

## ***Interactive comment on* “Brief communication: An Ice surface melt scheme including the diurnal cycle of solar radiation” by Uta Krebs-Kanzow et al.**

### **Anonymous Referee #2**

Received and published: 15 August 2018

This manuscript presents a novel surface melt scheme for glaciated land surfaces that accounts for the diurnal cycle of short wave radiation; a diurnal Energy Balance Model (dEBM). The manuscript is intended as a Brief Communication which introduces and explains the new dEBM scheme and provides an initial evaluation with respect to two other empirical schemes and a state-of-the-art regional climate model.

I feel this works well as a Brief Communication that introduces the new scheme and provides a simple initial assessment. I find the mathematical derivation of the scheme to be generally well explained with references to other papers for further details. An initial assessment of the dEBM scheme is shown by calculating melt rates for the Green-

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land Ice Sheet (1948 – 2016) for which dEBM generally performs better than two other empirical schemes with the authors recognising dEBM does not predict correct melt rates in one specific circumstance.

I have some minor alterations to suggest,

Page 1 line 23 “computational” should be “computationally”

Page 2 line 27 “Further, we define the ratio between . . . .” would “ $q\Phi$  is the ratio between . . . “ read better?

Page 2 line 27 & 28 “SW” is used for the mean solar radiation. I assume the S and W stand for Short Wave, so it would be better to state that here

Page 3 lines 24 & 26 and Page 4 line 10 These lines appear to have been indented / tabbed

Page 4 line 12 TOA is introduced for “top of the atmosphere” but only used once on line 15 then not used on line 16 (where there are hyphens between the words). Is an initialism really needed?

Page 4 line 21 “Choosing  $\beta = 10 \dots$  “. If that is a choice, i.e. if alternative values could have been chosen, then the reason for this specific choice should be given, e.g. cited or explained. If however it is the only reasonable value then it’s not a choice and “using “would be better than “choosing”

Page 4 line 22 “-6.5K” °C not K

Page 4, bottom, section 3 Just a general comment that any further citations or justifications for the values of coefficients used that can be included would be useful

Page 5 line 11 Misspelling “eqations”

Page 5 line 15 “GrIS” is used without definition. Whilst it is a well known abbreviation, especially for this journal, it maybe better to define it.

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Page 5 line 16 “going along with . . . “ would “corresponding to . . . “ read better?

Page 5 line 30 This refers to the blue points in Fig 2 panel 3 at 0 on the y-axis. I think this should be stated in the text.

Page 8 line 16 This is a new paragraph, should it be?

Figure S1, caption “meltrates” should be 2 words. Misspelling “lenght”. Refers to PDD, ETIM and DEBM as a), b) and c) but they are not labelled as such in the figures. Also “Identity . . . black line” is not shown (I think perhaps the caption is for an earlier version of the figure?)

In the introduction it is mentioned that the PDD scheme is computationally inexpensive (page 1 line 23) and that energy balance models could have their computational costs reduced (page 2 line 7) but the evaluation makes no mention of the computational costs of dEBM and the other schemes. I think it would be useful to include a brief comment on the relative computational costs in section 3.

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-130>, 2018.