

Response to Anonymous Referee #1

The referee's comments are in italics, our responses in plain font.

This manuscript presents and discusses results from long-term measurements (2010-2014) of the particulate matter (PM) mass, elemental carbon (EC), organic carbon (OC), water-soluble organic carbon (WSOC) for PM10 aerosol filter samples that were collected at the Zotino Tall Tower (ZOTTO) in Central Siberia. The data were complemented with measurements for carbon monoxide (CO). The results extend on previous data (and publications) for the ZOTTO site, such as those given by Chi et al. (2013), which dealt with aerosol and CO data for the period between September 2006 and December 2011. Although the measurements for WSOC could in my opinion have been done in a better way, I am overall satisfied with the way the measurements were done. I like in particular that a rather novel non-parametric approach named REBS (Robust Extraction of Background Signal) was used to separate pollution and background periods, and that in addition near-pristine air masses were selected based on their EC concentrations being below the detection limit of the thermal/optical instrument used. It definitely made sense to separate the 5-year long time series into polluted, background and clean periods and to analyze and discuss these periods separately. The approach used now seems a clear improvement over that used by Chi et al. (2013). Nevertheless, as indicated below, the current manuscript suffers from several (mostly technical) shortcomings, so that revision is needed before it can be published in ACP.

We thank the Referee #1 for the constructive criticism and suggestions for improvement that were taken into account upon manuscript revision. Responses to individual comments are given below.

Specific comments:

1. Page 4, line 27, and Page 22, line 13: Abbreviations and acronyms should only once be defined (written full-out). "SOA" was already defined on page 2, line 34.

Done

2. Page 8, lines 5-7: It is stated here that "The uncertainty (1 standard deviation) for the PM determination is estimated to be 3.5 µg for 47-mm quartz filters". Is there any substantiation for this statement? The uncertainty given is unrealistically low. For example, Hitzenberger et al. (Atmos. Environ., 38 (2004) 6467–6476) indicated that "The precision of the net mass determination for 47-mm diameter Whatman QM-A quartz fibre filters is estimated at 30 µg"; even for 47-mm diameter Nuclepore polycarbonate filters and Gelman Teflo filters (which can be weighed with much better precision), it was stated in the same paper that based on repetitive weightings of blank and loaded filters, the precision (1 standard deviation) of the net mass (i.e., of the particulate mass) was estimated at 5 µg; incidentally, for 47-mm diameter Millipore mixed cellulose ester filters, the precision was estimated at 30 µg.

We re-checked the uncertainty of the PM determination using a Mettler-Toledo micro balance model XP6. The Table below shows typical weighing results from four aerosol-loaded quartz filters. The same measurement uncertainty (even better) was observed for the back filters. Based on the gravimetric measurements the PM uncertainty was estimated at 10 µg. Thus, we replaced the initial value of 3.5 µg by 10 µg.

Table. Weighing protocol (mg)

112.386	110.787	111.968	116.159	
112.381	110.786	111.948	116.167	
112.397	110.798	111.964	116.174	
112.388	110.790	111.960	116.167	Aver
0.0067	0.0054	0.0086	0.0061	Stdev

3. Page 15, line 32: Abbreviations and acronyms should only once be defined (written full-out). "APT" was already defined on page 9, line 25.

Done

4. Page 16, lines 25-26: Sodium and potassium cannot be called "compounds"; perhaps, "compounds" can be replaced by "components".

Done

5. Page 18, line 33: It is strange to talk about "receptor sites" for samples that were collected along flights from northern Alaska (Fairbanks).

The "receptor sites" are replaced by "sampling areas".

6. Technical and other (mostly minor) corrections:

- page 1, line 24: replace "10 μ m" by "10 μ m".
- page 3, line 29: replace "have light-absorbing" by "have a light-absorbing".
- page 5, line 1: is "Andreae et al., 2008" 2008a or 2008b or perhaps 2008a,b?
- page 5, line 13: replace "Joutsensari, 2015" by "Joutsensari et al., 2015".
- page 7, line 8: replace "10 μ m" by "10 μ m".
- page 8, line 30: replace "are most" by "are the most".
- page 8, line 32: replace "NOISH-" by "NIOSH-".
- page 9, line 10: replace "by the two" by "the two".
- page 9, line 22: replace "calculated an" by "calculated for an".
- page 9, lines 30 and 34: replace "Giglio," by "Giglio et al.,".
- page 12, line 12: A Tab should be inserted before "Table 2 shows".
- page 13, line 7: replace "Saarino" by "Saarnio".
- page 15, line 17: A Tab should be inserted before "The lack".
- page 16, line 2: replace "2011(Fig." by "2011 (Fig.".
- page 16, line 15: A Tab should be inserted before "The".
- page 16, lines 17-18, and page 48, Table 3: "Verma et al., 2010" is not in the Reference list. The reference is added.

- page 16, line 22: A Tab should be inserted before "In winter".
- page 17, line 6: replace "in a strong" by "in strong".
- page 17, line 32: A Tab should be inserted before "The large-scale".
- page 18, line 24: A Tab should be inserted before "As a case".
- page 19, line 1: A Tab should be inserted before "In turn".
- page 20, line 7: replace "during selected" by "during the selected".
- page 20, line 23: A Tab should be inserted before "Both CO".
- page 20, line 30: A Tab should be inserted before "In contrast".
- page 20, line 30: replace "Fig.11c" by "Fig. 11c" and replace "Fig.11d" by "Fig. 11d".
- page 21, line 9: "Qi et al., 2016" is not in the Reference list; there is "Qi et al., 2017" in that list to which no reference is made within the text.

The link is corrected.

- page 22, line 11: replace "et al.,2005" by "et al., 2005".
- page 22, line 12: "Ebben et al., 2014" is not in the Reference list; there is "Ebben et al., 2011" in that list to which no reference is made within the text.

The link is corrected.

- page 22, line 15: replace "et al.,2014" by "et al., 2014".
- page 22, line 16: replace "Isidorov," by "Isidorov et al.,".
- page 24, line 7: replace "parameter along" by "parameters along".
- page 25, line 11: A Tab should be inserted before "Over the".
- page 25, line 11: replace "remain relatively" by "remains relatively".
- page 25, line 29: replace "during ZOTTO" by "during the ZOTTO".
- pages 26-45, References: For authors with more than 1 initial, there should be a space between the initials; references with the same first author (e.g., Andreae, Birch,

Bond, Chi, Heintzenberg, Kanaya, Kulmala, Maenhaut, Mikhailov) should be in the appropriate ACP order; for references with at least 3 authors, there should be ", and" before the last author (note that for references with only 2 authors, there should not be ", and" but " and" instead; the titles of journal articles should be in lower case instead of in Title Case; abbreviated journal names should be used throughout; furthermore, there should be a comma before the abbreviated journal name and there should be a comma followed by a space before the journal volume.

- page 27, line 4: replace "Glob. Biogeochem. Cy." by "Global Biogeochem. Cycles".
- page 28, line 16: replace "Aerosol Sci." by "J. Aerosol Sci.".
- page 29, line 4: replace "Techn." by "Technol.".
- page 29, line 28: replace "Tellus" by "Tellus B".
- page 29, line 32: replace "Paulsen, M., 2006b." by "Paulsen, M.:".
- page 31, line 5: replace "Remote. Sens." by "Remote Sens.".
- page 31, lines 7-8: this reference should come after "Goetz et al. (2007)".
- page 33, lines 7-9: this reference should come after "Liao et al. (2014)".
- page 35, line 14: replace "Biogeochem. Cy." by "Biogeochem. Cycles".
- page 35, lines 27-28: there is not referred to this reference within the text.
- page 35, lines 29-32: this reference should come before "Lack and Cappa (2010)".
- page 37, lines 11-12 and line 15 : replace "Spectrum." by "Spectrom.".
- page 38, line 14: replace "Geoph." by "Geophys.".
- page 38, line 27: replace "Techn." by "Technol."

- page 38, line 33: replace "Scientific Report" by "Scientific Reports".
 - page 40, line 17: replace "Grothe, H., 2012." by "Grothe, H.:".
 - page 41, line 22: replace "2016" by "2016.".
 - page 41, line 31: replace "Atm." by "Atmos.".
 - page 41, lines 33-34: there is not referred to this reference within the text.
- The reference has been removed.

- page 42, line 6: replace "Aeros." by "Aerosol".
- page 42, line 9: replace "Pollution" by "Pollut.".
- page 42, line 21: replace "Geoph." by "Geophys.".
- page 42, lines 27-33: these two references should come before "Singh et al. (2016)".
- page 44, lines 14-17: this reference should come before "Vestenius et al. (2014)".
- page 44, line 18 up to page 45, line 4: theses references are not in the proper order; they should be ordered alphabetically according to the first author's first initial.
- page 46, Table 1: replace "Chi et al." by "Chi" (3 times); furthermore, "Qu et al., 2009" and Zhao et al., 2015" are not in the Reference list.

The references to Qu et al., 2009 and Zhao et al., 2015 are added.

- page 48, Table 3, heading: replace "stands for" by "stand for".
 - page 48, Table 3: "Cao et al. (2005)" is not in the Reference list.
 - page 49, Table 3. Continued: "McMeeking et al. (2009)" is not in the Reference list.
- The references to Cao et al., 2005 and McMeeking et al., 2009 are added.

- page 50, Table 3. Continued: replace "Li et al., 2007" by "Li et al. (2007)".
- page 51, Table 4, heading: replace "The third column is average" by "The third column is the average".
- page 52, Table 5, heading: replace "The average" by "Average".
- page 54, Figure 4, caption: replace "The seasonal" by "Seasonal".
- page 55, Figure 5, caption: replace "The seasonal" by "Seasonal".
- page 57, Figure 11, caption: replace "(b), (c) median" by "(c), (d) median".

All the above reviewer's comments are taken into account.