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## ***Interactive comment on “A trajectory analysis of atmospheric transport of black carbon aerosols to Canadian High Arctic in winter and spring (1990–2005)” by L. Huang et al.***

**Anonymous Referee #1**

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General comments:

This paper deals with analysis of Black Carbon (BC) transport to Alert, Canada during the Arctic haze season in 1990 - 2005. As BC is known to affect the Arctic climate change in dramatic ways, such information is very important in building on the scientific understanding, and on future mitigation strategies. The manuscript seems well written and stands on several earlier studies. I have only minor comments and suggestions for improvements, and recommend the paper to be published in ACP.

My only more general comment deals with the emission inventories and the corresponding emission intensities. To my understanding these inventories do not consider

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biomass burning (BB) yielded aerosol. Nowadays, BB is considered as a major source affecting BC concentrations in the arctic (see e.g. Warneke et al. 2010), especially during spring-time. I would like the authors consider this in their paper, or at least mention it somehow. Is it possible that not only removal processes, but also sources can get “hidden” in the  $b$ -factor (“cluster specific proportional constant”)?

Specific comments:

There appears to be some ambiguity in the parameter  $E$  appearing in equation (2) and the text. Somewhere it is referred to as “surface flux”, somewhere else as “emission intensity”. These quantities also appear in figures 1 and 4, but having different dimensions. Are they one and the same thing, or different quantities? Please clarify.

Table 3: how would one interpret the  $b$  factors? What does a high or a low value mean? Maybe some comments on the  $p$ -values might be useful too; it seems that for some clusters estimating the  $b$  is easier than for others. What does this tell about?

Figure 1: BC surface fluxes for the European Union, former USSR and North America are shown. Please be more specific how the areas are defined. Are they restricted only to the areas relevant here? If they cover the whole land area, what proportion of the emission flux is important if transport to Alert is considered?

Figure 4 and relevant text in the manuscript: prior to this figure, the subject has considered Europe and the former USSR separately. Is there a reason to suddenly change the focus to Eurasia? This is a matter of opinion of course, but I would still like to see the contribution from the Europe and the former USSR separately. I find it interesting that even though figures 2a and 2b indicate quite few trajectories arriving from the Europe, this seems to be the main source area contributing to the BC concentrations.

References: C. Warneke, et al. (2010), An important contribution to springtime Arctic aerosol from biomass burning in Russia, *Geophys. Res. Lett.*, 37, L01801, doi:10.1029/2009GL041816.

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