

Interactive comment on “Fully integrated physically-based numerical modelling of impacts of groundwater extraction on surface and irrigation-induced groundwater interactions: case study Lower River Murray, Australia” by S. Alaghmand et al.

Anonymous Referee #2

Received and published: 15 October 2013

Dear Editor,

Thankyou for the oportunity to review the paper by Alaghmand et al.

I found that the work is tecnically sound and that the conclusions of the paper are based on the results. However, the paper needs extensive work to be fit for publication. Most of this relates to the writing. I reccomend it be returned to the authors for major

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revisions.

Generally this paper needs an extensive english edit. The language makes it very difficult to read. Particular attention should be paid to joining words like "the" and plurals.

The introduction in some cases is too detailed with alot of definitions. It would read easier if it pointed more towards how the studies cited are relevent to the work here.

The introduction refers alot to the HGS model. I think it would be better just to refer to the model as a physically based model and explain the use of HGS in the methods section.

The first paragraph of the numerical model section (section 3) has too much irrelevant information. It just needs a brief description of the code, not a detailed version history.

Additionally, most of section 3.1 is repeating the users manual so it may be better just to point the reader to this (the users manual) for further information.

The solute boundary conditions are not stated in the model set up section.

Section 3.3 - paragraph 1. This paragraph needs more clarity. It states that two approaches were used for calibration however it dioes not make it clear what these approaches are. Also - how is plume mass determined from discrete bore locations?

Section 4 - the first paragraph of this section contains information that may be better in the methods sectcion. It refers to how the work was analysed.

p3578 l1 - "A" combination of...

p3578 l2 - "water-tables"

p3578 l3 - "forcing" not "forced"

p3578 l8 - "The South Australian Government"

p3578 l9 - reword sentence starting "This is to..."

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p3578 l26 - "salt off the salt" - makes no sense

p3579 l2 - "storages instructions" - makes no sense

p3579 1st sentence - this needs to be two sentences. The first sentence is about regulation and the second could give the example of how it has impacted salt removal.

p3579 l18 - reword. Maybe "Prior to 2011, a high river flood event had not occurred for 13 years. However, salt accumulation has continued over this period."

p3579 l19-20 - how have the sediments also induced salt problems?

p3579 l24 - change "their recommendation 1" to "their 1st recommendation"

p3579 l29 - "The" South Australian Government.

p3580 l9 - "periods of shut down"

p3580 l15 - these two sentences need to be joined better.

p3850 l27 - "impacts" not "impact"

p3581 l4 - The two statements separated by a semi-colon seem unrelated. I suggest starting a new sentence.

p3582 l23 - "Moreover, HGSs..." remove "the".

p3582 l25 - " a HGS..."

p3582 l28 - the last sentence doesn't make sense.

p3583 l10 - add space between "potential" and "evaporation"

p3583 l11 - This section needs joining text to indicate you are now talking about the soils.

p3583 l14 -18 - the same information is repeated in two sentences. Remove one.

p3583 l21 - "electrical conductivity"

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p3583 l23 - "A more detailed..."

p3584 l2-4 - This sentence may be better if it states that the model is capable of simulating fully coupled surface/ sub-surface flow and transport.

p3588 l25 - "generated at a 10m"

p3588 l26-27 - Maybe these sentences could say that "A 10m grid size was used for computational purposes. However this grid size was adequate to model the processes in the floodplain."

p3589 Paragraph lines 1 - 10. Explain 1) the choice of vertical discretisation. 2) Did sublayers correspond to the sediments.

p3589 l2 - bottom should be "bottom"

p3589 l9 - "overlain", not overlaid. - do these correspond to the sublayering?

p3589 l11-115. Long sentence, suggest breaking the sentence after the reference to Doble et al. (2006).

p3589 l16 - "conditions" (add s)

p3589 l17 - "so the model was divided into the main channel (river) and the floodplain"

p3589 l15-17 - What was different about the properties?

p3589 l20 - "river bank occurred" remove has.

p3589 l21 - are the surface properties insensitive to the model or are the model results insensitive to the surface properties?

p3589 l26 - "conditions" add s

p3589 l26 - maybe add these different areas of vegetation to figure 3.

p3590 l5 - need space between include and specified. Maybe change the sentence to "specified head boundaries in the porous domain were implemented at the end of the

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floodplain"

p3590 I8-10 -Did you simulate pumping of did you use specified heads to lower the water table? This isn't clear

p3590 I10 - constant not consistence

p3590 I11 - was this using specified head boundaries?

p3591 I5 - "the stress period" add "the".

p3591 I6 - "covers a 30yr" add "a"

p3592 I9 - What are the more sensitive parameters?

p3592 I15 - do you really try to minimise goddness of fit. Maybe minimise errors between observed and measured values.

p3592 I22 -I28 - These statements are not backed up by anyting quantifiable. Maybe the EM31 data should be included so these statements can be confirmed.

p3593 I10 - remove the words "at the same time"

p3593 I15 - need a space between "interactions" and "induced"

p3593 I20-I24 - It is unclear if the levels in figure 7 were a model input or an observation. If they were a model input they should be in the methods. If they are observed this should be made clear.

p3593 I27 - change "accurate" to "accurately"

p3594 I4 - Are the groundwater heads water balance components? Are these just a reflection of the ammount of water in the porous media, or do they indicate the ability of the model to re-produce these storages spatially.

p3594 I7 - "along transect B1" (Add spaces)

p3594 I9 - "rate for" (Add space)

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p3594 I14 - Are these varying heads or constant heads?

p3594 I23 - "stop" remove s.

p3594 I25-27 - need to make it clear what you are refering to. In the context of SW-GW interaction losing generally referes to SW discharging to gw.

p3595 I3 - further on the above comment in figure 9 it appears that at all times there is a flux from the river to the floodplain being a losing condition.

p3595 I3 - I18. This paragraph may be better supported if the pumping and bank infiltration were on the same graph. for example, the change in accumulation should be the difference between inputs and outputs to the system.

p3595 I14 - replace "less" with "a smaller"

p3595 I18 - "was the same"

p3595 I19 - This paragraph would be better if river levels were plotted on figure 10.

p3595 I19 - "Following the SIS..."

P3595 I20 - Here and elsewhere, you refer to a bore relative to the river level. You should refer to the groundwater level at the location of the bore, rather than the level of the bore.

P3595 I25 - As above

p3595 I25-28 - If this is the case, why does the flux in figure 9 not reverse?

p3596 I23- "increases with time" - add an "s"

p3596 I23-25 - In figure 12, it looks like the floodplain salinity decreases in the "with SIS" scenario, not stays stable as the text states.

p3596 I25 - "Except when the SIS". The two sentences starting at line 23 may be better written along the lines of "In contrast, salinity levels were reduced for the with

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SIS scenario with the exception of the period of time when the SIS was shut down."

p3596 l26 - following on from above, this would read better as "This was due to an increased flux of river water induced by the SIS, in addition to the removal of saline groundwater."

p3596 l28 - the sentence starting "Overall," seems un-necessary (Removing saline groundwater causes a less saline floodplain).

p3597 l1 - Maybe state in this sentence that these observations were at the same field site.

p3597 l3-4 - "in the with-SIS" and "while the without-SIS"

p3597 l5 - "in the without-SIS"

p3597 l10 - "The unsaturated zone"

p3597 l10 - I think "compartment" should be "component"?

p3597 l11 - "Particularly in areas...". Also, I'm not sure if this should be a new sentence or a continuation of the previous one.

p3597 l14 - "in the with-SIS". Check for this everywhere. "the" should be used as a joining word before the scenarios...

p3597 l16-17 - Sentence starting "In fact,..." is un-necessary - lowering the water table increases the unsaturated zone.

p3597 l17-19 - The talk of nodes is not useful. Maybe phrase it as volumes.

p3597 l19-22 - For this sentence, just focus on the relative removals of each scenario. As above, nodes are hard to understand.

p3597 l24 - "configurations"

p3597 l24 - this sentence (about ratios) is confusing and does not add anything

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p3597 l26 - "Illustrates the solute mass"

p3597 l27 - "In fig. 13a the distribution"

P3597 l28 - Remove "It seems" from the start of the sentence and insert "the" before "SIS" and "middle"

p3598 l1 - "the SIS"

p3598 l1-3 - Remove "as could be expected", add "been" before "stored".

p3598 l4 - "a less saline..."

p3598 l16 - "and the decrease"

p3599 l1 - "analysis" not "analyse"

p3599 l1 - "showed" add "ed"

p3599 l3 - switch "fresh" and "river"

p3599 l5 - "Also, a deeper"

p3599 l9 - remove ";

p3599 l10 - "In terms of the solute balance, the SIS results in a less saline floodplain aquifer, as evidenced by the reduced amount of solute stored in the with-SIS scenario."

p3599 l16 - once again, this is not consistent with typical terminology. Gaining suggests GW flowing to SW and losing the opposite.

Figures:

Figure 3 - It is hard to see the grid in this figure. Suggest removing the image below.

Figure 13 - Remove the mesh. It makes it hard to see the colors.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 3577, 2013.

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