

# ***Interactive comment on “Snow cover sensitivity to black carbon deposition in the Himalaya: from atmospheric and ice core measurements to regional climate simulations” by M. Ménégoz et al.***

## **Anonymous Referee #2**

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Review of Menegoz et al. "Snow cover sensitivity to black carbon deposition in the Himalaya: from atmospheric and ice core measurements to regional climate simulations". This is a useful study that focuses on the effects of BC on snow and climate exactly where the biggest pollution is and where its biggest effects are. The authors, unlike their predecessors, employ high resolution model, which should be more helpful. The high resolution is not very high though for this very challenging region. 50km barely approaches a coarse resolution of a regional model, which would be more appropriate if the emphasis is on higher resolution. This is one of the biggest takeaways for me from this study. 50km is still inadequate to represent snow covered areas in

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this region. The use of a gcm rather than a ctm is still rather novel in the atmospheric chemistry/climate studies, and it would be helpful to read more details on the model. One thing that I do not see addressed and is almost as concerning as snow cover is topography. Is that improved in higher resolution? Is it at least approaching adequate at 50km? What would be adequate in that region? Specific comments: Abstract: could be expanded upon, especially with the important detail that the focus in the study is on Central Himalayas, not on the entire region. This would explain the decrease of snow cover measured in days, which sounds confusing to a not very well informed reader who expects year-round snow cover. p31017, l 26: "Each 150s (5 times the time step with that wind velocities are computed)" I don't understand what that means p31019, l. 13 typo in the reference, it should be "Kopacz" p31019, l. 25 what does "relatievly well reproduced" mean? I see qualitative agreement. p31021, l. 19-21 I'm confused, are these percentages referring to the amount of atmospheric BC that is deposited? Because I would expect a higher fraction during monsoon. p31022, l. 3-14 Again I'm confused here. If the similarity of snowfalls is a coincidence that to me implies that they are not related on some level. Therefore, I don't kow if you can use this similarity to then conclude that snow fall doesn't influence BC concentrations. Also aging is not mentioned at all in this section. p31022, l. 19 "hazardous"? perhaps "of little use" p31022, l. 21 should "analyses" be "analyze"? p.31022, l. 22 I would remove "global" since this is a very regionally focused study, examining regional influence on effectively a grid box p31023, l. 20 "trough" should be "throughout" Section 4 After large error bars on model concentrations in previous sections, I am not sure what to think of the error bars on the climate impacts. Is the snow cover extent reduced by 1-3 days or 1-10 days? Authors state 95% significance level, but naturally this is without error propagation from the intermediate findings. This result appears to be the main one mentioned in the abstract, but given its almost qualitative nature, I don't know if it should be emphasized as the key result. The biggest things that stands out for me in this work is the need for more measurements and higher resolution model. This section also doesn't talk much about snow aging that can significantly impacts albedo.

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There has been some literature on that a few years ago at least. Black fonts and lines in figures are tough to read. Please make them thicker and darker.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 31013, 2013.

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