**The Cryosphere
Discussions**

Interactive comment on "Estimating ice phenology on large northern lakes from AMSR-E: algorithm development and application to Great Bear Lake and Great Slave Lake, Canada" *by* K.-K. Kang et al.

Anonymous Referee #1

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The paper addresses an important issue - monitoring ice phenology over Great Bear and Great Slave lakes in Canada using AMSR-E data.

General comments:

The paper is quite long with many tables and figures, and extensive use of acronyms does not make it easier to read. In some cases (Page 3134, lines 17 and 18) acronyms are introduced (MRB and NWT) even if they are not used at all later in the paper. I would suggest to keep acronyms when it is necessary, but also to use more often here and there some human language.

A more thorough justification of the choice of 18.7 GHz channel is needed. Several

other ice algorithms (Artist Sea Ice etc) successfully use 85 GHz channel from SSM/I and 89 GHz from AMSR-E by correcting weather influence using other channels. Why not use the similar approach as it is will dramatically increase the spatial resolution and minimise land contamination of the radiometric signal?

Have the authors considered combining different channels at different polarisations to improve the ice/water detection? A table showing differences in defining ice phenology dates using different channels would help to substantiate and justify the choice of 18.7 GHz channel. Also, the discussion on potential possibility to estimate ice concentration could be useful.

An important issue is the fact that both lakes go through spring and fall overturning (when the lake water temperature reaches the temperature of maximum density at +4°C). This is not mentioned in the paper and some conclusions are not correct in this respect. For example, I agree that the large amount of heat accumulated in the lake will result in later freeze-up onset (P.3144). However, after the overturning the whole water column has the same temperature and, contrary to what is stated on pages 3144-3145, freeze duration (FD) will depend only on air temperature variability after the overturning (no memory effect whatsoever whether it was a warm of cold summer before the overturning).

There is a lot of tables and I would suggest to add at least one graph showing some of the results from Tables 6-8 or just from Table 8 to illustrate the interannual variability of ice phenology and may be even some possible trends (by adding some historical data before winter 2002/2003) to put the results in the larger climatic context.

Technical comments:

P3132, Line 5 - is "mimicked" an appropriate expression?

P3138, line 11: quick look or quick-look?

P3140, line 26: please explain what is meant here by clear, black and snow ice

P3166, Figure caption - - please indicate the meaning of numbers in brackets after "Ice Season" and "Ice-free Season".