

This paper has been re-worked in response to the reviewer comments, as discussed in the responses to the reviewer comments, which have been uploaded onto the HESS website. However, these responses largely dealt with the detailed comments that were made by the reviewers and the Editor has requested a discussion on the more general comments. In the opinion of the authors', these more general comments were addressed by responding to the detailed comments. This is made apparent in the comments presented below.

### Referee 1 – general comments

Overall this is an interesting paper that is on a subject that would be of interest to the readers of HESS. As discussed in detail below, my main concerns relate to the rather general / vague descriptions of the data and the degree of justification of the interpretations. The  $^{14}\text{C}$  data are not interpreted well and that section needs more work. Additionally, the study's conclusions are very specific and the authors should think about the broader implications in section 6, which would give the paper a better overall impact.

I hope that the authors find the comments useful in revising the paper.

#### Authors' response:

The authors' have added more in depth descriptions in response to this comment and the detailed comments made by this referee and Referee 3. Also, we have added another section (Section 5.2) to interpret and discuss the  $^{14}\text{C}$  data in response to the referee's comments. Furthermore, the conclusions have been rewritten to better highlight the broader implications of the paper.

### Referee 2 – general comments

This is an interesting and well written paper. I am wondering if the paper would benefit from a little more focus: The main conclusion of the paper is that most of the rainfall contributing to the flood event obviously ended up in the Cressbrook dam or recharged the alluvial aquifer in the lower part of the catchment. However, this result can be inferred from Figure 8 alone, which only presents data of stable water isotopes plus chloride. The paper would also benefit from discussion of some of the uncertainties involved in the interpretation of recharge processes inferred from the environmental tracer data.

#### Authors' response:

The authors' believe that the paper is now more focused as a result of the edits that were made to the paper. In particular, we note that the Abstract, Introduction and the Conclusions have been rewritten, and another section (Section 5.2) has been added to the "Discussions" section of the paper. Also, the uncertainties of the rainfall strontium isotope data were discussed in section 4.4. Furthermore, Section 5.2 has been added to the paper, and this discusses some uncertainties associated with the use of  $^{14}\text{C}$ .

### Referee 3 – general comments

The paper uses a multi tracer approach to assess the importance of flood recharge to the alluvial groundwater, the recharge processes, and the influence of recharge by bedrock groundwater. The paper is of clear interest for the readers of HESS, and the multi tracer approach and the generated data set is really interesting and valuable. Nevertheless, the manuscript needs some additional work before I can recommend it for publication in HESS.

**Comment 1:** My biggest concern is the structure and content of the discussion section, and in parts of the result section. Both sections are, in my opinion difficult to read and the argumentation and the story line hard to follow. To me reading these section feels a little bit like the reader should figure out the story line and filter important things on her/his own. I do think the authors need to do a better job in leading the reader through this huge amount of data, filtering the important points and leading the story based on the outlined research questions. Right now I don't see how the research questions have guided the results and discussion sections, but this is crucial for readability.

**Comment 2:** A second limitation of the discussion is the pure focus on the current case study and only very limited discussion in the frame of general research about stream-alluvial aquifer-recharge topics in ephemeral or intermittent stream systems. How are processes similar, how is the work going beyond previous work, etc. Lot of work was done in different environments like Israel and Southern Africa (Lange, 2005, JoH; Dahan et al., 2008, Groundwater; Klaus et al., 2008, JoH; Morin et al., 2009, JoH; and

more to find with a quick search) that focussed on the importance of transmission losses and also included the role of diffusive recharge by bedrock groundwater to the alluvial aquifer. Also I would recommend the recent paper of Baudron et al (2014 HP), that also employed a multi-tracer approach ( $^{14}\text{C}$ ,  $^{13}\text{C}$ ,  $^2\text{H}$ ,  $^{18}\text{O}$ ,  $^3\text{H}$ ) to determine aquifer recharge in semiarid southern Spain. Further I was wondering how the different tracers add understanding to the recharge processes. Would we achieve the same results if not using  $^{14}\text{C}$  or tritium?

**Comment 3:** Further, some quantitative work would add clear value to the current manuscript, e.g. presenting GW levels, perform mixing calculates, etc. What could be interesting would be longitudinal chemistry/isotope profiles in the alluvium? This might allow a better way to visualize the results.

Authors' response:

**Comment 1:** The paper has been significantly altered in response to the comments made by the three referees, and we believe that this has significantly improved the readability of the paper. Also, the authors note that the other two referees rated the paper's presentation as "good" (other possible rating options were excellent, fair and poor).

**Comment 2:** The authors chose to focus the paper on the use of scientific methods rather than on a comparison between this alluvial system and other similar systems. Nevertheless, the reference that was suggested by the referee (Baudron 2014) was added to the paper.

**Comment 3:** Surface water and groundwater levels were added to Fig. 4. With regards to the prospect of additional figures (i.e. longitudinal chemistry / isotope profiles): the specific conductance and the hydrochemical facies distribution is shown on Fig 3. Also, a conceptual model of hydrological processes is shown in Fig. 10. The authors believe that the current figures have the right balance between highlighting the utility of the methods and an assessment of site characteristics, especially considering that the focus on the application of innovative methods to identify processes.