

Interactive comment on “Elemental carbon in snow at Changbai Mountain, Northeastern China: concentrations, scavenging ratios and dry deposition velocities” by Z. W. Wang et al.

Anonymous Referee #1

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We would like to thank the anonymous referee#1 for his constructive comments and suggestions, which have greatly improved the quality of our manuscript. We have revisited the manuscript according to the comments. As the manuscript has been thoroughly revised after comment of referee#2, we would suggest a complete new lecture of our work. Nevertheless, specific answers to the questions are detailed below

Comments by referee#1 are in black and the corresponding answer is below in blue:

p 14223 line 8. Cite also the comprehensive assessment of Bond et al. (2013).
That paper was not yet published when we submitted this work but we agree that it has to be added. It is now cited in the introduction.

p 14224 line 6. Cite also Wang et al. (2013).
The reference has been added in the section 3.1.

p 14224 lines 22-23. "Changbai Mountain . . . (Fig. 1)". The mountain is not shown on Figure 1.
Thank you for that precision. We replaced “mountain” by “station”. We only show the station on the figure.

p 14225 lines 14-15. "The melt water was immediately filtered through a quartz microfiber filter". What fraction of the BC passes through the quartz filter without being caught? Forsström, Ström, Pedersen, et al. (2013) found under catch values of 2-53%.
Thank you for that observation which needs to be detailed. In our experiments, we didn't test the collection efficiency of the quartz microfiber filter (Munktell, 420208, T293). According the information from the manufacturer, the penetration DOP % (0.3um) of this filter is >0.002%. Therefore, we preliminary estimate that the collection efficiency for BC (>0.3um) is >99.998% during the filtration process of melt water. Obviously, the smallest particles have higher chances to not get catch by the filter but the work of Forsström et al, (2013) is focused in Arctic snowpacks meaning that the black carbon is originate from transport so that the ratio of small particles to the total amount is probably higher than in our work. Moreover, the quantity of black carbon in our samples is fairly higher and contaminated by local sources so that the average size of the particles are much higher than those found in the Arctic, reducing the under catch process for our samples. Even if such process might happen, we did not tested it and estimate the under catch to be lower than 10%. We will mention it in the revisited version.

p 14229 line 23 "typically around 300 ng/g except one high value (623 ng/g)". There is a second high value (855 ng/g) shown on Figure 4.
The value of 855 ng g⁻¹ is from Changbai station. In the two surveys of EC in surface

snow around Changbai Mountain, we took a snow sample from Changbai station for comparison. We will modify the color in order to avoid any misunderstanding of the figure. Changbai station is now shown with a star.

p 14230 line 17. Give units for all four quantities in this equation.
Precision on the unit have been added in the revised version.

p 14231 lines 10-11. "[scavenging ratio is] much smaller than those from Zeppelin". Give the value of the scavenging ratio for Zeppelin.
Thank you for that precision. Both values, for Zeppelin and Ny-Alesund, have been added, respectively 381 and 597.

p 14233 lines 23-25. "Elemental carbon concentrations . . . 7636 ng/g . . . which is comparable to those found in Europe in the early 1990s". Give a citation; 7636 ng/g seems too large for Europe, by two orders of magnitude.
Thank you for that remark. (Fily et al., 1997) showed concentration in the 500-1000 ng.g⁻¹ of soot in snow in their Table 3 but such comparison might be non appropriate as the observations sites of (Fily et al., 1997) are located in mountain pass where very high local emission by road traffic is expected. We will therefore delete completely that citation form our work.

p 14234 line 3-4. "scavenging ratio . . . 149.4, which is much smaller than those reported from Arctic sites". This is not true; Noone and Clarke (1988) reported a scavenging ratio of 100 for Arctic Sweden.
Thank you for this precision. We will therefore only compare our values to the one that deals with Svalbard. We kept the citation of Noon and Clarke (1988) but only in the introduction..

Table 1. Compare these values to the BC values reported for Changbai Mountain by Wang et al. (2013); Site 39 in their Table 1.
Thank you. We have compared these values to the BC concentrations reported for Changbai Mountain by Wang et al. (2013), which is 1700 ng.g⁻¹ in the introduction instead of showing it in Table 1. Values of Table 1 are a summary of statistic EC concentrations during three snow seasons at Changbai station, but the value by Wang et al. (2013) is just a unique investigation. Therefore, we do not think that it is very appropriate to show the value of Wang et al., (2013) in Table 1.

Figure 7. What are the hatchings on the gray bars? They are not identified in the legend. Also, a legend is given for V_d, but no data corresponding to these bars are plotted. Reduce the clutter on the right-side vertical axis tick labels, by changing units from m/s to mm/s. Then for example "2.0x10⁻³" becomes just "2".
Figure 7, vertical axis label, change "ug" to "(Greek letter mu)g".
We apologize for that and have modified and improved the quality of that Figure. Regarding the unit, we show the dry deposition velocity (V_d) as in m s⁻¹ because that it is the most common unit in the literature for deposition velocity of airborne particle.

SPELLING AND GRAMMAR

p 14222 line 22. Probably you meant to say something other than "mean median".

p 14227 line 7. Change "relatively humidity" to "relative humidity"

p 14231 line 10. Change "Zeppelin" to "Zeppelin"

Thank you.

Figure 3 vertical axis label. Change "Relatively humidity" to "Relative humidity".
Thank you, it has been changed.

Figure 5, internal label, change "Zeppline" to "Zeppelin". Vertical axis label, change "ug" to "(Greek letter mu)g"
Thank you, it has been corrected.

INAPPROPRIATE ACCURACY

The number of significant figures given is excessive, in comparison to the standard deviations given. Rounding appropriately will also reduce the clutter, making the paper more readable. Some examples:

p 14222 line 12. Change "137.4 _ 99.7" to "140 _ 100". Change "149.4" to "150".

p 14227 line 18. Change "987 _ 1510" to "1000 _1500".

We have modified all of these inappropriate accuracies in our Table 1 and in the text.

Table 1 all entries; e.g. change 1418 _ 1728 to 1400 _1700.

We have modified all of these inappropriate accuracies in Table 1.

Figure 4 all entries; e.g. change 258.7 to 260; change 1392.5 to 1390.

Figure 4 internal label Change "Chanbai" to "Changbai".

Thank you, we have corrected those.