

Interactive comment on “The importance of Asia as a source of black carbon to the European Arctic during springtime 2013” by D. Liu et al.

Anonymous Referee #1

Received and published: 17 June 2015

The paper presents an analysis of the contribution of various source regions and sectors to the BC burden observed in the Arctic troposphere during spring of 2013. Attribution of the Arctic BC burden to different source regions and sectors is conducted through use of FLEXPART trajectory analysis. Precipitation amount based on HYSPLIT trajectory analysis is used to determine the fraction of BC that was scavenged en route to the Arctic. Overall, this paper contributes to our understanding of the sources that impact the BC burden in the Arctic and the altitude dependence of these impacts. One aspect that was lacking was an assessment of the significance of flaring in northern Russia on low altitude BC burdens in the Arctic as suggested by Stohl et al., ACP (2013). The paper should be publishable in ACP once this concern and those listed below have been addressed.

C3774

Abstract: Define ng s m^{-3} .

p. 14846, line 15: Is there a reference for this statement (“visibly reddish-brown in color”)

p. 14846, line 26: Change to “. . .intensively conducted AT various. . .”

p. 14847, line 2: Change to “. . .transported TO and built up. . .”

p. 14847, last paragraph: change to “THE IMPACT OF open biomass burning sources ON BC CONCENTRATIONS IN THE ARCTIC WAS OBSERVED during the recent ARCTAS. . .”

p. 14847, line 26: Change to “forest fires in Siberia largely contributed. . .”

p. 14848, line 4 - 7: This sentence is confusing. Please edit for clarity.

p. 14848, Lines 8 – 9: What is the topic of considerable debate – the poor representation by models or the concentration of BC in the Arctic?

p.14848, line 21: What is meant by “microphysical system”?

p. 14848, line 25: “an explicit determination of BC scavenging efficiency” is a tall order. How would this be done?

p. 14849, line 22: Corrected for ambient what? Aerosol?

p.14850, line 5-6: What was the range of the applied collection efficiencies? Please give quantitative information on the degree of agreement between the AMS-measured mass and the SMPS volume concentration.

p. 14850, line 11: “Data ARE missing. . .”

Figure 2: Define PES and FPES in the figure caption.

Figure 3: Define “NA”, “CL”, etc. in the figure caption.

p. 14853, lines 16 - 19: Are flaring emissions included in the anthropogenic emission

C3775

inventory? Stohl et al., ACP (2013) suggest that flaring in northern Russia could be a large source of low altitude Arctic BC. If flaring is not included (or the emission inventory of Stohl et al. is not used), then the SI region may incorrectly be assumed to be a minor contribution to ground sources.

p. 14854, lines 5 – 14: Again, were flaring emissions included? Based on what inventory?

p. 14854, lines 16 – 17: The statement that “SI emissions are relatively low during that time of year” suggests that only OBB and not flaring emissions are considered to be significant for this region.

p. 14856, lines 4 – 5: It is stated that “NA influences were low at all levels” yet the contribution of NA to lower troposphere SO₄ is higher than or equivalent to contributions from the other regions (Figure 8c).

p. 14856, lines 18 – 20: Do the precipitation fields from HYSPLIT indicate more precipitation for air masses en route from MA compared to the other regions?

p. 14857, lines 7 – 9: Change to “The lower-latitude source REGIONS had potential temperatures. . .”

Figure 11: Couldn't the lack of a correlation between precipitation and SF_BC also be due to the assumptions in the calculation of SF_BC, i.e., that BC/deltaCO_source is adequately parameterized using emission inventory data?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 14843, 2015.