

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

Anonymous Referee #1

Received and published: 24 October 2011

Synopsis:

The paper presents the operational problems encountered in the radiation measurements in the polar regions. The authors are especially concerned with ice accretion on the instruments and the tracker, and recommend solutions. The problems and solutions presented in the paper are real and correct. However, these are all known problems and in many cases techniques to counter the problems have already been developed but in some countries these experiences were not adopted in the past. This reviewer feels strongly that our civilization is just re-discovering what has been already built in the past. The observation of weather induced problems and also the recommendations for solutions based on a very short period presented in this manuscript

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are missing a broader view that could be presented by well-experienced field workers who have wintered in the polar regions. The authors have presented short-term instruments comparisons, which do not include operational problems encountered in the longer wintering period. However, the paper is useful for readers who have no experience of radiation observations, to obtain an elementary awareness as to what might be involved in the field conditions. If the paper proceeds for publication, it requires fundamental revisions. One of the best solutions of the problems raised in this paper is the use of a heated and ventilated apparatus (which is operationally used already for more than 20 years in certain countries). The instruments comparison should have been made using such an arrangement.

In detail:

1 Introduction

P. 4912, Line 2: This very first sentence is misleading. The importance of radiation in the climate system was not first discovered in 1997 or 2009. There was a long and important development in this area for more than a century, and necessarily many more important works exist than the authors have quoted. I recommend in this case quoting at least one fundamentally important work in the history of energy balance climatology, and some other important good works of recent years.

P. 4913, Line 13: the expression “climate-grade measurements” is not clear, nor is it universally used.

P. 4914, Line 16 to 19: These sentences are unnecessary, even incorrect. First, the upwelling fluxes are in one of the three categories of observation requirements. Second, the fact that the upwelling components are not on the list of the minimum observations, poses neither advantage nor disadvantage for the observations and climate research. Third, “the following theoretical consideration of surface energy budget” and Equation (1) do not correspond to each other. Eq. (1) represents the radiation budget and only a part of the energy budget. Radiation budget or net radiation is not the best formulation

to check a particular component of irradiance. This is because the objectives of the paper are not clear. Consequently, the statement in Lines 24 and 25 is wrong.

P. 4914, Line 25 to 27: Again, to quote a work of 2006 for the surface energy balance is not appropriate. This was an established concept already in 19th Century; the first full measurement was carried out during the 2nd IPY (1932-33). Box (2006) is not particularly a representative work in this area, and this work is missing in the list of references.

P. 4915, Line 8: Barrow has a long record of radiation measurements, going back to 1950s, and this makes Barrow one of the most important sites in the Arctic.

P. 4915, Line10: arctic should spell Arctic, in this case.

P. 4916, Line 4: This statement is wrong. BSRN has rigorous quality assessment procedures. If they are not practiced now, that is the responsibility of each station scientist and the data centre.

P. 4917, Line 17 to 20: More pioneer works exist and should be quoted, and not works starting in 1978.

P. 4918, Last sentence to Line 6 of the following page: The fundamental problem is the misuse of the tower in radiometry. The high towers are intended to measure the outgoing irradiances to capture a larger area, and are not intended to measure the down-welling components. The down-welling components must be measured at a height low enough for frequent checks but high enough to avoid drifting snow.

P. 4919, Line 7-14: This paragraph contains redundant statements and can be shortened.

P. 4919, Line 16 to 18: By analyzing the cause of errors, the answer must be more specific.

P. 4920, Line 2 to 5: “Common sense strategy”. The instruments should be checked

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hourly at each synoptic observation hours. This has been practiced at many meteorological stations.

P. 4920, Line 23: This situation does not apply to all trackers in use.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 4911, 2011.

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