

Interactive comment on “Brief communication: Antarctic sea ice gain does not compensate for increased solar absorption from Arctic ice loss” by Christian Katlein et al.

Anonymous Referee #2

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The Brief Communication uses a new dataset, APP-x, to examine trends in the annual mean absorbed flux of shortwave radiation in the polar regions from 1985-2014. It addresses relevant scientific questions within the scope of the journal. The conclusions are appropriate for a Brief Communication. The article is clearly written and easy to read. However I have some criticisms.

I felt the authors could improve the description of the motivation for the study. For example, why consider only shortwave radiation and not include the emitted longwave radiation? The stated goal is “to determine to what extent the increased absorption of solar shortwave energy caused by losses in Arctic summer sea ice can compensate for the decreased absorption caused by modest increases of sea ice extent in the

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Antarctic.” But why? I assume the reason for doing this is to assess the contribution to the overall global energy balance? If so, please comment on how you think how longwave radiation would contribute to the story?

Commas are placed in unusual places and sometimes seem to be missing; eg p. 1, line 9 insert comma after “sea-ice”. Please check throughout the document.

p. 1, Line 19: Please give a reference for the debate.

p. 2: I think that the AAP-x data set calculates ice thickness using a 1D OTIS model with satellite-derived input variables. Is there any validation of these AVHRR ice thicknesses in the Southern Hemisphere?

p. 2, Line 22: More snow on Antarctic sea ice is also likely to give a higher albedo in the Southern Ocean.

p. 3: It is excellent that the authors compare sea ice concentration derived from the APP-x data with passive microwave concentration data. But I would like to have seen some sort of quantitative comparison. This would increase the reader’s confidence in the new dataset.

p. 3, Lines 10-15: I would like to have seen some estimate of the error in the quoted measurements.

p. 3, Line 26-27: I did not understand this sentence. Do you mean “this does not significantly affect our analysis of energy fluxes, as the largest uncertainty in the albedo occurs with low fluxes, subsequently leading to a low uncertainty in the time-averaged energy flux.”?

p. 3, Line 29: ahha – here snow cover is mentioned. Please support with a reference.

p. 4, line 1-2: Is the APP-x surface albedo not used to obtain ice thickness through the OTIM model? How does the lack of independence of surface albedo and ice thickness affect the calculation of shortwave energy flux?

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p. 4, Line 3-4: Do you really know the annual shortwave energy flux to 0.1 in 200 Wm⁻²? Please make it clear that you have considered the accuracy of your results.

p. 4, Line 6-7 states that “Average Southern Hemisphere absorption remained relatively constant throughout the satellite record” while on line 13 it states “In the Southern Ocean energy absorbed by the ice-ocean system south of 50oS also increased . . .” I am confused by this apparent contradiction and I suspect that I have missed a subtlety.

p. 4, Line 12-13: I think you say the total annual shortwave energy in the northern hemisphere increases at a significant rate, while in the Southern hemisphere it did not. Yet the numbers seem similar (8.77 X 10²⁵ Jyr⁻¹ compared with 6.14 X 10²⁵ Jyr⁻¹). Please justify. Again I may have missed a subtlety but, if so, perhaps you could make this clearer.

Fig 1a): Confidence would be increased in the dataset if the slope from another reliable source (eg NSIDC) was added to the figure.

Fig 1b): What are the intriguing jumps in the data?

Fig 2: The trend should be in Wm⁻²yr⁻¹. Remove comma after “both”

Fig 3: Caption and figure do not agree.

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