Paris, June 28, 2014

Dear Editor,

Please find enclosed the revised version of our paper “Continental hydrosystem modelling: the concept of nested stream–aquifer interfaces » by N. Flipo, A. Mouhri, B. Labarthe, S. Biancamaria, A. Rivière, and P. Weill. Once again, we would like to thank the two reviewers for their detailed and fruitful comments, which helped improving the manuscript significantly. We are pleased that the paper now meets HESS standards of publication.

Please find below our point-by-point response to the requested minor revisions.

Best regards

Nicolas Flipo (On behalf of the co-authors)

Reviewer 1 :

The authors have adequately addressed the main points made in my review, in that they now present references for the importance of stream-aquifer interactions for processes such as nutrient removal, connect their stream-aquifer modeling framework with potential SWOT products, and explain the MIM methodology. Some remaining problems I noticed include

(1) confusion between lengths and areas in presenting scales (2:6-8, 7:11ff) and in the MIM diagrams (the scale in Figures 4 and 5 extends to 1E9 m, which is much more than the circumference of the Earth);

*R1 : We thank Reviewer 1 for this carefull check. The initial graph took into account the atmosphere according to klemes (1983) and bloschl et al. (1995). We recalculated the largest scale with the area of the reference geoid (4*pi*R2) assimilated to a square, from which we calculated the side length as the maximal scale. Fig.4 & 5 were modified accordingly with a length of ~2.10^{+7} m.*
As far as the confusion between lengths and areas is concerned, we added the conversion of areas into lengths in the scales description sub-section p.7-8. The conversion is based on the hypothesis that a basin area has an equilateral triangle shape, from which we calculate the length of a side. However, as hydrologists are more used to areas for the description of hydrological objects, we kept only them in Fig. 4, for which the axis are in metres.

(2) "the hydrologic spiralling concept of Poole et al. (2008)" is referred to several times, perhaps redundantly, and with little explanation -- it would be better to mention it once and specify in a few sentences how it informs the discussion;

R2 : Reviewer 1 is absolutely right, we missed this point. A short explaination is now given at the first occurrence of the concept p5-29.

(3) many idiosyncratic usages are still found (e.g.
1.18 concern --> concerns;

OK

1.25 equalizing (meaning unclear);

It means to make equal. As suggest by reviewer 1 we changed « .. aiming at equalizing » into « .. , which ensures the consistency of »

2.23 is, depends --> are, depend;

Reviewer 1 is right, changed into « Water exchange dynamics at the stream–aquifer interface are complex and mainly depend on…. »

3.11ff pollutants --> pollutant;

OK changed into pollutant transport and removal

3.15 tautological (meaning unclear)).

The tautological nature of models refers to the fact that models lead to conclusions, which are only derived from the model assumptions. In this case, it seems the most precise and concise description of our thoughts. We therefore prefer to keep it in the text.

Reviewer 2

I have reviewed a previous version of the paper (reviewer 2). The paper has greatly improved and I did very much appreciate that the authors have put in a lot of effort to consider the reviewers comments. My key points of criticism for the previous version have been addressed (with the exception of the Partington papers—they are all about spatially distributed systems, the authors might have missed this point).

R3 : We already replied to this comment in our previous point-by-point reply : « [R2.6] In the paper we assume that stream-aquifer interfaces are distributed objects, that we try to simulate with distributed models. This is why we did not focuse on the deconvolution issue. However we thank reviewer 2 for bringing this paper to our attention as it will be very helpful for further publication on the subject. »

Chapter 2.3.2 might benefit from briefly talking about streambed topography, see Käser et al 2014 and the references therein. He discusses how to consider and mesh streambed topography for the same scales as discussed in this paper.

R4 : We thank reviewer 2 to have pointed out this in press publication. It informs on how to derive a stream network from a DEM, and on the extraction impact on stream-aquifer exchange estimation. It was added at the end of section 3.6.1 (p28), where the need for an adaptative mesh for river cells is pointed out : « The mesh can be derived from a DEM, which is a source of uncertainties for the assessment of stream--aquifer exchanges (Käser et al., 2014) »

Apart from that I have only one minor comment related to the references for remote sensing. It would be nice to highlight some papers on page 16, line 1: "…….and spatially from the sub-kilometer (Brunner, 2008; Munch 2013) to continental scale (García-García 2011)"

R5 : We thank reviewer 2 for these useful references, which add value to the argumentation line. However, given the already extensive reference list of the paper, we decided to select only Brunner et al. (2008) and Garcia-Garcia et al. (2011).