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Discussions

Interactive comment on "Black carbon in snow in the upper Himalayan Khumbu Valley, Nepal: observations and modeling of the impact on snow albedo, melting, and radiative forcing" *by* H.-W. Jacobi et al.

Anonymous Referee #1

Received and published: 5 November 2014

This manuscript presents the observations and modeling the impact of black carbon in snowmelt processes at Khumbu region of Nepal Himalaya. The content of the manuscript is of weighted significance in snow modeling community as this paper discusses about the upgrade and evaluation of the physics based snow model (Crocus) with the effect of black carbon against field observations. This is a well written manuscript; however some points should be clarified and revised and then the manuscript shall be considered for publication in TC.

Comments/Suggestions:

1. Page 5046, line 14-16, Pokhrel et al, 2014 had not corrected the precipitation at Pyramid station, thus the corrected annual value in this paper cannot be compared with Pokhrel et al., 2014.

2. Page 5052, line 2-6; in this paper evaluation of the model is presented for point scale then why the point scale measurements show error for point scale validation. I would agree authors view if they simulate the impact on basin scale.

3. Provide the table for the model parameters of the standard and upgraded Crocus model for the simulation of albedo.

4. How the decay of the albedo is accounted in standard Crocus model. The large bias/overestimation in snow albedo is due to its poor representation of the decay of the albedo. Employment of more physically based scheme for decay of albedo is undershadowed by the implementation of upgraded version of the model for black carbon and dust. Many albedo parameterization schemes were adopted for various land surface schemes. Please clarify the parameterization of old scheme vs. implementation of upgraded version.

5. The biases in albedo and snow depth is critical in the melting season. Please perform the analysis in the melting season similar to the analysis presented for 22-31 Jan 2005 (fig.4)

6. What is the reason for the large discrepancy of albedo decay even for the upgraded model as presented in Fig.5.

7. Please present the analysis of simulated vs observed soil temperature as soil temperature has larger effect on shallow snowpack, mainly in the melting season. How the initial condition for soil parameters were provided, please clarify.

8. Are threshold air temperature parameter (for separation of precipitation into rainfall and snowfall) and fresh snow density parameters sensitive? If so, it is better to show quantitative analysis of their effect on snowpack simulation as these parameters are

the drivers for the correction of snowfall.

9. Please discuss a little about the future strategies for improving the simulation of albedo besides enhanced field observations.

10. Corrections in citation:

a. Line 25-27; Kaab et al, 2012 and Menegoz et al 13a do not discuss about black carbon.

b. Page 5039, line 9; Immerzeel et al, 2010 also does not discuss about BC, please reorganize the sentence.

c. Shresta should be replaced by Shrestha throughout the manuscript