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Hydrology and Earth System Sciences Discussions

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

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General comments:

This is a study of considerable interest because of the implications for the water supply of a major city. Juxtaposing figs. 1 and 5 immediately makes this point – groundwater from the eastern wetland is likely to be affected by the treatment of city effluent in the wetland, and pumping of groundwater beneath Kolkata is causing flow of groundwater from the wetland to the city wellfields. An important question is whether recharge to the aquifer(s) beneath the wetland is localized. The answer to the question will have vital implications for the protection of Kolkata's water supply. The authors have chosen to approach this question by studying sediment size distribution beneath the wetland in order to locate areas where recharge is likely, and by studying groundwater isotopes

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in order to confirm whether recharge is localized in such areas.

Specific Comments:

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). 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:

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?

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.

3. A specific point: why are the two LMWLs so different? If one took all of the available

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data, would a better estimate of a single LMWL result?

Technical matters:

Some specific suggestions on presentation:

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.

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.

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.

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

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.

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

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

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.

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Tables:

1. “Average depth’ is confusing. How about giving ranges of thickness?

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

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 below. A detection limit should be given for the tritium data.

Reporting tritium data:

The detection limit, 0.6 TU, is calculated as 0 + 2σ for low-counting samples.

A sample with a mean calculated TU value between 0 and 1σ, say 0.20 $\pm$ 0.35 TU, is reported thus: $<$0.9 TU (= 0.2 + 2 x 0.35). A sample with a mean calculated TU value between 1σ and 2σ, say 0.51 $\pm$ 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 2σ are reported thus: 1.1 $\pm$ 0.4 TU.

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