

The Cryosphere Discuss., referee comment RC1  
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## Comment on tc-2021-335

Anonymous Referee #1

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Referee comment on "Contribution of ground ice melting to the expansion of Selin Co (lake) on the Tibetan Plateau" by Lingxiao Wang et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-335-RC1>, 2021

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In this study, Wang et al. estimated deformation rate of permafrost in the Selin Co basin by Sentinel-1 SAR data. The subsidence volume was assumed as ground ice melting. The contribution (ratio) of ground ice melting to lake water volume gain was estimated. This study first quantified the contribution of ground ice change to the expansion of Serlin Co. This study is novel and suitable to publish in Cryosphere after further improvement/clarification.

Major comments:

1) In this study, the contribution of ground ice melting to water volume increase of Selin Co was estimated by subsidence space derived from Sentinel-1 SAR data. The ice density of 0.91 g/cm<sup>3</sup> was used to estimated the water released from ground ice into lake. This process is not easy to understand. The authors can add more interoperation of this hypothesis that the subsidence volume equals to ground ice melting supply is reasonable.

2) This study only presents three-year study from 2017 to 2020. How the lake volume and space of subsidence were estimated and uncertainties? ICESat-2 started from 2018, how about the data in 2017? The authors could include a comparison (lake level/volume changes) in discussion with a supplementary table with previous studies?

3) The uncertainties (plus minus) of all estimates could be included.

4) Figure 4: The seasonal cycle of lake level looks strange. Please check your data and compare with other studies.

5) Table 6: How the surface water elevation for each year was decided? The mean or level in a month was used/selected? The column of velocity is no value and can be removed.

6) The English writing of this manuscript need improve. It is better to polish by a native English speaker. For example, Line 375, too many "them had amplitudes" was used.

Specific comments:

- Serling Co lake to Serlin Co throughout, not include lake as Co means lake in Tibetan.

- "increases in precipitation and glacial melting are not enough to explain the increased water volume of lake expansion" How to understand this? The previous studies have closed the lake water balance.

- Line 20: the long-term, I do not suggest to use this as the short study period.

- Line 35: Tibetan Plateau to Tibetan Plateau (TP), and use TP thereafter.

- Line 35: 1000 lakes, 40,000 km<sup>2</sup>, please use new values.

- Line 40: lake area and volume increase to 2017, please use the value from new published paper updated to 2019

- surpassed Nam Co lake in 2014, it is about 2011, please check new published paper, and include the citation.

- Line 45: For the statistics of glacier number and area, please use the data from the second China glacier inventory.

- the ground ice volume in the watershed reaches 132.3 km<sup>3</sup> (Zhao and Sheng, 2019). How about the value compared with Farinotti et al. (2019) (doi: 10.1038/s41561-019-0300-3)?

- glacial meltwater contributed ~ 10% of the total water input to Serling Co lake since the 1970s (Lei et al., 2013; Tong et al., 2016). The two other studies (doi: 10.3389/feart.2020.582060; doi: 10.1016/j.scitotenv.2021.145463) for the estimates could be included for comparison together.

- The weakening of lake evaporation has also contributed to the accelerated expansion of Serling Co lake. It is really weaking? It should be increasing as the warmer air temperature, and some studies have corrected this by Nam Co or different study period?

- Table 2. Ele. (m) to Ele. (m a.s.l.)

- Line 245: ERA-5 reanalysis data, how about ERA-6 data? It is better?

- Line 445: compared to the values recorded in previous studies. The references are necessary.

- Line 515: "in the northern two" to "in the two northern"