

## ***Interactive comment on “Ice sheet mass loss caused by dust and black carbon accumulation” by T. Goelles et al.***

**Anonymous Referee #1**

Received and published: 20 May 2015

This manuscript presents a new modeling effort to quantify the effect of aerosols (black carbon and dust) on the albedo and melt of the Greenland ice sheet, an effect that has so far not been quantified. This is an important topic to research and the work presented is a good first step towards our understanding of its impact. The text is well written and the experiments are clearly described, therefore it should be published after only minor revisions.

Comments

Is this x-direction in the model representative of a South-North or West-East profile? This should be stated more clearly in the text.

What about spatial distribution of particles? This study is applied to a profile and the

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proportions are assumed to hold for the whole ice sheet. However, if particles are deposited in concentrated areas, for example, the impact on ice sheet melting overall would be comparably small. Can you comment on this in the discussion?

Additional minor comments

P 2567, line 3: Extra parenthesis in  $i_{n,englacial}$ . Why is this specified in square brackets?

P 2567, line 3: which depends on, . . .

P 2574, line 21: These numbers refer to additional ice volume loss, correct? This should be stated clearly, since it looks like only 0.66/1.59% of the ice sheet melts in total for RCP4.5.

P 2575, line 20: to small addition => to the small addition

P 2575, line 26: remain => remains

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Interactive comment on The Cryosphere Discuss., 9, 2563, 2015.

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