Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-244-RC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "An 800 year high-resolution black carbon ice-core record from Lomonosovfonna, Svalbard" *by* Dimitri Osmont et al.

M. Rubino (Referee)

mauro.rubino@unina2.it

Received and published: 14 May 2018

Osmont and colleagues present a new record of black carbon concentration from ice cores from Svalbard. The authors measure the concentration of black carbon in two ice cores sampled from the Lomonosovfonna ice field in 2009 and 2011 covering the periods 1222-2004 and 2004-2011 respectively, and show that the results from the two ice cores are compatible for the overlapping year (2004). Then they discuss the long term trends of the black carbon concentration record by converting it into a black carbon flux record. After realising that the black carbon concentration completely changes after the industrial revolution, they focus on the industrial period and interpret

the industrial black carbon record by comparing it with proxies of anthropogenic aerosol emissions (such as nitrate, sulphate, and ammonium). In doing so, they attribute an anthropogenic origin to part of the measured black carbon. Then, the authors compare their record to records of black carbon from Greenland, and use the HYSPLIT model to identify the geographical source of anthropogenic black carbon in the Lomonosovfonna ice core. They conclude that Siberia and Northern Europe are the main sources of black carbon for Svalbard. However, since they are unable to provide an explanation for some of the features found in the industrial black carbon record, they discuss the possibility that post-depositional processes induced by summer melting could have been the cause for them. Their discussion is qualitative, as they state, but it is realistic and leads to the conclusion that melting and refreezing has affected part of the industrial record of black carbon. Finally, they interpret the pre-industrial record as a reconstruction of biomass burning events by comparing it with records of other proxies of biomass burning such as ammonium, formate, vanillic acid and para-hydroxybenzoic acid, and performing a Principal Component Analysis. In the end, they also correlate the frequency of past biomass burning events recorded with the main indexes of climate variability (e.g.: the summer temperature anomalies and the Palmer drought severity index). The study is of interest for ACP. Though not extremely innovative, the investigation provides a new record of black carbon from a site which had not been explored before. The methods used are appropriate and rigorous. The interpretation of the results has no flaw, as far as I can see. Therefore, the manuscript can be published in the present form. However, I have provided several comments on points that I did not find very clear, or that I think could be improved (e.g.: some figures could be merged). I have reported my comments on the manuscript in the attachment. I hope the authors will take my comments into consideration before the manuscript is accepted.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2018-244/acp-2018-244-RC1-

supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-244, 2018.