This manuscript introduces a novel dataset detailing the ice phenology of small lakes (< 50km 2) through the integration of Brightness Temperatures (Tb) from passive microwave observations with air temperature (Ta) data sourced from ERA5, specifically focusing on the Tibetan Plateau (TP). The incorporation of air temperature data proves pivotal in mitigating seasonal fluctuations and amplifying the discernible differences of Tb at frozen and ice-free seasons. Overall, the method is interesting but may not be robust for generating a dataset. Please find my questions below.

1. Now it is very common that studies integrate both high-resolution optical data and PMW data to generate high-resolution, continuous snow surface properties, such as snow depth [1], snow albedo phenology [2], snow fraction [3], and snow mask [4,5]. I believe if you follow such similar ideas, you may get better results, and the way Ta and Tbs used in this study is a little bit simplified.

2. The sensitivity test between lake size and the model accuracy should be given. Even though including Ta may remove the seasonal cycle to some degree, it does not mean this proposed method works for all small lakes. Such analysis will give the readers a hint of how robust the model is in different lake sizes.

3. The fundamental assumption underlying this work, as I understand it, is that ERA5 Ta exhibits a closely aligned seasonal cycle with Tb, enabling the removal of this cycle and thereby enhancing the discernible Tb changes. However, in theory, variations in the timings of peaks and valleys in annual cycles of Ta versus surface/soil temperatures are very different. Fig 2b also indicates that the annual valley of Ta is ahead of Tb. How do the authors deal with such a mismatch?

4. Would the post modification (Sect. 2.3.3) be too subjective to affect the proposed data to be used for application (e.g., temporal trend analysis)? A year-to-year temporal variations of the FUS, FUE, BUS, and BUE are needed to test the stability.

5. Reanalysis Ta has a very large uncertainty in TP areas because of the incorrect snow cover simulation [6].

6. Examples in Figure 5 still provide pretty large lakes that are larger than one single pixel thus its phenology won't be very hard to be detected. Some cases for sub-pixel lakes are necessary.

7. In Fig 3b, there are Tbs in ice-free season, especially during 2013.09 – 11, making the first threshold not robust.

8. Any spatial maps of threshold Tbs/dates for different lakes? The map like Fig 8 has few spatial details.

9. Line172: why the thresholds for breakup periods were always higher than those for freeze-up periods

10. The manuscript requires additional accuracy evaluation and data variation analysis, such as the statistics of the lake areas, freeze/thaw date annual variation. The cross validation with MODIS is not enough, any ground measurements? NASA IMS snow/ice cover can be another high-resolution continuous reference data.

**Minor**

The definition of mid- and small lakes should be clarified in the abstract.

Line 101: spell the LIP where it appears for the first time in the article.

Line 94: any processing for the AMSR2 swath gaps? They are very common in TP areas.

Line 97: ERA5-land has much higher spatial resolution compared to ERA5, why not choose ERA5-land?

Line 60, please add one sentence to clarify why previous studies cannot involve mid- and small lakes. As you are using the same input data, why this study can capture the free-thaw info from the subpixel?

As a manuscript for a data journal, this is for end users. Suggest including one or two sentences to introduce why PMW data can capture the freeze-thaw signals.

Include this study in Table 1

Line 79: any specific value range of the object lake areas? how these object lakes were selected? Manually?

[1] Xiong, Chuan, et al. "Mountain Snow Depth Retrieval from Optical and Passive Microwave Remote Sensing Using Machine Learning." IEEE Geoscience and Remote Sensing Letters 19 (2022): 1-5.

[2] Jia, Aolin, et al. "Improved cloudy-sky snow albedo estimates using passive microwave and VIIRS data." ISPRS Journal of Photogrammetry and Remote Sensing 196 (2023): 340-355.

[3] Xiao, Xiongxin, et al. "Estimating fractional snow cover from passive microwave brightness temperature data using MODIS snow cover product over North America." The Cryosphere 15.2 (2021): 835-861.

[4] Kumar, Sujay V., et al. "Quantifying the added value of snow cover area observations in passive microwave snow depth data assimilation." Journal of Hydrometeorology 16.4 (2015): 1736-1741.

[5] Foster, James L., et al. "A blended global snow product using visible, passive microwave and scatterometer satellite data." International journal of remote sensing 32.5 (2011): 1371-1395.

[6] Meng, X., et al. "Simulated cold bias being improved by using MODIS time-varying albedo in the Tibetan Plateau in WRF model." Environmental Research Letters 13.4 (2018): 044028.