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The Cryosphere Discussions

Interactive comment on "Improving satellite-retrieved surface radiative fluxes in polar regions using a smart sampling approach" *by* K. Van Tricht et al.

Anonymous Referee #1

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General comments

This study presents a new method for increasing the spatio-temporal sampling of shortwave and longwave radiation retrievals from CALIPSO and CloudSat satellites. The method developed may have a strong potential for the use of active remote sensing observations over polar regions. The topic is interesting, innovative, and fits well within the scope of The Cryosphere. Moreover, the paper is well structured and well written. However, a few issues should be resolved before publication.

Specific comments

The authors have developed a method to minimize the bias relative to the spatial rep-

resentativeness. There is a discussion about how the differences in surface conditions can influence the shortwave and longwave fluxes. However, I would like to see more discussion about how the differences in atmospheric conditions (cloud cover, temperature, and humidity) can induce a bias in the retrievals, and how it relates with the maximum distance chosen between the point of interest and the satellite retrieval.

Over the Greenland and the Antarctic ice sheets, there are strong gradients from coastal to inland regions in various meteorological variables such as surface temperature (Ettema et al., 2010, Fréville et al., 2014), specific humidity (Ettema et al., 2010), cloud cover (Ettema et al., 2010, Bromwich et al., 2012), and precipitation (Palerme et al., 2014). Therefore, the point of interest is probably more representative of the satellite retrieval if the direction between the point of interest and the satellite footprint is parallel to the coast than if it is perpendicular to the coast. For instance, in Antarctica, the point of interest is probably more representative of the satellite retrieval if the point of interest is oriented in an eastward or westward direction than in a southward or northward direction compared to the satellite footprint. This should be mentioned in the text. Furthermore, do the direction between the point of interest and the satellite footprint is always perpendicular to the satellite ground track in the method developed ?

Page 10, line 7. "A daily sampling frequency was found to yield optimal results". I would like to see a discussion about the maximum distance between the point of interest and the satellite retrieval for a daily sampling frequency. The information is shown in figure 3 b), but I think it should also be mentioned in this paragraph. Moreover, a curve showing the maximum distance between the CloudSat/CALIPSO footprint and the point of interest for a daily sampling frequency depending on the latitude could be added in figure 3 b).

Figure 1. What do the gray circles represent in figure 1?

Figures 9, 10, 11, and 12. The value of the correlation coefficient should be added in

all the scatter plots.

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