

Interactive comment on “The role of radiation penetration in the energy budget of the snowpack at Summit, Greenland” by P. Kuipers Munneke et al.

Anonymous Referee #2

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GENERAL COMMENT:

This paper is very clear and has an interesting and clear objective; to use an ideal laboratory that Summit, Greenland is, to explore the importance of radiation penetration into snow. By not having to address the complexities of melt and internal freezing the problem can be assessed more easily than elsewhere. A number of energy and mass balance models are presently being used on glaciers in different regions, some with, and some without a tool to account for shortwave radiation penetration. This paper serves those who are using such models and it is of much interest. It also demonstrates the usefulness of the dry snow zone of the Greenland ice sheet, where these types of

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exercises are possible. I recommend this paper for publication and only have a few minor comments.

SPECIFIC POINTS:

1. No information about the height of the CSAT3 instruments is provided, or problems associated with riming and/or other issues related to obtaining accurate sensible heat fluxes in this environment. How much data loss did you have during the measurement period, and were any corrections necessary? Does height influence the reported values? Some of this information might be useful to readers.
2. Some of the methods described in section 4.4 (snow samples collected to generate Figure 6) may be better suited in the methods section. As mentioned, the results using the radiation model are "somewhat inconclusive" - but it is implied in the abstract that you "discuss the differences", which is achieved to some extent in your discussion linked to Figure 6. The authors may wish to clarify their justification for using the more sophisticated radiation model - what does it tell us and does it allow us to eliminate any uncertainty that the two stream model did not? By clarifying this a little it may further enhance the interpretation of the most critical results in the paper associated with Figures 3 and 4.

TECHNICAL COMMENTS:

1. P280/L11: "we present data acquired in (over) a period of 42 days" - change in to over.
2. P284/L2-3: "Roughness length for momentum, $z_{0,u}$, is taken (as a) constant" - add "as a"
3. P286/L19: Add comma at end of point 1 to be consistent with format of other bullet points
4. P288/L21: Consider changing "measurements excellently agree" with "measurements agree very well with"

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5. Should modeled throughout the paper be spelt as "modelled"?
6. P290/L13: "This fundamental difference makes that" - perhaps change to - "This fundamental difference suggests that"
7. P303: Figure 5 caption - you could include "(thin dashed line)" at the end of your sentence (figure caption), as other line descriptions are provided.

Interactive comment on The Cryosphere Discuss., 3, 277, 2009.