The Cryosphere Discuss., 5, C1793–C1795, 2012
www.the-cryosphere-discuss.net/5/C1793/2012/

The Cryosphere Discussions

Interactive comment on "Sensitivity of a distributed temperature-radiation index melt model based on a four melt season AWS record from Hurd Peninsula glaciers, Livingston Island, Antarctica" *by* U. Y. Jonsell et al.

Anonymous Referee #1

Received and published: 23 January 2012

This paper not only provides an important contribution to the body of data available in the particular study region of Antarctica, but also contributes to the growing knowledge base of glacial melt modeling. The development of a new method for correcting albedo for diurnal variation while retaining the effects of cloud cover is a useful tool that has potential application in other modeling endeavors. The paper explores in some depth the relative contributions of energy fluxes and their relationship to each other. This helps support the use of the temperature-index model used to predict melt. Because the importance of different fluxes can vary widely from region to region, this contribution

may be particularly key to this study region. Overall, this paper was easy to read and presents significant new contributions to cryospheric research. I recommend this paper for publication with some revisions. The comments below include a few points which merit further discussion/explanation in the text, in addition to several grammatical errors.

3229 – 14: Is the r-value a correlation coefficient? Later in the paper, you define r_x as the correlation coefficient of flux to A, but in this earlier instance the statistical meaning is unclear.

3234 – 24-26: What criteria were used to select the best set of model parameters from all possible sets? How many possibilities were examined? This is an important point in model selection and deserves some discussion in the text. The presentation of the final model parameters could be improved using a table or equation, rather than listing them in text.

3235 – 20: Explain the different response of L_{in} and S_n to cloud cover to connect the discussion to physical processes. The relationship between these two fluxes is a focus of the results and discussion, in the context of the point energy balance, and so understanding the relationship is key. This point comes up again in your conclusions, making an explanation especially necessary.

Figure 7: In the discussion of Figure 7, you note that in 2009/2010 days of high daily mean A were associated with the outer ranges of S_n, while in 2006/2007 days with high A were generally associated with intermediate S_n. The figure seems to show the opposite, that days of high A are clustered near the mean S_n in 2009/2010 and scattered from intermediate to high S_n values in 2006/2007. You explain the different patterns of these two years by the difference in standard deviation of S_c, but the greatest difference in the standard deviation is seen between 2008/2009 and 2009/2010. Why did you choose to show 2006/2007 in Figure 7 rather than 2008/2009? In 3236-1, you state that this relationship between L_{in} and S_n results in the high correspondence between

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R and A. This statement needs to be backed up, how did you reach that conclusion? This discussion of L_{in} and S_n should be revisited and clarified. A more logical flow of the results and conclusions drawn from them would improve the paper in this section.

Technical corrections:

3222 – 19: Replace “at” with “into”

3225 – 29: Should the sentence read “but gusts with wind speeds above. . .”?

3227 – 8: After the semi-colon, use “or else” or simply “otherwise”.

3236 – 8-10: The sentence beginning “T_{air} and S_n were slightly. . .” interrupts the flow of the preceding and following sentences, which both discuss the relationship between T_{air} and A. Consider moving the sentence later in the paragraph.

3239 – 24: The phrase “showing differences model-observations generally below. . .” is incomplete. It could read “differences between model results and observations” or “model-observations differences”.

Interactive comment on The Cryosphere Discuss., 5, 3221, 2011.