Hydrol. Earth Syst. Sci. Discuss.,
doi:10.5194/hess-2016-632-RC1, 2017

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "Seasonal thermal regime and climatic trends in lakes of Tibetan Highlands" *by* Georgiy Kirillin et al.

Anonymous Referee #1

Received and published: 12 January 2017

Undoubtedly, this paper contains interesting new information and important results about poorly studied lake systems of Tibetan Plateau, as well as potential feedbacks between the hydrological regimes of small and medium size lakes on the one hand and the ongoing climate change on the other. The author's approach combines the use of in situ, reanalysis, and remote sensing data with numerical modeling, which adds robustness to the conclusions. The manuscript can be accepted for publication after a moderate revision, which, in my opinion, should address the following points:

General comments

1. The authors tend to extend their findings and conclusions onto all lakes of the Tibetan highlands, which are "thousands" distributed over a broad area, while factually they only investigated two individual lakes, situated close to each other. Therefore,

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they should either confine their conclusions to the specific lakes Ngoring and Gyaring (perhaps, making it explicit even in the title of the article), or otherwise try to justify that these two lakes are somehow representative of the whole generality of Tibetan lakes. Is it possible to compile from the literature some kind of statistics on the principal characteristics of all Tibetan lakes (e.g., size, depth, salinity, turbidity, etc) from where it would follow that Ngoring and Gyaring are indeed “typical” examples?

2. The core result of the present study, as the authors put it, is the statement that on the climatic scale, “the effects of the air temperature increase on the lake heat budget were counteracted by the reduced radiative heating”. While this concept is qualitatively clear and sounds very plausible, cannot it be made more quantitative? That is, can we estimate the changes which the air temperature trend of 0.5-0.7oK decade-1 evident in the reanalysis will produce in the heat flux through the lake surface and see whether the latter is sufficient to offset the decrease of solar irradiance at 3.8 W m-2 decade-1? If yes, this would make the author’s hypothesis about the mutual compensation of the two trends in heat budget components much more grounded.

Specific comments

3. In my opinion, the description of the FLake model (section 2.3) should be detalized and made more concrete. It is not immediately clear to those unfamiliar with the model what does “self-similar representation of the temperature profile” mean (do I understand right that the shape of the profiles is prescribed and only the coefficients are fitted?) and what kind of prognostic entrainment equation was used. Of course, these details can be found in the references provided by the authors, but the reader should be able to get sufficient insight into the model without having to browse through the literature.

4. Figure 3 is barely legible at this scale. For example, the thin grey line is only distinguishable where the NCEP/NCAR-forced outcome exceeds the ERA-force one. I suggest simply deleting this figure, as it adds little, if anything, to the information

already presented in the tables.

5. Page 3, lines 31-32: “The mineralization of the lake water is low with a conductivity of ∼0.4 mS/cm-1” – can this be expressed in mg/l of salt content?

6. Same lines and page 4, first paragraph: Mineralization is specified only for Ngoring, while nothing is said about mineralization of Gyaring. Reciprocally, the Secchi depth is only specified for Gyaring, with no mention of that in Ngoring. This is confusing. Whenever possible, comparative characteristics should be given for both lakes.

7. Page 7, line 4: Looks like Fig. 4 is referred to before Fig. 3. Consider revising the numbering of figures.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2016-632, 2016.

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