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Hydrology and Earth System Sciences Discussions

Interactive comment on "Characterizing interactions between surface water and groundwater in the Jialu River basin using major ion chemistry and stable isotopes" *by* L. Yang et al.

Anonymous Referee #1

Received and published: 9 July 2012

General comments The title of the paper indicates that the aim of the paper is to characterize interactions between surface water and groundwater - which is an important subject given how contaminants may move between the two - and given that the two are part of one coherent fresh water resource. The paper presents two carefully sampled and carefully analyzed datasets.

The study has its focus on effects of river water on the groundwater quality, which given the many pollution sources for the river water could be a problem for the groundwater

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quality. The problem is that the sampling of the groundwater is based on existing wells - and evidently the existing wells are, in general, too far from the river to be affected by river water - actually only one out of the 8 wells, 30 m from the river is affected. To what extent this makes sense is hard to say, as there is very little information on the groundwater levels compared to river water levels, and also information on the hydraulic conductivity is missing. Is this a losing or a gaining river - probably depends on where and when. The only general data that are given is the precipitation. Given the average precipitation, it appears that the sample year has been rather extraordinary with two single events exceeding the monthly rainfall - some comments on this would be appropriate. Information on evapotranspiration and net infiltration would also be useful.

Based on the presented data it would seem that main interaction was that groundwater flows into the river, but this is actually impossible to say. In principle there could be a wide zone, the next closest well is 70 meters from the river - and the next is 170 m away) around the river with frequent exchange of water - the sampling is just not capable of showing this due to the large distance to the river. To gain further insight based on the presented data a more careful scrutinizing of the data seems to be needed. Probably adding in information on rain water chemistry would help. Using this it might be possible to find out the amount of evaporation affecting the groundwater - it would also make it possible to see how much of the sulfate is derived from sulfate in the rainwater derived from SOx'es in the atmosphere. The suggestion on possible pyrite oxidation as the source of sulfate is not really backed up. It is the same for the Na and Cl - which are suggested as coming from urine, but this is again not backed up in any way. Also for the isotope data we are told that there is evaporation - but how much - and does this fit with what to expect in this area.

It might be possible to make some sort of mass balance on the river water - to see if the groundwater component is there during flood events - or whether these events are completely dominated by surface runoff. It would have been nice with a data set

HESSD

9, C2813–C2816, 2012

reflecting base flow conditions.

More could be done with the groundwater chemical data. Given the nice data it would be appropriate to make a speciation using e.g. PHREEQC to see whether any minerals are controlling the chemistry, my guess would be that aragonite or calcite is controlling the Ca and carbonate content - and given the fluctuations in Na - there might also be some ion exchange going on in the system. The SY14 sample from Sept. 2010 appears to have an interestingly low Na/Cl ratio that fits with a high Ca/Alkalinity ratio indicating that Na is exchanging for Ca on the exchanger of the sediment.

All in all, the data set is not really appropriate for characterizing interactions, but with further analysis of the data, it might be possible to gain more information on the system. With some hydraulic information and some gradients, hydraulic conductivities, flood durations etc. it might be possible to give some constraints on how far reaching the effects of the interactions should be. In general proposed explanations should be backed up if possible by additional data or information.

Specific comments. There are a number of places where the text leaves you uncertain as to what is meant, and there are also some "errors":

p.1 l.14: Transitional - what is meant by this?

p.1 l.18: "would" - should probably be "should"?

p.1 l.24: COD is Chemical Oxygen Demand

p.2 l.19: was -> were

p.2 l.20: flood processing ? - does this mean during the flooding event ?

p.2 l.20: "after the? flooding period"

p.3 l.15: this -> the (two occurences)

p.3 l.27 - p.4 l.5: This is very difficult to follow and needs a rewrite

HESSD

9, C2813–C2816, 2012

p.4 l.22: It must have been some sort of "multimeter" if the same instrument could also measure pH???

p.5 l.6: Edmond et al. not in reference list - please check

p.5 l.10: this -> the

p.6 l.4: "meteoric WATER? line" - most frequently the word "water" is included

p.4 l.5: "giving accurate information on the input signal" What does this mean?

p.7 l.15: oxidation -> oxidizing

p.7 l.20: The TDS is generally not very high - and with a relatively high evaporation and calcite dissolution under high PCO2 conditions the concentrations are not that high?

p.9 l.10: How much urine does the measured values present - what is the concentration in precipitation - corrected for evaporation? More background and backup information is needed. If the Na and Cl is from urine - then some other specific compounds should follow ?

p.9 l.25: animal breeding?? - do you mean grazing??

p.10 l.2: "improper proportions" - this sound strange, I would like to think that if you go through the trouble of making artificial fertilizer you would try to make it "proper" if not perfect?

p.11 l.13: could -> can

p.12 l.22: it appears that things are turned around in this sentence.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 5955, 2012.