

Interactive comment on “Measurements of light absorbing particulates on the glaciers in the Cordillera Blanca, Peru” by C. G. Schmitt et al.

Anonymous Referee #2

Received and published: 11 November 2014

This paper presents new measurements of black carbon in snow on tropical glaciers in Peru. In addition, the paper proposes a new measurement technique of black carbon. The paper is very interesting and should be published after some revisions.

I agree to a large degree with Referee #1 and will, therefore, try to avoid repeating his/her comments.

Major comments:

Vertical variation: As Referee #2, I don't fully understand how the data from the surface and sub-surface samples are used. Are they all mixed together in the results, or are only surface samples used in some of the data presented? As Referee #2, I expect a discussion of the variability between these samples. You could potentially differentiate

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between these two types of samples in Figure 6.

Undercatch: As Referee #1, I worry about the undercatch in the quartz filters. On page 5086 lines 4-6 the formulation is a bit peculiar for me. You use a BC standard that is not well captured by the quartz filters. This sounds a bit strange for me. Have you tested a BC standard with larger particles, similar to those that likely occur in the snowpack?

Minor comments:

Page 5081, line 25 to page 5082, line 4: References to BC emission statistics would strengthen your statements here. One candidate is Bond et al. (2004): A technology-based global inventory of black and organic carbon emissions from combustion. Newer publications and more specific on the area around the Cordillera Blanca would be even better.

Further, how large is Huaraz in terms of population size and at what altitude?

Page 5083, lines 10-13: Snow can often have a highly variable concentration of dust from nearby outcrops or other landscape features that act as sources of dust. From personal experience of sampling snow, variability in dust concentrations in snow is often observed visually at site. Could you potentially add a sentence on how you selected areas to avoid areas highly influenced by local dust and sand particles?

Page 5083, line 26 to page 5084 line 1: Can you explain better why you think the sub-surface sample contain snow from the most recent snowstorm? Perhaps a reference to glacier or snow dynamics in tropic glaciers is in place and would help your statement? As the sampling is done in the dry season, I'm not totally convinced that the sub-surface samples contain snow from the latest snow storm. Could the snow come from different episodes and also include dry deposition and accumulation through melting?

Page 5087, lines 23-24 and the following sentences: The statement about the correlation between dust content and heat capacity is not very firm. Could you find any support for this finding in the literature? I understand this is not the main scope of the

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publication, but a strengthening of this part would be helpful.

Page 5088, lines 6-7: What is your reason to believe the reduction is 25%? I understand this issue concerns only a small part of the total samples, but I would like some more reasoning.

Page 5088, lines 15-17: Could you please clarify whether the snow was tested by both LAHM and SP2, or if snow samples from the same sites were used for the two measurements. Variability on micro scale in the snow pack is well known; hence, it is very unlikely to get a perfect correlation if different snow samples from the very same sites are analyzed.

Page 5089, lines 1-7: You could also compare to other regions, such as sites in Europe similar to that in your study.

Page 5090, lines 16-17: How do you know the crevasse was newly opened? You don't need to elaborate about this in the paper, but I ask to check the quality in your findings.

Page 5090, lines 21-23: If possible, you should find and refer to literature on the stratification of annual layers in tropical glaciers to find support for your statement.

Figure 3, caption line 3: Rewrite "of data 12 temperature profiles". The current formulation is odd.

Interactive comment on The Cryosphere Discuss., 8, 5077, 2014.