

Comment on hess-2021-195

Anonymous Referee #2

Referee comment on "Seasonality of density currents induced by differential cooling" by
Tomy Doda et al., Hydrol. Earth Syst. Sci. Discuss.,
<https://doi.org/10.5194/hess-2021-195-RC2>, 2021

HESS three Principal Review Criteria

1. Scientific significance is excellent with new concepts, methods, and data.
2. Scientific quality is good. The approach and applied methods are valid and the results are appropriately discussed.
3. Presentations quality is good. There is an appropriate number and quality of figures/tables, appropriate use of English language. I found that there were few typos and that the English is good. The use of some symbols and abbreviations is confusing.

General Comments

The preprint addresses an important aspect of differential cooling with new concepts and data. With an extensive data set the thermal siphon process is shown to flush the near shore region. A simple model based on practically measured or available data is used to predict this process and its seasonal variability. I enjoyed reading all five sections and the appendices and found all of the figures engaging. In summary I believe the work represents a significant contribution to the field and is well suited to HESS. My only general comment is that the clarity of the paper's main findings are obscured somewhat by the complex collection of abbreviations and symbols. In the first three specific comments below I address this and other clarity issues that I think should be addressed.

Specific comments

Three specific comments related to the overall clarity:

1. The along-x locations and their labels are confusing even after the reader is comfortable with the XZ description of the lake:

L_{lit} is the distance from one end of the lake along the thalweg to MT. So MT was located at the location where the photic zone reaches the bottom? I don't think this is ever stated, rather it seems MT is located at an arbitrarily shallow location along the thalweg.

L_{ML} the distance from the same origin along the thalweg to the isobath that matches the depth of the mixed at MB.

x_q the distance from the same origin to MT (where q is measured/predicted but not clearly linked between Figures 1 and 2).

l_p the length of the plateau (not indicated in Figure 2).

I think the formatting of these labels should be more consistent (e.g. a capital letter L followed by a subscript) and that x_q or L_{lit} be omitted. A similar simplification would help with the depths ($d_p, d_{MT}, h_{TS}, h_{lit}$, etc). I never could figure out what MT and MB stood for.

2. Although the transect data in the schematic represents an efficient use of space and looks great I think it unnecessarily complicates the schematic. The schematic should address the seasonal cycle, identify the plateau, perhaps include the equation $q = c_q h (BL)^{1/3}$ or similar equation for U, and serve as a road map or foreshadowing for the rest of the paper. Something like Table 2 added to the introduction could compliment the schematic. Where is the origin $x=0$ on the map in Figure 1? Why not identify the plateau in the schematic? Could the authors incorporate a graphic illustrating the essential time scales? If aspects at the end of the paper are too complicated to include in the initial schematic provide a revised schematic at the end of the results or in the discussion. I recognize the authors have spent some time linking the text and figures including Figure 1 and Table 1 together but it still needs improvement.

3. The language related to flow direction is sometimes confusing. I think this is partially due to the fact that the shorelines to the northwest and southeast are closer to both stations than the shore line to the northeast. The authors should explicitly state early in the paper and repeat in several captions that offshore flow is southwestward flow or something similar, line 191 is inadequate. I don't think the authors ever comment on along shore flow, tell the reader why it's ignored or if there's none.

Other specific comments

4. I was expecting to see more transects demonstrating the TS during other times of the year e.g. TS in July, October and December, were there no others collected?

5. Figure 2. Provide the depth at MT in Figure 2 (b). I think the map of Switzerland should be identified as a map of Switzerland.

6. Lines 145 to 152 - has anyone ever done this before for winds or humidity? explain why you think the simpler approach failed. Can you provide a separate R^2 for the northerly and westerly wind components, or the along and across axis wind components?

7. Line 239 I think this is ok for B_0 and is discussed later but I'm not so sure about L_{ML} , wouldn't this often increase over the cooling period?

8. Table 1 would benefit from some recomposition to aid in connecting the four columns, particularly the fourth column, e.g. swap the third and fourth column and justify the 'definition and equation' column left.

Technical corrections

1. Whether limnology is patriarchal or not the reference to 'fathers of limnology' reads a little too patriarchal.

2. The whole sentence beginning 'Such shift' on line 594 needs improvement, to start, change 'Such shift' to 'Such a shift'.

3. line 373 and 374 change shadow to shading.

4. line 376 refer to figure 7 for the histograms.

5. line 475 remind the reader what the depth is at MT.