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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Hydrogeological controls on spatial patterns of groundwater discharge in peatlands" *by* Danielle K. Hare et al.

Anonymous Referee #3

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Review on "Hydrogeological controls on spatial patterns of groundwater discharge in peatlands" by Danielle Hare, David Boutt, William Clement, Christine Hatch, Glorianna Davenport and Alex Hackmann.

This is a very innovative and well-structured paper. The methodology is faceted across many different measuring techniques, each of them enriching the overall understanding on the hydro-geological controls on groundwater discharge in a reclaimed peatland. The paper is well-argued. The results are very interesting allowing the identification of water sources and local flow paths and providing new information on upwelling of groundwater.

However, a simple 3-D conceptual model of the sand/peat interface might be useful for explaining the geomorphological situation and flow directions.

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A more in-depth discussion of how hydrology and seasonality and day and night differences influence or are susceptible to influence your results would be helpful. It would be important to point out how the given window of observation is related to the long-term hydrology and particular season and how the results would differ of they were taken at a different time period. Sometimes information on the measuring dates are missing altogether.

p. 4 The site description could benefit from some background information on the geology, climatology, hydrology, vegetation and landuse and gradient. Some more detail on the flashboards and the role of the dam would be useful.

p. 6 What type of GPR instrument did you use? When were they carried out? How did they relate to the hydrological situation and season? How would you expect your results to be different if carried out in a different season?

p. 10 Results. A subsection on Hydrology at the beginning would be important so that the reader can obtain a better idea of the overall hydrology as well as how representative the measuring periods are. A conceptual 3-D model of the underlying topography (gravel/peat interface) would be helpful. Describe the location and recording period of the discharge stations and show some results.

p. 11 It would be useful to have some air temperatures here to correlate with the groundwater temperatures in the ditches and channel (Fug. 3).

Discuss the limits of the methodology if the pictures (Fig. 4) were only taken at night. How would the results differ if taken by day? Mention this in the methods section.

p. 13 Why were the rates so high for temperature profiler 2? To which extend is this dependent on seasonality?

p. 15 The explanation of "PEP" and "matrix" should come much earlier since it is difficult to understand these without the definitions.

p. 16 Would it not be better to introduce the conceptual model at the beginning to

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help guide the reader throughout the text and provide a simple, conceptual 3-D model extended from Fig. 9 for the whole study area?

I recommend publishing once the comments have been addressed.

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