

Interactive comment on “Flexpart v10.1 simulation of source contributions to Arctic black carbon” by Chunmao Zhu et al.

Anonymous Referee #2

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This manuscript presents the source apportionment of black carbon at surface (0-500 m) and high altitudes (4750-5250 m) over the Arctic region using the latest version of Flexpart model. This study provides interesting data specifying the contributions of anthropogenic and biomass burning sources from different source regions to the surface and high altitude Arctic BC that significantly contribute to the Arctic aerosol community. However, discussion needs to be improved further before the MS appears in ACP.

Specific comments: Lines 24-25: “— with a focus on — 2010.” It is not clear in the abstract and in the whole text as well that whether the two source categories (i) anthropogenic activities include only the fossil fuel combustion (or human made such as domestic and agricultural biomass burning as well) and (ii) biomass burning includes

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only the forest fires (or human made biomass burning as well)!

Lines 58-92: The review of literature of Arctic BC and its sources appears very brief. It is necessary to describe it fully by detailing the previous studies and thus addressing the necessity of the present study.

Lines 188~: “Flexpart generally reproduced the seasonal variations —” Lines 200~: Flexpart v10.1 underestimated observed BC —” I suggest the authors to compare the ground based and estimated concentrations, rather than just correlations, which are medium ($r = 0.53-0.80$) only, and statements, in order to make the extent of differences / uncertainties’ clear.

Lines 255~: “This seasonality —” It is not at all clear that how good the results obtained in the present study are in agreement with the previous reports and how advanced /differed the source assessment of Arctic BC obtained from this study compared to the previous reports. For example, Stohl et al. 2013 reported that gas flaring and domestic biomass burning are the major sources of Arctic BC. This study also showed that the gas flaring is a major source, but the role of domestic biomass burning is not clear.

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