

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.

Anonymous Referee #1

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Summary and recommendation This paper presents a dataset of black carbon (BC) and mineral dust (MD) concentrations over the LHG glacier obtained during two successive summer field campaigns. The impact of BC and MD in term of radiative forcing is evaluated using the SNICAR snow albedo model and the authors finally investigated the impact of combined and separated BC and MD on glacier summer mass balance using a distributed energy model.

I think this study presents an interesting dataset. However the study suffers from insufficient details provided on the measurement and modelling methods and has to be improved substantially before publication.

Main comment

C1

1/ As stated above, the authors do not provide sufficient details on the impurity content measurements method so that the reader can have an idea of the uncertainty associated with the impurity content measurements (section 2.3 is really too short). see specific comments below

2/ The authors also do not provide sufficient detail and analysis on the modelling approach, e.g. for mass balance simulations, how the simulated values compare to field measured values, for albedo calculations, how do the SNICAR modelled values compare to the broadband measured values presented in Figure 3. see specific comments below

3/ The paper must be reviewed by a English native speaker. Specific comments

Page 2- line 61 : 'in replicate with an' I think the authors have to be more precise, is it 100m or 50 m ?

Page 3- line 88-90 : I don't understand what has been used exactly for the modelled albedo values. This is rather a critical point for the conclusion of the paper and must be explain in more depth.

Page 3 – line 90 – 'in the coupled ...' please explain in more details, in my mind the reader should be able to understand what has been done without reading section 3.2.

Section 3.2 – The albedo reduction strongly depends on the value of grain size, and grain size evolves over time .. Is this taken into account in the simulation ? On which basis the diameter of dust was selected for snow and ice ? Which values of snow grain size do you use for simulation of superimposed ice ?

Section 3.4 : It would be really important to compared measured and simulated albedo values ... Section 3.4 : Over which period is the ablation calculated ? How are the values of fresh snow albedo calculated ? How does that compare to ablation measured in the field ?

Minor comments

C2

Page 2 -lines 68-69 : what is the accuracy of the measured broadband albedo

Page 2 – line 80 : typo Gen Page 3- line 98 : what does n stand for ? Page 3- line 104 : Is 5 cm of snow an heavy snow fall ?

Figure 1 : What is the colour bar of the above panel ?

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-32, 2016.