

Interactive comment on “On the use of incoming longwave radiation parameterizations in a glacier environment” by J. Sedlar and R. Hock

M. Van den Broeke (Editor)

broeke@phys.uu.nl

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Based on the reviews and my own assessment, major revisions will be necessary before this paper can become acceptable for publication in TC.

General The main issue is that the paper, apart perhaps from (new, unpublished?) longwave radiation measurements from Storglaciären, could add more to existing work than it does now. Parameterizations of LW incoming radiation are useful for energy balance modellers, but at the same time the availability of such data has increased sharply in recent years, as has the amount of parameterizations. For example, in a 2000 paper by Pirazzini (see reference below), 15 similar parameterizations are tested using LW data collected at Koldewey station in Svalbard.

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From these and other papers the impression may easily arise that each Arctic site requires another LW parameterization, and that these expressions do not have the wide geographical application range we hoped them to have. This is perhaps not surprising given the often- large vertical and horizontal temperature gradients that are present in the Arctic near-surface atmosphere.

It is my view, therefore, that to justify publication of a new dataset, assessments of LW parameterizations should focus on new ways to analyze these data, e.g. inter-comparison of existing data sets/parameterizations and on explaining the physical mechanisms that are at the basis of the differences in order to enhance their range of applicability. A potentially useful contribution lies in the assessment of e.g. the vertical lapse rates of LW radiation.

At present, your paper does not provide such an analysis, but merely adds new data and tests a seemingly arbitrary set of available parameterizations.

That is why, although the LW data from Storglaciären are very useful, they will require a more extensive interpretation before they become of added value to the scientific community.

Specific comment There is an inherent difficulty in scaling incoming shortwave radiation with TAO radiation without accounting for multiple reflections between the ice/snow surface and the cloud base/atmosphere, as also pointed out by reviewer 2. Especially for highly reflective surfaces this effect becomes important and could introduce a bias in your results.

Additional reference

Pirazzini, P., M. Nardino, A. Orsini and others, 2000: Parameterization of the downward longwave radiation from clear and cloudy skies at Ny Alesund (Svalbard), in: Smith, W. L., Y. Timofeyev, 2000: Current Problems in Atmospheric Radiation, Hampton, Virginia (A. Deepak Publishing), 2001. p. 559-562.

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