

## ***Interactive comment on “Northern Hemisphere Surface Freeze/Thaw Product from Aquarius L-band Radiometers” by Michael Prince et al.***

**Anonymous Referee #1**

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The authors present a new FT product using Aquarius passive data and compare the results with the Ka-band FT-ESDR products. The results show some very interested global features over three years for three different landcovers. However, there is some lack of the algorithm description and discussion. The algorithm for this global F/T products is directly used the regional results from the Roy 2015 paper. I suggest, at least a few optimization over global region need to be tested and some basic screening should be applied to minimize the false alarm. The detail comments are as below,

1. In section 2.1, the author should give more descriptions of the general Aquarius mission, such as its native resolution for three radiometers, repeat cycle and etc. This info will help readers to better understand the what the FT-AP product represents. If

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I understand right, the level 3 TB is a gridded products integrated both ascending and descending orbit in a weekly basis. The actual collecting time of the each pixel (in ~100km Aquarius resolution) is still around 6am/6pm of the certain day but not representing the weekly average. While comparing to FT-ESDR, the weekly F/T from FT-ESDR is more of an averaged F/T status of the week. This instantaneous vs. weekly averaged comparison itself can lead up to a week of discrepancy. 2. Page 3 Line 25, why just generate reference from 2012 to 2013 instead of using the three year average? Is the five minimum/maximum value get from winter months and summer month or over the whole year? 3. It is worth listing out explicitly the thresholds that are used in generating the F/T map. Base on Roy 2015 paper, the thresholds were optimized over North American. How well is it applicable for the rest of the region? Especially in the latter session, the thawing process shows a great difference for the North American and Eurasia (Fig 5.) Is that related to the chosen of the threshold? 4. Figure (2b) wrong direction of the ] in the figure label 5. In section 3.3, when comparing with the in situ weather stations, the surface air temperature is definitely an important indicator of the soil freeze/thaw. However, it's still an indirect way of predict F/T status of the soil. Although the soil moisture and soil temperature may also have some ambiguity to determine the F/T, it has more direct information of the soil itself and should be included in the discussion when they are available.

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C2