Responses to Referee #3:

This study developed an approach to monitor lake ice phenology based on passive microwave brightness temperature (TB) products. By applying this method to 56 lakes from 1979 to 2019, a ice phenology dataset was established. Considering the benefits of passive microwave data including long record, daily re-visit frequency and potential to work under all-weather conditions, this study is of great interest and meaningful for the community to improve our understanding of global lake ice phenology. The paper is well written and the methodology flow is clear. Therefore, I recommend accepting this paper after minor revisions.

Response: Thanks for your recommendation.

1.Line 97, compared with the traditional studies that only a few large lakes could be monitored based on passive microwave data, more lakes with smaller surface areas are included study because the latest TB product with higher spatial resolution was released by NSIDC. I suggest giving more background information about this new TB product, such as how it was achieved and what the accuracy of this down scaled product.

Response: We have added some brief introductions to the CETB dataset here (see Lines 99-101 in the revised manuscript): "The enhanced-resolution images were generated using the radiometer version of the Scatterometer image Reconstruction (rSIR) algorithm, which provides higher spatial resolution surface T_B images with smaller total error compared with conventional drop-in-the-bucket gridded image formation (Long and Brodzik, 2016)." There are also additional introductions to the dataset in the data description section.

2.Methodology section in 2.3.1

I think add a figure showing the time series of TB for one or two lakes would be better to illustrate how MIT works for determining the abrupt changes.

Response: Thanks for the suggestion. We have added an example of Great Bear Lake to illustrate how to determine lake ice status for a pixel and extract ice phenology for a lake in the revised manuscript (Figure R1).

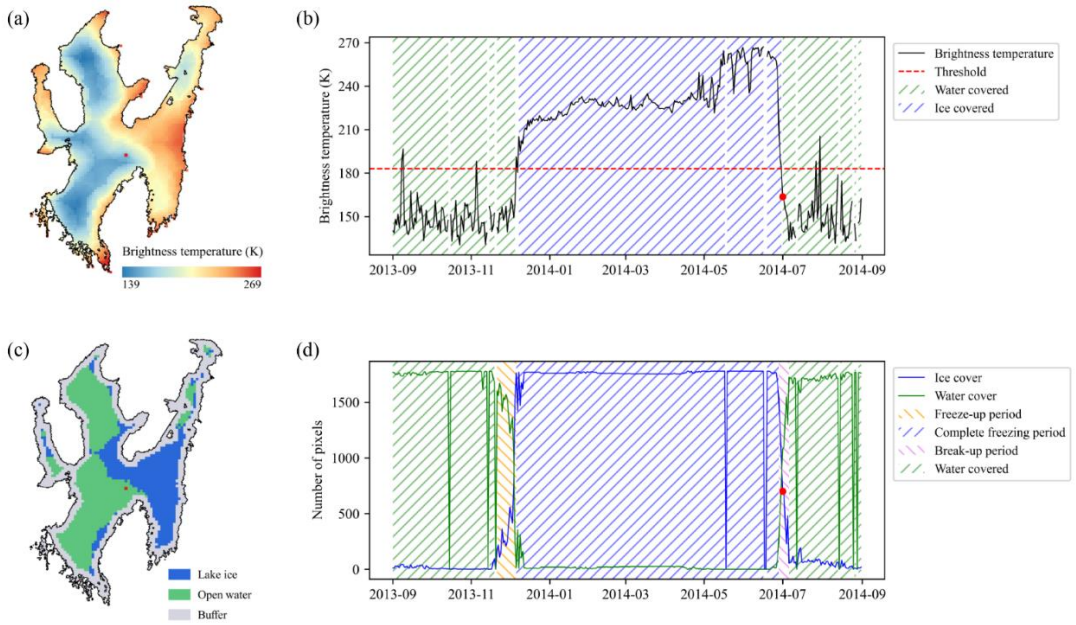

Figure R1 Example of determining the lake ice status for a pixel and extracting the ice phenology for a lake. (a) The T_B image of Great Bear Lake on 1 July 2014, (b) variations in the T_B of the pixel marked in red in (a), the red line represents the reference T_B determined by MTT algorithm, and the pixel was determined to be water covered on 1 July 2014 (red dot), (c) lake ice status for all the pixels at least 6.25 km away from the lake shore on 1 July 2014, and (d) variations in the number of lake ice and open water pixels for Great Bear Lake in 2014, the lake ice phenology were extracted by thresholds of 5% and 95% of the total lake pixels, and 1 July 2014 (red dot on the ice cover line) was determined to be in break-up period.