

Interactive comment on “Implications of deep drainage through saline clay for groundwater recharge and sustainable cropping in a semi-arid catchment, Australia” by W. A. Timms et al.

Anonymous Referee #2

Received and published: 20 January 2012

General

This paper deals with the possibility of deep drainage through saline clay and its potential consequences in terms of increasing groundwater salinity and reducing soil salinity within the rooting depth. I think that there is still a big space for enhancement before the paper is ready for publishing in HESS. Many issues in the paper need to be addressed and clarified.

The paper objective: you mentioned in page 10057, line 27 that the groundwater already known to be deep and saline, how do you justify the objective of your study?

Page 10057, Lines 10-13: casting your objectives in this way gives the impression that there is indeed significant deep drainage. Please rephrase a sharper objective statement.

The "Methods" section should be re-organized and presented in a more logic and easy-to-follow way: I think that the core subsection in this section is subsection 3.5 which should be focused on. The other efforts to collect and describe supportive data and information (i.e. sections 3.1 - 3.2 - 3.3 - 3.4) should be presented within its framework.

Too many details in the "Methods" section are not needed and negatively affect the paper readability. For example describing the hydraulic conductivity measurements (pages 10059-10060) is long, complicated and can be summarized in a few sentences. This section "Methods" is also missing a clear description of the time frames within which the authors conducted the different investigations, data collection and simulations. How did these activities overlap in time?

In section 3.5, three methods were presented to estimate and simulate deep drainage:

The first method was not successful, as you stated that SODICS software did not lend itself well to the calculation of deep drainage, so the question here why you present this method, please discuss.

The second method gives a rough idea about the deep drainage; this method involves many reasons of uncertainty, please discuss this in the paper.

The third method: how did you calibrate the APSIM model, and how much are you confident about the output of its simulation? In Page 10070, line 17 you mentioned that the model provided good simulations of actual grain yields? Is this enough for calibration? Besides, I do not think that the agreement is sufficiently good as presented in Fig.10.

The language and the readability of the paper: it is essential that the English should be checked thoroughly. Most sections of the paper need to be revised and explained

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more clearly.

Specific comments

Page 10055, Line 1: how can water be a limitation?

Page 10055, Lines 14-16: please rephrase the sentence to be more accurate.

Page 10055, Lines 19-20: "although higher ..." please give a reference to support this.

Page 10056, Lines 1-3: please rephrase this sentence.

Page 10056, Line 27: please give examples of these conditions.

Page 10056, Line 29: "Possibly due ..." please provide more sharp statements.

Page 10057, Lines 14-16: "measurements of soil and groundwater" & "paddock records", please be more specific and mention clearly what you measured.

Page 10057, Line 27: "partly because ..." what are the other reasons not to use groundwater? Page 10058, line 11: the reference is not presented correctly.

Page 10058, lines 18-20: would you please clarify how can this information serve the purpose of the paper? Is Narrabri within the scene of Fig.1?

Page 10059, lines 1-5: please provide a map showing the soil samples locations.

Page 10059, line 17: please check for the correctness of the presented DUL equation.

Page 10059, lines 17-19: how do you justify this assumption at this point of the paper?

Page 10060, line 7: you mean D3 here not D2?

Page 10061, lines 2-8: please consider presenting a figure that shows the stratigraphic transect through your piezometers. And explain the types of the aquifers in these locations.

Page 10062, line 7: "Twelve loggers ..." please specify what was installed where?

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Please be more clear and specific.

Page 10064, lines 4-5: $1 \times 0.1 + 25 \times 0.2 = 5.1 \text{ m}$?

Page 10064, lines 10-11: repeated sentence in two lines.

Page 10065, line 26- Page 10066, line 1: is this information important to the objective of the paper?

Page 10066, line 16: this reference is missing in the list.

Page 10069, line 17: specific yield is a characteristic of unconfined aquifers. What are the kinds of aquifers in the area?

Page 10068, lines 21-24: is there an evidence that the increase in the groundwater level is due to a local recharge? How do you explain that the water level in deeper piezometers rose earlier than in the shallower piezometers (Fig 9a & b)?

Page 10068, lines 24-25: "Equipment failure . . ." please specify "which equipment", "in which piezometer" and "when".

Page 10069, line 4: since the water was collected in the sump of SP1s which means that the water in this section was not hydraulically connected to the surrounding soil, how did you consider this as a rise in water level outside the piezometer?

Page 10069, lines 16: please clarify how was 1.5% calculated. What is the logic behind proportion the 107 mm level rise to the total rainfall of 2009?

Page 10069, lines 21-24: "if recharge is . . ." this is not a rational debate. Please see the above comments.

Page 10075, line 14: what is dryfall?

Page 10075, line 22 where is the 10% threshold in the figure?

Page 10076, line 13: "Groundwater moves . . ." is the groundwater flow direction correct, this contradicts with water levels shown in Fig.4.

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Page 10076, line 18: "since 1 mm. . . ." please add a reference here.

Page 10076, line 23: the term "water table" means the studied aquifer is unconfined? Again, please describe the aquifers types in the area more clearly.

Page 10077, line 5: "deep drainage and recharge measurements.." did you really measure deep drainage and recharge?

Figure 2. please separate into two figures (a) and (b), and clarify the legends.

Figure 3: please insure that the four subfigures have the same size, add legends.

Figure 5b: how do you explain the disagreement between the EC and the chloride profiles.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 10053, 2011.

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