

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

J. Sedlar and R. Hock

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Reviewer 1:

We thank you for your insightful comments, criticisms and suggestions. We have extensively revised the manuscript according to the majority of your suggestions/criticisms.

Our responses to your main suggestions/comments are as follows:

1) We have now updated the parameterization suite to include 7 clear-sky emissivity parameterizations consisting of 0 to 2 independent variables commonly found in the literature; all-sky emissivity parameterizations have been expanded to 3, eliminating the general cloud factor used in Kimball et al. (1982). All coefficients have been fit to the Storglaciären data set.

We have motivated the choice and use of these 10 clear-sky/all-sky emissivity param-

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eterizations based on the number of independent variables. This allows for a simple model inter-comparison and identification of importance of independent variable in longwave calculations.

2)The authors agree that using TOA radiation inherently introduces bias/errors. Much of the scatter in parameterizing cloud factor as a function of tau is a result of cloud phase, cloud and atmospheric optical depth, surface albedo, error in observed cloud fraction and solar zenith angle. We attempted to use direct, incident solar radiation at the surface to normalize observed shortwave radiation. However the ratio exceeded 1 for more than half of hourly observations since the observed broadband solar radiation includes the diffuse component, and hence this ratio is not very useful. We have therefore limited the cloud fraction and cloud factor parameterization development to cases when solar zenith angles were less than 80° and observations of shortwave radiation were larger than 15 W/m^2 .

3) We have included a section titled Cloud factor where we develop a parameterization of cloud factor F using tau and calculate longwave directly, eliminating the need for an all-sky emissivity parameterization.

Interactive comment on The Cryosphere Discuss., 2, 487, 2008.

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