

## ***Interactive comment on “High–Arctic aircraft measurements characterising black carbon vertical variability in spring and summer” by Hannes Schulz et al.***

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–Arctic aircraft measurements characterising black carbon vertical variability in spring and summer

We would like to thank the referees for their detailed and constructive comments, which helped us to improve our manuscript.

For easier reading, we attached our comments as PDF, where the referee comments

C1

are given in black bold, our answers are given below in blue letters. Additionally, we added the changes we made in the revised manuscript in blue bold letters.

Answers of the authors to anonymous Reviewer3

### *Anonymous Review of Manuscript acp-2018-587 GENERAL REMARKS:*

*This paper discusses and analyzes the measurements of the vertical distribution of refractive black carbon (rBC) in the high Arctic during the spring and summer measured with a single particle soot photometer (SP2) during the NETCARE project. The mean and variance of the vertical profiles of total rBC mass, mass-mean diameter, and the ratio of rBC to CO and total aerosol number are discussed, along with the changes in transport patterns and sources that lead to the distinct vertical layers observed in the profiles. The data gathered in this campaign helps to fill an important gap in previous observations of the Arctic. The work presented in the paper is an excellent, detailed analysis of the sources and mechanisms (e.g., wet deposition) leading to the observed vertical profiles of rBC, helping to provide a conceptual model that explains key features displayed in the observations. Generally, the conclusions of the study are well-justified by the results shown and the potential for alternate explanations is appropriately discussed. I don't have any major concerns with the methodology, results, or conclusions of the study. Most of my comments below focus on either unclear wording in the manuscript text or issues with the figures that made it difficult to identify some of the features discussed in the text. I've only focused on cases where it was unclear to me what the authors intended to say. There are numerous other language choices that struck me as odd, but rather than list them here I would suggest that these be addressed by an English language copy-editor before publication.*

The authors would like to point out that the referees raised questions concerning the interpretation of the BC/CO ratio as indicator for wet scavenging and encouraged

C2

us to verify the subsequent hypothesis and conclusions. Due to the high number of comments on this specific topic, we prefer to provide here a general and common answer to all reviewers. As a consequence of the above-mentioned reasons, Section 3.4 was substantially modified. The discussion now focusses on the importance of transport patterns on the observed BC concentration. Thus, Figure 7 and Figure 8 were modified. The discussion on potential impact of wet scavenging on BC and BC/CO ratio is now substantially reduced. However, additional analysis of back trajectories, including encounter with clouds, is now presented in the supplementary material.

Specific comments of Reviewer3

**Please find our comments in the supplementary material to this AC!**

Please also note the supplement to this comment:

<https://www.atmos-chem-phys-discuss.net/acp-2018-587/acp-2018-587-AC3-supplement.pdf>

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