

## ***Interactive comment on “Physical and optical characteristics of heavily melted “rotten” Arctic sea ice” by Carie M. Frantz et al.***

### **Anonymous Referee #1**

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#### General comments

This manuscript provided a good and detailed investigation on the “rotten sea ice” during the melt season of Arctic. Physical and optical properties of such ice were measured through in-situ investigations and discussed here. The potential readers can get a lot of useful information from this manuscript, but a problem also exist accordingly: a very clear subject is absent throughout the manuscript. I understand that the data presented in the manuscript are good, but I think the structure of manuscript should be improved to focus on one or two scientific topics, for example, the difference between rotten ice and often-studied summer ice. And then the whole content will look like a good paper rather than a data report.

The manuscript is well-written, and the quality of the presentation is good. However,  
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the manuscript can be further improved upon addressing the points above and below.

#### Specific comments

1. Rotten ice is not an often-used word in previous publications, so can you provide a very clear definition first in the introduction section?
2. In section 2.1, there are titles for the subsection: “2.1.1 May, 2.1.2 June, 2.1.3 July 2015, 2.1.4, July 2017”. Then what is the year for the first two titles?
3. Figures 1, 2, and 3, gave some in-situ pictures, but they seem to be somewhat repeated. So please consider to remove some of them and leave the important ones.
4. In section 2.2.3, line 178, manual thresholding gave more reliable results than automatic thresholding. I understand this because automatic thresholding cannot handle all situations we met, but manual thresholding is very sensitive to the person who perform the image segmentation. So how to evaluate the error of manual thresholding?
5. In section 2.3, a method to measure inherent optical properties of sea ice in laboratory is introduced, but the process is still a little difficult to understand by readers who are not so familiar with optics. Can you add a figure here to explain the laboratory method?
6. In section 4.1, yes, the equation of Cox and Weeks [1983] is valid only for ice temperature less than  $-2^{\circ}\text{C}$ , but Lepparanta and Manninen [1988] has setup a new equation to solve the problem as temperature more than  $-2^{\circ}\text{C}$ . The authors should cite the paper Leppäranta M, Manninen T. 1988. The brine and gas content of sea ice with attention to low salinities and high temperatures. Finnish Institute for Marine Research, Internal Report, 1988(2): 14.
7. In section 4.2, line 478. Increasing in ice scattering seemed to be a result of changes of ice microstructure, so can we give some quantitative results here because both optical and physical parameters were measured in this study?

Technical corrections

1. Line 44, Eicken et al. [2002] noted. . .

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-141>, 2018.