow discharge can result in different inundation areas during rising and receding periods of flood events. This result may affect both flood control and stream ecology.

The reviewer also concerned the DEM resolution for the floodplain delineation in the modeling study. Although we agree that finer resolution DEM may provide more spatial details, we do not think it will greatly affect the result of this study. The study area is much larger than the 30 m DEM grid size and can be described fairly well by the current DEM and bathymetry data. There are no very sharp topographic changes in the floodplain that needs very fine grid size to capture, and very small topographic features can be neglected. In the main channel, we have very detailed Lidar survey result for the bathymetry, which is well enough for the channel flow simulation.