

## ***Interactive comment on “Satellite Microwave Assessment of Northern Hemisphere Lake Ice Phenology from 2002 to 2015” by Jinyang Du et al.***

### **Anonymous Referee #1**

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The authors have developed an automated method for assessing timing of ice-on and ice-off for large lakes in the Northern Hemisphere using AMSR-E/2 passive microwave observations. Their results generally compare well with available observations from the ground and other satellite-derived records, such as from the NOAA 4-km IMS maps. Increasingly shorter ice duration for 43 of the 71 lakes was found, but results of only five lakes were statistically significant. Larger trends toward shorter ice duration were found at higher latitudes.

This is generally a very interesting paper and clearly written, though I have some comments. Please provide more detail regarding the implications of the 5-km spacing (in section 2.1.4), since the native resolutions of the AMSR-E/2 sensors are coarser than your product resolution.

C1

It would be good to mention in the abstract that the automated method is consistent, whereas manual methods are not. This is mentioned later in the paper but is an important point with respect to climate-change studies.

Can you include information on the warming trends in the Northern Hemisphere during the 12-year study period, since warming is the likely driver of the shorter ice duration? In particular is there evidence of greater warming during the study period at the higher latitudes? If so, this would support the finding that the higher latitude lakes show a shorter ice duration (vs lower latitude lakes) during the 12-yr study period.

It is correctly stated that optical data (e.g., IMS, AVHRR and MODIS) can generally provide an update on ice conditions every few days (not daily due to clouds). How is your automated passive microwave algorithm superior? In other words, why is it important to have the update on ice conditions daily vs every few days? An added advantage of optical data is that the resolution is better than passive microwave. With the passive microwave you are only able to detect changes in the largest lakes.

I found the number of acronyms daunting to read and remember, though most if not all have been spelled out appropriately.

I found Table 2, and especially the caption, to be confusing.

Other comments: p.3, line 5 – I don't consider 1978 to present to be “long term” – please reconsider the wording p.3, line 23 – please consider using the word “including” versus “encompassing” p.3, line 30 – the paragraph starting on this line and ending on the next page, line 24 seems way too long; can you break it up into 2-3 paragraphs to increase the clarity? p.4, line 16 – consider using the word “represent” versus “encompass” p.5, section 2.1.3, and p.5, sentence on lines 25-27 - first paragraph; please check to see if you have already stated this p.5, line 25 – Lake Superior is in both the US and Canada; please fix p.6, line 14 – have you previously spelled out the acronym SAT? p.8, line 25 – last sentences of this paragraph – please provide a more thorough discussion of the uncertainties associated with gap filling over a period of 7 months

C2

p.10, line 19 – consider using the word “show” versus “indicate” p.12, first paragraph – please break up into 2-3 paragraphs to increase clarity p.12, last sentence of first paragraph – how do you know that the LIP was incorrectly detected? p.13, paragraph 1 – please break up into two paragraphs to increase clarity Figure 1 – on the map, it can be hard to distinguish the two different shades of blue Figure 2 caption – Lake Superior is not only in the USA; please include Canada Figure 5 – the yellow stars do not show up well in figures 5b and 5c

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