Geoscientific
Model Development
Discussions

Open Access

Interactive
Comment

# *Interactive comment on* "Determining lake surface water temperatures (LSWTs) worldwide using a tuned 1-dimensional lake model (*FLake*, v1)" *by* A. Layden et al.

## Anonymous Referee #1

Received and published: 28 October 2015

This manuscript addresses the tuning of the FLake model for worldwide lakes, with various adjustments specific to the characteristics of the lakes. This is relevant work, both for evaluation of FLake, and for generalized application of it. However, the presentation is quite poor, with many confusing statements throughout, and poor and often missing use of units of measure. My comments that follow cover both major scientific points and minor editorial points, although the latter class should not be viewed as an exhaustive list of editorial points. The overall sum of problems with this paper leads me to recommend rejection; better presentation would greatly improve this situation.

P. 8548, lines 15-19: "The sensitivity of the summer LSWTs of deeper lakes to changes in the timing of ice-off is demonstrated." This seems to imply a direct causal relationship

between the two, whereas reality has both summer LSWT and ice-off dependent on the preceding heat budget. So "correlation" might be a better word than "sensitivity." Then this goes on to more confusing territory by saying that the summer LSWT response to ice-off is dependent on latitude and depth. The way that I would symbolically represent this statement is "the correlation of [correlation of summer LSWT vs. ice-off day] vs. latitude and depth is 0.5 (R2)". Are you really taking a correlation of a correlation, or is the second part of the sentence a better representation?: "Lake depth and latitude, explaining 0.5 of the inter-lake variance in summer LSWTs."

P. 8550, line 7: "…albedo; snow and ice (alpha)" occurs here and elsewhere. This is a very strange description. Alpha is simply the symbol that stands for albedo, so it should just say "albedo (alpha)". You can certainly make the true statement that albedo is strongly dependent on snow and ice, but the result that you use as an input to FLake is simply albedo.

P. 8550, line 256: Change "seasonally" to "seasonal".

My preference is to use a hyphen in "ice-covered" when they are used together to form a compound adjective, such as when they modify "lakes" in "ice-covered lakes". Contrast "Ice covered the lake."

P. 8552, line 13, and elsewhere: GMD might have an editorial policy on this. Although some German-language sources might have this name spelled "Mironow", every instance I found on Google mentioning this paper, admittedly all English-language sources, has it spelled "Mironov", and you have it that way on p. 8574, lines 8 and 11.

P. 8553: The variables "c_relax_C", "fetch", and "latitude" are formatted here as a list of definitions. This would make more sense visually if each of these key words were italicized, and a colon works better than a semi-colon to separate a term from its definition.

P. 8553, line 1: I am a stickler for proper use of units, and this is the first of several

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

comments on this topic. This line says that c_relax_C is a relaxation time scale. This implies that its units are time, such as seconds or days. Then you proceed to mention values without units, and imply that larger values of c_relax_C indicate more vigorous vertical mixing of water, meaning that a larger value of c_relax_C means a shorter relaxation time. I think its units are inverse time.

P. 8553, eq. 1: Even though not directly stated, we've established above that fetch has units of length (maybe km), so this equation should show this explicitly. Is 39.9 in units of km? What are the units of area, and how does its coefficient convert it back into the same units of length? Including units is crucial for the reader to be able to address the question, "Does this equation make sense?"

P. 8553, line 15: The name "Doll" should have an umlaut over the "o".

P. 8554, line 2: Units should be W m-2 (with superscript) rather than W m2.

P. 8554, line 15: This shows units of m for fetch. Are you really dealing with water bodies with fetch < 16 m? That's a very small water body.

P. 8554, eq. 2 needs units.

P. 8555, eq. 3: This strongly implies that kappa has units of m-1 (as does eq. 4), so the intercept 0.07 in this equation should have those same units. On the next line, it is ambiguous whether units of m refer to Secchi disk depth or inverse Secchi disk depth; it is much more straightforward to say "where S = Secchi disk depth (m)".

P. 8559, eq. 5: It is necessary to make it really straightforward what is meant by this operation. You're calculating varjas for whole groups of lakes, right? So N isn't just the number of years, but the sum of the number of years over all of the lakes. And xbar is the mean across both years and lakes. Whether I'm right or wrong about this, it needs clarification.

P. 8559, line 7: You have interjas in the same definition format as on p. 8553, so it should be set off by a paragraph break, italics, and followed by a colon.

P. 8559, line 14: Then you need to clarify what "max" and "min" mean. Are these the monthly mean values that happen to be warmer (cooler) than any other month of the year. If most years have August with the warmest LSWT, but one has the warmest water in September, do I insert the September value for that year, or is do I always use the same month, with the highest mean value?

P. 8559 and elsewhere: When you use the form varjas(K2), it seems to mean "varjas in units of K squared". On the other hand, interjas(R2adj) seems to mean "interjas, which can be thought of as being like a correlation coefficient, but with adjustments for the number of predictor variables". Both of these are at odds with what I think of at the standard form f(x), "f as a function of x", so this becomes quite confusion and needs to be explained.

P. 8563, lines 14-15: Are you saying that water density is lower because of atmospheric pressure? Lakes and oceans add about 1 atmosphere of pressure for each 10 m of depth, but this has a rather minimal effect on water density. Then I don't see how lower water density inhibits heat transfer, especially if you balance the effects of density on effective thermal conductivity (eddy diffusivity) and on thermal capacity.

P. 8564, line 27: When it says p=0.000 here and on the next page, is that a typo, or does it mean that it's less than 0.0005?

P. 8566, lines 18-20: This is a similar problem to some of the wording in the abstract. I think you did one correlation of depth and latitude to the delay in 1 deg warming day due to increased albedo, and another of depth and latitude to the decrease in JAS LSWT. If this is correct, then change "between" to "in" and add another "in" before "the JAS LSWT..." If this is incorrect, then what you actually did needs more careful explanation.

P. 8566, line 26: "...as a result of" implies a direct cause-effect relationship. I suspect that the delay in 1 deg warming day didn't actually cause the LSWT decrease, but that they were associated because albedo caused both. The same statement of causality

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

also occurs in the following sentence, as well as p. 8567, lines 8-11.

P. 8567, lines 12-14: "...response of the 1 deg C cooling day to the decrease in JAS LSWT" has a similar causality problem; albedo is the real root cause. Later sentences also have similar cause-effect language. It seems that you are simply calling the earlier event the cause, and the later one the effect. While the history can have some importance, it too has a cause.

P. 8567, line 23: Remove "of".

P. 8567, line 27: Pull "lakes" outside of the parentheses.

P. 8568, line 12: Start a new sentence at "Therefore".

P. 8568, line 17: When you say "more timely" here, I think it means "less biased in time", which would be a better description.

P. 8568, line 26: Change "being" to "been".

P. 8569, lines 15-16: The units should be kg per cubic meter, so I think the exponent of -3 belongs to the number 10, not the unit of kg, and the exponent for m should be -3, not 3.

P. 8569, line 19: "...buffering effect against wind" is vague. Against wind causing what? Heat flux through the thermocline or surface?

P 8569, line 20: "Purports to" doesn't make sense here. Possibly substitute "is set to".

P. 8570, line 5: I think the idea is that you have done a generalized tuning that can apply across all lakes, with dependence on the lakes' properties. Therefore, "without needing to tune the model" should have appended "for each lake".

P. 8570, line 20: This is where I've bothered to note that you missed capitalizing the "L" in "FLake", but it occurs elsewhere, too. My autocorrection just tried to overrule me on doing it this way.

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

P. 8571, line 5: To make it clear that 21 m is part of the first clause of the sentence, and 13 m is part of the second part, follow the number 21 with the unit of m, then a comma.

Interactive comment on Geosci. Model Dev. Discuss., 8, 8547, 2015.

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper