

# ***Interactive comment on “Examining the spatial and temporal variation of groundwater inflows to a valley-to-floodplain river using $^{222}\text{Rn}$ , geochemistry and river discharge: the Ovens River, southeast Australia” by M. C. L. Yu et al.***

## **Anonymous Referee #1**

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General comments The paper by Yu et al provides detailed data and analysis of fluxes between groundwater and a relatively high gradient, valley-constrained, perennial river system. The authors use a range of tracers, specifically radon and major ions, to investigate these fluxes and demonstrate interesting spatial and temporal patterns in the groundwater fluxes. The analyses show the value in using multiple tracers and methods to gain greater insights into patterns of fluxes and potential biases in separating the groundwater flux from other slow flow components.

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At this stage the paper is let down by possible errors in the calculations of groundwater fluxes. As stated in the paper, the evaporation flux rates appear incorrect and also the standard deviation of the radon activity and the Cl concentrations used in one reach do not appear correct. It is not possible to check these calculations using the data in the paper or in the supplementary material as the width and flow velocity data are not given. The authors need to check and confirm that the correct values were used and correct these in the text where required. If the incorrect values were used then the analyses have to be recalculated and checked to see if any of the discussion points have changed.

Field studies such as presented in this paper can greatly assist in our understanding of important components of the catchment-river water balance and also in determining which techniques give greatest confidence in estimating these components. I think that this paper would make useful contribution to HESS but that it firstly requires that the specific points made below are addressed.

## Specific and technical comments

Abstract Line 26 – “can result in fluctuating”

1. Introduction Line 48 – “(losing streams)” Line 57 – Pritchard (2005) not a very useful reference if it is a thesis. Lines 73-74 and 79-80 – are so many references required? Line 101-102 – “the end of 2000s Australian drought” could be more succinctly referred to (and referenced) as “the Millenium drought (2001-2009, reference)”. The reference could be van Dijk et al. (2013) in WRR but there are other references. Are you able to give the range of recurrence intervals for the 2010 Victorian floods that would be a useful reference for non-Australian readers? Line 105 – “the temporal distribution of GW-SW exchange”

2. Study area Line 144 – “outcrop” Line 145-148 – “silt”. Also, “rubbles” is not a grain size term – do you mean cobbles? Coonambigal misspelt. In this section it is worth stating that all three formations are not really distinguishable but the literature suggests

they have differing hydraulic conductivities. Line 154 – “fragments” Line 161 – what do you mean by head gradients are usually downwards? Line 171-172 – these PET rates are far too high and I suspect the correct units are mm/month. Are they point or areal potential rates?

4. Results Lines 271-280 – the description of groundwater types would be greatly assisted by including a piper diagram. Lines 305-308 – Would read better as: “from immature sediments in the alluvial valleys, containing abundant U-bearing fragments of granitic and metamorphic material , to more mature, weathered sediments on the plains that are dominated by quartz and feldspar.” Line 309 – were the differences in the radon activities between sampling rounds statistically tested?

5. Discussion Line 318 – surface runoff is more likely to transport weathered material but may not be the main agent of weathering. Line 330-331 – is this sentence specific to this catchment or is it a more general statement about data availability in other catchments in the region? Line 338 – these ET rates are far too high and are most likely rates in units of m/month. Were the incorrect units used in the calculations? If this is the case then the fluxes need to be recalculated. Significant overestimation of the evaporation loss term will lead to underestimation of the groundwater influx term. Lines 343-343 - it would be useful if some numbers from the literature can be put on when hyporheic exchange is significant. For instance, for rivers with low groundwater input can a percentage range be given as a rule of thumb? Likewise with low radon activities, what is the activity range where hyporheic contributions can become important? Equation 2 – what is ‘a’? Line 354 – “stream” Line 361 – “river” Lines 380-389 – are these increases in groundwater input consistent with the head data during the same period? Are the bore head data relative to the river stage of sufficient resolution to test this? Lines 400-402 – the standard deviation of the groundwater radon activities used for the three reaches is the same as the mean values used. Is this correct? Therefore, the mean – 1 SD = 0? How was this dealt with? The percentage changes reported suggest that the reported SD values are incorrect. Equation 4 – was the cor-

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rect evaporation data used in this equation? Line 425 – why is the CI data used for the middle reach so much higher than reported in Table 2? Line 462 – In equation 5 is f the filtered quick or slow flow? Lines 542-544 – ‘around’ or ‘round’?

6. Conclusions The last sentence makes an important point and should be addressed more in the Discussion, particularly the issue of some methods systematically overestimating groundwater discharge to the river.

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