Interactive comment on "Impacts of black carbon and mineral dust on radiative forcing and glacier melting during summer in the Qilian Mountains, northeastern Tibetan Plateau" *by* Y. Li et al.

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The authors measured the BC and dust concentrations in snow over the northeastern Tibetan Plateau and further used the SNICAR model and surface energy-mass balance model to quantify the snow albedo reduction and subsequent snow melting caused by BC/dust deposition. This work is very interesting and important, which could provide a better understanding on the light-absorbing aerosol-snow interaction over the Tibetan Plateau. However, several necessary references and details are missing in the current manuscript.

1. "Introduction" (Line 28): the authors provide three references (Hansen and Nazarenko, 2004; Xu et al., 2009; Bond et al., 2013) to support the argument that

"...could be accelerated due to the presence of light absorbing particles (LAPs)". However, these three references all focused on BC only, which is not equivalent to LAPs. Please also provide 1-2 references on dust-induced accelerated glacier/snow melting.

2. "Introduction" Paragraph 2 (Lines 30-42): A recent paper by He et al. (2014) estimated the snow albedo reduction and associated radiative forcing caused by BC deposition over the Tibetan Plateau. They also quantified the uncertainty due to different BC-snow mixing states and snow grain shapes. I suggest including this reference and also adding 1-2 sentences to discuss their findings. Also in Section 3.3, how does your estimate on BC-snow radiative forcing compare with their results? Please add some discussions.

Reference: He, C., Li, Q. B., Liou, K. N., Takano, Y., Gu, Y., Qi, L., Mao, Y. H., and Leung, L. R.: Black carbon radiative forcing over the Tibetan Plateau, Geophys. Res. Lett., 41, 7806–7813, doi:10.1002/2014gl062191, 2014.

3. In Section 2.4 (Line 89): the authors mentioned SNICAR model, however, a number of key model details are missing, which are very important to the understanding of simulation results. For example, what is the data used to drive SNICAR model? How long does the model run to get the results? What are the model assumptions for BC/dust-snow mixing state and snow grain shapes? Is the snow aging process considered in the model? I suggest adding more details about the model.

4. In Section 3.3 (Lines 114-130): the author did not provide any information about the BC/dust-snow mixing state (external? or internal?) assumed in the model simulation. This is very important for the estimate of snow albedo reduction. Liou et al. (2014) used a stochastic snow model to show that BC/dust-induced snow albedo reduction vary significantly based on different BC/dust-snow mixing states and snow grain shapes. Please add descriptions on the model assumption. Also please include this reference and comment on the effects of BC/dust-snow mixing state and snow grain shape on albedo reduction.

Reference: Liou, K. N., Takano, Y., He, C., Yang, P., Leung, L. R., Gu, Y., and Lee, W. L.: Stochastic parameterization for light absorption by internally mixed BC/dust in snow grains for application to climate models, J. Geophys. Res.-Atmos., 119, 7616–7632, doi:10.1002/2014jd021665, 2014.

5. In Section 3.4: the author designed four sensitivity simulations to show the individual and combined effects from BC and dust. Is the combined effect equal to the sum of two individual effects (i.e., linearly additive)? It would be interesting to see some discussions on this aspect.

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