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Interactive comment on “Reconstruction of high resolution time series from slow-response broadband solar and terrestrial irradiance measurements by deconvolution” by A. Ehrlich and M. Wendisch

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Thanks to the editor for providing a detailed review. We think the comments and according changes have been helpful to improve the manuscript. We also addressed all other suggestions by the anonymous reviewer and Dr. Kierdon. Therefore a separate replies are given.

The detailed replies on the editors comments are given below.

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The reviewers comments are given italicized while our replies are written in roman letters. Citations from the revised manuscript are given as indented text.

Detailed Replies

Please make sure that all abbreviations are spelled out on their first occurrence in the text, even if they are as trivial as AD or SD. Are the instrument names (KT19, CGR, ...) abbreviations with any kind of meaning?

KT19, CGR-4, CMP-22, CT 24, AMPBOX, and RS92 are type designations of the instruments and have no special meaning. All other abbreviations are explained in the revised version of the manuscript.

For the measurements over open leads, I would be interested in the estimated actual surface temperatures.

The actual surface temperatures are given by the KT19 measurements. Due to the low flight altitude and the KT19 measuring in the atmospheric window, the KT19 signal is mostly determined by the surface temperature. Measurements were taken with emissivity of $\epsilon = 1.0$. Accounting for the slightly reduced emissivity of water and sea ice $\epsilon = 0.96 - 0.98$ and the temperature of the atmosphere (-10°C to -0°C) being in the same range of the surface temperatures, a correction changes the KT19 values by less than 0.2 K. Therefore, the KT19 temperatures can be assumed to be representative for the actual surface temperature. We agree that these values are of interest for the reader and added in the revised manuscript:

Mean surface temperatures of -2.1°C over open water and -7.6°C over the ice were observed by the KT19.

In Figure 7, I would find it helpful if the cloud-free areas would be indicated similarly to

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the open leads in Figure 6.

Even when the boundaries of the cloud free areas are not as clearly defined as the open leads, we agree with the reviewer. Therefore, we add labels indicating the cloud-free zones in the revised version of Figure 7.

Section 4 already includes mention of equivalent horizontal distances for sampling frequencies. Approximate numbers translating the limiting frequencies into distances would also be helpful in the abstract and conclusions.

Thanks for this suggestion! We totally agree and added some numbers in abstract and conclusion:

Cloud top temperatures were improved by up to 1 K above broken clouds of 80-800 m size (1-10 s flight time) while an underestimation of 2.5 W m^{-2} was found for the upward irradiance over small leads of about 600 m diameter (10 s flight time) when using the slow-response data.

It was shown that upward irradiance over small leads with size of about 600 m (10 s duration of measurement) may be underestimated by 2.5 W m^{-2} or more when using uncorrected measurements. Similar results were observed for the upward irradiance above broken clouds of 80-800 m size (1-10 s flight time) where cloud top temperatures could be improved by up to 1 K.

page 5186, line 14: criteria → criterion

Has been corrected in the revised version.

page 5195, line 8/9 change parentheses

Has been corrected in the revised version.

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