

## ***Interactive comment on “Influence of the melting temperature on the measurement of the mass concentration and size distribution of black carbon in snow” by T. Kinase et al.***

**Anonymous Referee #2**

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Kinase et al have written an interesting paper on the influence of the melting temperature on black carbon measurements when processing snow samples with the SP2 instrument. Given that this technique is being used more frequently, I feel that the article is suitable for publication in AMT. Although I feel that it is suitable for publication, there are several issues that I feel need to be addressed, or at least mentioned.

1. The study size is very small. Snow samples collected from two locations only were analyzed. And, three replicates of each procedure were analyzed. The results for the two samples locations varied significantly. This would suggest that a more systematic study is clearly needed to quantify the loss as a function of melting temperature as well as snow conditions. The authors should state this.

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2. The study is somewhat limited in that the samples are melted in “specific temperature” water baths. If the sample is large enough, it is possible that the actual temperature of the sample does not rise to the temperature of the bath. This is relevant to techniques which use larger sample volumes and filtering techniques (eg the University of Washington technique as well as the technique described in Schmitt et al: <http://www.the-cryosphere.net/9/331/2015/tc-9-331-2015.html>).

3. The article could benefit from editing by an English language expert. There are numerous statements that are either grammatically incorrect or awkward and it is necessary to clear up those issues before publication.

4. Did the authors quantify dust at all? The aged sample is likely to contain a lot more dust than the fresh snow sample.

Minor items: Page 1 line 18: Change “time conditions” to “amounts of time”. Line 18: remove “its”. Then line 19 change “distribution” to “distributions” Line 20: change to “The experiments where the melting temperatures were varied. .” Page 2 line 1: change “or in a long time” to “or over a long time period” Note: After the abstract, I won’t address each grammar error individually. Line 11: it should also be noted in the publication that albedo changes can lead to significant changes in timing of snow melt therefore affecting water supply, therefore BC on snow isn’t solely a climate issue. Line 21: light “transmission”, not “transparency” Line 23: the second “technique” (not “one”) Page 3, line 5: There have been a few intercomparison studies between techniques (Schwarz et al, 2012). It might be of value to mention these studies and a brief summary of their uncertainties in order to further support the need for understanding all aspects of the techniques. Line 6-31: The authors comment several times about the melting of snow samples using a microwave oven. Clearly the process of melting is somewhat different using a microwave oven versus using a warm water bath. The study only involves using a warm water bath for melting. This should be stated. Page 4, line 10: instead of “it was”, “the snow samples were” Page 5, lines 29-30: Can you speculate as to why the uncertainties in the Hakusan samples were so much larger

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than in the Shirouma samples? Page 6 line 17: consider changing “presumably depends” to “could depend”. Line 25: Looking at the graph in Figure 5, it seems that the substantial loss begins around 150 nm rather than 300. Page 7 line 30: use “after” rather than “since” Page 8 line 1: On successive days, were the samples stirred or shaken? (This is stated in the conclusions, but should be stated earlier)

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