Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Modeling experiments on seasonal lake ice mass and energy balance in Qinghai-Tibet Plateau: A case study" *by* Wenfeng Huang et al.

Anonymous Referee #2

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The paper focused on seasonal lake ice mass and energy balance over a small lake in Tibetan Plateau with thousands of lakes. Owing to the harsh environment, the Qinghai Tibetan lakes are very sparsely covered by in situ measurements and little studied. With a case study observations and numerical simulation, the manuscript showed the interesting and useful information about the lake ice thermodynamics and heat and mass balance during ice-covered season in the Qinghai Tibetan Plateau, but the work and the manuscript should be checked carefully. Therefore, in my opinion, it should be published after moderate revisions. Specific comments as follows:

L15-16 What's the relationship between ice-covered lakes in the plateau and monsoon

systems in winter?

L24-25 The author draws the conclusion that strong solar radiation, consistent freezing air temperature, and low air moisture were the major driving forces controlling the seasonal ice mass balance. The wind is quite strong including frequent gusts. It is quite important to the calculation of latent heat flux. How about wind effects on the seasonal ice mass balance ?

L32 Ice surface sublimation could account 41% of lake water loss in ice season. Can we know its contribution in the annual water balance?

L94-95 "During years 2004-2014, the mean annual air and ground temperatures varied from -2.9 °C to -4.1 °C and from -1.8 °C to -0.5 °C, respectively". How could ground temperature increase 1.3 °C and mean annual air temperature decrease 1.2 °C during 11 years? And the warming rate is quite fast.

L96-97 "precipitation ranged from 229 to 467 mm (average: 353 mm), while the annual mean potential evaporation ranged from 1588 to 1626 mm " VS L103 "The lake is perennially closed without rivers or streams flowing into and out of it." How did the lake survive with huge evaporation and less precipitation? How did the lake area and level respond to the rapid increase of precipitation?

L110 What's the effects of plenty of gas bubbles on albedo as showed in Figure 1? Does it include in the simulation?

L128 May I think the other two years' experiments failed? Why?

L142 The incident longwave radiation Ql is missed in equation (1), and the direction of the upward longwave radiation should be wrong. In this case, how about the simulated results?

L162 The bulk transfer coefficient for water vapor is vital for Qle calculation. It varies with wind, stability and the type of landscape. How does it set in the calculation?

L178 Undoubtedly, the air temperature between the two site are highly correlated. What's difference between them? Could air temperature over lake surface show the lake charactericts?

L264-266 The percentage of solar radiation absorbed by lake surface is main factor to decide the Qss. Could you show more information about it? How to get the percentage of Qsi and Qsw? Are they fixed?

L395 During melting period, the lake water temperature below lake ice will increase fast owing to the strong solar radiation. The absorbed solar radiation by ice and the warm temperature should not be ignored for the ice melting. Will the model simulate the lake water temperature? If yes, how about the precision?

L335-L339 According to the manuscript, the monthly mean Ts was consistently lower than the monthly Ta from December through April, while Ts was higher than Ta in November when the ice was rapidly growing, especially when the ice thickness was less than $\sim$ 10 cm. But in Table 3, the direction of Qh may not match it?

L405-407 Make sure if the lake (ice) released heat to the atmosphere through the whole ice-covered season with a consistent stable ABL.

L424 and Table 1 Lake ice albedo is very important for the simulated results and it may be very low in the plateau as mentioned by authors. But we couldn't get the specific information about your lake ice albedo. How to treat it in the work?