Interactive comment on "Sunlight, Clouds, Sea Ice and Albedo: The Umbrella Versus the Blanket" *by* Donald K. Perovich

Anonymous Referee #2

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This manuscript describes a set of calculations carried out to assess the magnitudes of surface radiative forcing for a sea ice cover during summer. The calculations present relative differences between cloudy and clear conditions for the 5 months typically spanning melt season in the Arctic. The data employed are taken from the SHEBA project.

The topic is interesting and relevant for TC readership. The presentation is clear, original, and insightful. I agree that sweeping simplifications were made, but for the purpose of illustrating how these concepts apply to the real world Arctic, they seem justified and appropriate. This is a simple, yet clear, illustration of how radiative forcing responds to clouds and surface albedo for a sea ice cover. It is true that the analysis is done exclusively for individual "snapshot" samples in time, but the conclusions are informative

and instructional.

Minor comments: Abstract line 6: First sentence should state the domain you are consideringâĂŤ"The surface radiation budget of the Arctic Ocean plays. . ."

Abstract line 12: "other four months" is not clear, could say "other four months of the melt season" or explicitly spell them out "For May, June, August, and September, the net. . ."

p. 1 Line 18: Just improving prediction of ice extent? What about also improving prediction of ice thickness (specifically surface melt)?

p. 3 line 10: "First," p. 3 line 16: "to check" p.3 line 25: : ". . .defined as the albedo that, for a given radiative forcing, results. . ." p.3 line 27: "fall" p. 3 line 30: ". . .is greater than outgoing. . ."

Fig. 2: The legends would be easier to decode if they were more consistent with the terminology used in the text. I recommend using "sunny" and "cloudy" for the color legend (it's totally clear in the text which date is which condition, but it's not intuitive in the figure and someone looking at the figure won't really care what the date is, they just care about the sky conditions). Also, the line type legend would be clearer if stated as "incoming" and "outgoing", as used in the caption and the text.

p. 6 line 15- 16: This sentence is a bit unclear. Does it mean "Under cloudy skies the net radiative flux is always less than for clear skies for leads and almost always less for ponds."?

p. 8 line 18: can't tell if the end of this sentence is a copy and paste accident or whether there are commas missing, but it needs to be rewritten

p. 8 line 19: ". . .freezing in August, greatly reducing the pond fraction, and young ice. . ."

p. 10 line 15 - 16: Does this mean that one should expect to see significant differences

in surface melt between cloudy and sunny conditions? This may merit a reference to Perovich et al. 2003, where this idea was posed.

p. 10 line 17: Not sure what "favoring" means here? How about "For M, J, A, and S, the ... albedo is greater than the break-even albedo, suggesting that sunny skies promote less surface melt"?

And, finally, a question: Does this analysis suggest that a cloudy period is required (or even just hugely beneficial) to the initiation of melt in the early summer? If so, this might be a nice conclusion.

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