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The Cryosphere Discussions

Interactive comment on "Recent changes in pan-Antarctic surface snowmelt detected by AMSR-E and AMSR2" *by* Lei Zheng et al.

Anonymous Referee #2

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This study makes use of passive microwave data from AMSRE and AMSR2 to detect melt over the Antarctic Ice Sheet and sea ice regions using a diurnal difference in brightness temperature algorithm. Means and trends in melt onset, number of melt days, and melt day fractions from 2002-2017 are presented and compared with ERA estimates of surface melt based on air temperature, and SSMI melt indices. A method of improving melt detection in marginal sea ice is also presented and validated.

In general the paper is well written and of great interest with excellent figures but a few points need to be addressed. There are many instances where the use (or not) of the definite article is incorrect, I suggest a read through by a native English speaker to correct these.

Early on it should be made clear that satellite algorithms for melt retrieval detect either

the presence or absence of liquid water, or the diurnal transition between the two, rather than actual melting events.

Various products used in this study, Tb, Tair, SIC were undoubtedly supplied at different projections and swaths and resolutions. Please provide more detail on how these products were coregistered.

The validation described briefly P5, L28 does not give enough detail. What is the 'melt signal determined by satellite'? How are the accuracy and coefficients referred to calculated? Why is this agreement 'in contrast'? In contrast to what?

P1, L21. It does not make sense to compare snow melt extents of sea ice and ice sheets when they cover different areas in total. What is the point?

P1, L28. You mean snow melt leads to an increase in size of snow grains.

P1, L30. You confuse ice sheets on bedrock, with the hydrofracture on ice shelves which are floating. Separate the discussion of these two impacts.

P3, L13. It needs to be made clearer why DAV is more likely to detect melt with AMSRE/2. Ie Explain why time of day (rather than period) of the overpasses is important.

P3, L21. 'Meltwater on the AIS always refreezes instantaneously'. Needs a reference. Also,in this case, it would never be detected.

P4, L7. Changes 'almost shares' to 'shares almost'.

P4, L17. This sentence does not make sense. Please rewrite. Which air temperature was used? 2 m?

P4, L29. Please move reference to Fig. 1 to later in this paragraph. You have not yet described the simulations.

P5, L8. Replace 'opposite' with 'contrasting'.

P5, L12. Replace 'prevailing' with 'prevalent'.

P5, L19. Replace ‘extensively’ with ‘extensive’.

P7, L19. This sentence needs rewording ‘MDF decreases in an opposite trend’ suggests that MDF decreases going from high to low latitudes.

P6, L24. How is this definition of frozen based on ERA Tair used in the algorithm?

P7, L31. Figs. 5k-o? should be g-i?

P8, L12. Again, what is the point of comparing melt extents of sea ice and AIS?

P8, L16. It is not clear why the decreasing sea ice extent would lead to an increasing sea ice melt extent? This would only explain the delayed peak in sea ice MEF.

Fig. 9. You should only plot those pixels with a significant trend. Or also plot the p values.

P9, L14. You should discuss further implications of the failure of DAV when melt is continuous. This would presumably manifest as a decrease in Melt Days detected where melt temporal continuity became more prevalent. Might this also explain areas with very early melt onset such as in BAS but a surprisingly low number of melt days.

P10, L25. Please include these correlations between atmospheric indices and melt in a table.

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