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Hydrology and Earth System Sciences Discussions

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Interactive Comment

Interactive comment on "Understanding wetland sub-surface hydrology using geologic and isotopic signatures" *by* P. K. Sikdar and P. Sahu

P. Sikdar

p_sikdar@hotmail.com

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Reply by the authors

Q.I have several improvements to suggest to the paper. First, the text should be written to address exactly the question posed above – rather than as a description of a sediment size study and an isotope study. Much detail could be omitted, particularly from the sediment size study (this is all worthy material, to be sure, but putting in all the details makes it difficult for many readers to understand the important findings).

Ans. Sediment size study has been omitted.

Q. A legible form of Fig. 3 as the end-point of that part of the study would illustrate the important conclusions adequately. The isotope data can possibly be used to fuller effect. It would seem, from the sediment study, that any distinctions between groundwater in the north and in the south of the wetland will be important to an understanding of recharge. Some points to consider:

Q.1. The tritium vs. depth plot shows little of interest in the present form. What if data from the northern and southern parts of the study area are distinguished? If recharge is taking place in the north only, then is tritium distributed accordingly?

Ans. We have divided the ECW into three zones, viz. north, central and south. The write up has also been modified in page 3155 line 11 and 12.

Q.2. The evaporation trend in the groundwater is a signature that could be useful. It's a somewhat different trend from the one relating the surface waters (pond, fish farm, river). Why would it be different? The signature is presumably related to evaporation of effluent in ponds on the wetland. Where in the aquifer(s) do the most evaporated waters occur? To help answer and illustrate this for the reader (who will generally not have access to the data of Misra et al.), the isotope data of Misra et al. should also be plotted in fig .7 Considering all of the data, are the most evaporated groundwaters localized? If they are in the north, this will have implications – the north side of the wetland wouldn't be a good place to treat effluent, and the progress of effluent-derived groundwater through the aquifer(s) could be traced using O and H isotopes.

Ans. Changes have been done as per suggestion. A new figure (Fig.6a) containing plots of stable isotope data of the present work and that of Shivanna et al., 1999 and Misra, 2001 has been added. The write up has also been modified in page 3156.

Q.3. A specific point: why are the two LMWLs so different? If one took all of the available data, would a better estimate of a single LMWL result?

Ans. In literature, only the LMWLs of Mukherjee, 2006 and Sengupta and Sarkar, 2006 are available. Hence it is not possible to estimate a single LMWL. For clarity the authors prefer to use LMWL of Mukherjee, 2006 in the relevant figures. The LMWLs are different because Mukherjee, 2006 data are regional in nature, covering the Indian part of Bengal Basin whereas Sengupta and Sarkar, 2006 LMWL is based on a very local data of a district in West Bengal.

Technical matters: Some specific suggestions on presentation: Q.Language – there is much non-standard idiom and the occasional problem of grammar in the text. I have not addressed these things – but the authors should do so.

Ans. Corrections have been made.

Q.Several of the diagrams are difficult to read. Again, they should be designed to enable the reader to understand the main point of the paper. I would suggest placing fig. 5 earlier in the paper – probably as the second figure, to emphasize the effect of pumping.

Ans. Figure 5 has been now placed as figure 2.

Q.Fig. 1 has far too much detail that obscures important information. The focus should be on the sample sites and on place names that are important enough to mention in the text – perhaps not al place names at present mentioned.

Ans. Figure 1 has been modified as per suggestion.

Q.Fig. 2 is also difficult to read because of excess detail. It appears that the Hugli river flows both ways.

Ans. Figure is changed according to suggestion. Being a tidal river, Hugli river flows in both ways.

Q.Fig. 3. First, there needs to be some way of locating this figure relative to figs. 1 and 2. Can the oultine of the wetland be superimposed on this diagram? Second, the patterns are difficult to read. I am going to suggest simplifying to a classification into three sediment types: clay plus silty clay (black); silt (stipple) and sand plus gravel (white). This doesn't preserve the detail of the work that has been done, but it will illustrate clearly where recharge is likely.

Ans. It is difficult to superimpose the oultine of the wetland on fence diagram as they are drawn using two different softwares. The fence diagram has been modified as per suggestion.

Q.Fig. 4 is almost impossible to read at the scale provided. Is this figure necessary alongside Fig. 3?

Ans. Figure 4 has been deleted along with the corresponding write up.

Q.Fig. 6: Only one of panels a and b is necessary.

Ans. Panel b has been deleted.

Q.Fig. 7: Simplify the axis scales by removing zeroes after the decimal point. In panel a, there should be a legend to show shallow and deep. Simplify the regression equation by having fewer figures after the decimal point.

Ans. Figure is changed according to suggestion.

Tables: Q.1. "Average depth' is confusing. How about giving ranges of thickness?

Ans. This table has been taken from a paper of Sikdar, 2000 and the source has been mentioned. Therefore, the authors would prefer to maintain the phrase 'average depth'.

Q.2. Are these statistical parameters relevant to the argument? If not, please delete the table.

Ans. Table 2 containing statistical parameters and their corresponding write up has been deleted.

Q.3. Please use appropriate numbers of significant figures. For sample 1, the data should appear thus: -29, -4.0, <0.6. For sample 2: -28, -3.6, <0.8 (Apparent 0.4). The presentation of tritium data is a particular problem. I'll paste our lab's guidelines

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below. A detection limit should be given for the tritium data. Reporting tritium data: The detection limit, 0.6 TU, is calculated as 0 + 2_ for low-counting samples. A sample with a mean calculated TU value between 0 and 1_, say 0.20 _ 0.35 TU, is reported thus: <0.9 TU (= 0.2 + 2 x 0.35). A sample with a mean calculated TU value between 1_ and 2_, say 0.51 _ 0.38, is reported thus: <1.3 (Apparent 0.5), where 1.3 = 0.51 + 2 x 0.38, rounded. Samples with calculated TU values greater than 2_ are reported thus: 1.1 _ 0.4 TU.

Ans. Changes have been made in the table according to suggestion.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 3143, 2009.