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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Simulation of black carbon in snow and its climate impact in the Canadian Global Climate Model" *by* M. Namazi et al.

Anonymous Referee #2

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This work focuses on atmospheric black carbon (BC) aerosol deposited in snow and the resulted changes in snow properties by employing a physically developed parameterization in CanAM4.2 climate model. Parameterization and model results are validated with multiple field measurements and compared with other model simulations. Global radiative effect and climate response to BC in snow are investigated from 1950s to 2000s. Results of this study are substantially different from some previous studies in terms of the impact of BC in snow on climate, which is attributed to different model configurations and possibly missing BC-snow feedbacks in model. The manuscript is addressing an interesting scientific problem, rich in content and well-constructed. I

would recommend it for a publication after minor revisions.

Specific comments:

1) Page 18853, line 20-22: If data in Fig 3 is averaged over a certain time period, please show a standard deviation to indicate how data varies over the averaging time period.

2) Page 18858, line 1-4: Where is the factor of 3 coming from and how is the equilibrium temperature change of 0.03 degree obtained? Does 0.03 degree here have anything to do with the negative temperature response analyzed in paragraph 2 at page 18861?

3) Page 18861, line 26: In Page 18845, paragraph 2 indicates an underestimated snow albedo response to BC in snow in Can AM4.2 model. If the parameterization is improved, will it help to enhance the model simulated climate response to BC in snow? A sensitivity study may help to further understand the question.

Editorial comments:

1) Page 18845, line 3: "BC are taken to to be that", remove a "to".

2) Fig. 5: It might be good to change the unit to mg/m3, to make the numbers under color bar more readable.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 18839, 2015.