

Interactive comment on “Evaluation of arctic broadband surface radiation measurements” by N. Matsui et al.

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General Comments:

We feel that the reviewer’s criticism that our recommendations are based on short period is fair. However, at NOAA/GMD/G-RAD, we have more than 20 years of experience collecting data from South Pole and Barrow. ARM also has been operating at Barrow since early 1998. We show a few short period cases to illustrate our points in this manuscript.

Also, it is not our intention to overlook the accumulation of creative solutions invented by well-experienced field workers who have wintered in the polar region. For example, we

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are aware of the extensive ventilator modifications done during the SHEBA campaign (Horst 2003, <http://www.eol.ucar.edu/isf/projects/sheba/rad.isff.html>). Thus, we modified the manuscript to reflect our position. However, we also felt the need to revisit the riming, frost, ice etc issues in light of recent developments in commercial radiometers such as the Delta-T SPN-1. We respectfully assert that heated and ventilated apparatus traditionally used in the past has not been good enough to mitigate riming and snow accrual. Ventilation has also been shown to induce more severe IR loss from the pyranometers that it is trying to improve. For example, studies such as the NSA Pyranometer IR Loss Study (2006-2007, <http://www.arm.gov/campaigns/nsa2006pyirloss>) and the ARM Evaluation of Heated Ventilators in the Arctic Campaign (2007-2009, <http://www.arm.gov/campaigns/nsa2007pyranometerext>) demonstrated that current ventilation and heating are not sufficient for mitigating riming, frost, and snow in Arctic conditions at Barrow.

Finally, in response to the reviewer’s comments, we reorganized the manuscript to improve its focus.

Responses to specific comments:

P. 4912, l. 2, References have been added.

P. 4913, l. 13, We replaced “climate grade” with “accurate”.

P. 4914, l. 16-19, Correct term ‘surface radiation budget’ is used now.

We respectfully disagree with the review’s comment that the exclusion of upwelling measurements from the basic measurements list “poses neither an advantage nor disadvantage especially in polar regions where snow cover varies and upwelling measurement captures this aspect.” We clarified this issue in the conclusion section.

P. 4914, l. 25-27, The reference was removed because we believe that the statement on lines 23-27 is fundamental.

P. 4915, l. 10, The NOAA record of careful radiation observations at Barrow begins in

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1976.

P. 4915, l. 10, The statement that data QC is not presently done at the BSRN archive is correct. However, according to BSRN policy, it is the responsibility of the site operator to provide the best data possible to the archive. Chuck Long's QCRad program is based on BSRN recommendations for QC as a starting point, with significant improvements (see Long and Shi, 2008).

P. 4917, l. 17-20, Other references on the thermal offset of single-black-detector pyranometers have been added.

P. 4918 We agree with the reviewer's comment and made a correction.

P. 4919, l. 7-14, The referenced sentences have been simplified

P. 4919, l. 16-18, Changes have been made to reflect reviewer's point.

P. 4920, Changes have been made to the manuscript.

P. 4920, l. 23 On line 20, " The solar tracker" was changed to "Modern robotic solar trackers"

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