

Interactive comment on “Identifying, characterizing and predicting spatial patterns of lacustrine groundwater discharge” by Christina Tecklenburg and Theresa Blume

Anonymous Referee #1

Received and published: 22 January 2017

The paper describes a case study of a very detailed investigation of groundwater discharge patterns to a lake. The authors used a range of methods and took a large number of measurements with the goal to derive relationships between parameters that are easy to obtain (e.g. topographic indices) and groundwater discharge patterns. They found that groundwater discharge was higher closer to the lake shore. They also found correlations between topography and large-scale groundwater inflow patterns, and between small-scale groundwater inflow patterns and sediment grain size distributions.

The paper does not really present anything new. The methods are well established and the outcomes confirm the general assumptions made about groundwater discharge

C1

to lakes, including that it is usually very heterogeneous. The only surprise was that hydraulic conductivity did not seem to correlate with groundwater discharge.

However, the investigation was well designed, the methods are nicely described and the paper is overall very well written. I think it therefore merits publication and it will be a very useful reference for other researchers working on similar subjects.

I only have a few minor comments that should be addressed before publication:

There is no information on the motivation for this study. Was it a purely science-driven study and the lake was selected for convenience reasons, or was there a problem that drove the initiation of the project, such as lake water quality issues which may result from groundwater discharge? How does the selection of the lake impact on the transferability of the findings?

P9L26: Groundwater levels were measured “regularly”: What does that mean? “Regular” can be once every year. . . please specify.

P15L20: You give transpiration as a possible reason for a near-shore depression in groundwater levels. Is there a type or density of vegetation at this location that potentially transpires more than at other locations at the lake shore, i.e. is there a reason to believe transpiration could be the cause?

Conclusion: My main question is: so what? Your main recommendation seems to be to take topographic indices combined with a few sediment cores as a first step, and then do more investigations at areas of interest. But which ones are most useful and give you most value for money? Are the findings transferable to other lake settings?

I am also wondering how such an investigation would help remediation planning. How important is it to know the spatial distribution or local hot spots of groundwater discharge to a lake? What could you do about those hot spots, or would you use them to trace back a contamination source?

References: P10L11-13: the two references are missing in the reference list

C2

Language/typos:

Readability could be improved by using more hyphens, e.g.:

Large-scale patterns

Small-scale variability

High-precision thermometer

Near-surface sediments

Far-field conditions

Climate-driven processes

and similar constructions throughout the manuscript.

“Grain size” should be two words

P1L27: groundwater-lake exchange

P7L22/23: “purged for 3.5 at least hours” should be “purged for at least 3.5 hours”

P8L4 and 6: I think internationally the term “screen” is preferred to “filter”

P8L27: mean...was or means...were

P9L1: goodness-of-fit

P10L4: “resolution of 1 m that” should be “so that”

P11L1: “norther” should be “northern”

P11L31: “measurements in2 minute intervals” should be “measurements in 2-minute intervals”

P1L28: “a slight negative, but spastically” should be “a slightly negative, but statistically”

C3

P15L31/32: k_{sat} should be k_{sat} (subscript)

P16L5: remove comma after structure

Figures:

Figure 2: The use of (a) (b) and (c) in the caption is a bit confusing

Figure 7: k_f should be k_{sat} in the caption

Figure 10: (e) is missing in the caption

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