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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Source attribution of light-absorbing impurities in seasonal snow across northern China" *by* R. Zhang et al.

Anonymous Referee #2

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Title: Source attribution of light-absorbing impurities in seasonal snow across northern China Authors: R. Zhang et al.

General: The authors discuss the source attribution of light-absorbing impurities (LAI) in snow samples from China based on PMF method and back trajectory cluster analysis and concluded that soil dust was the main source of the LAI. The outcome seems interesting and important for the community of atmospheric chemistry and physics. However, the data used in this study are all derived from previous study of Wang et al. (2013), and thus it is not clear for me what originality of this study is.

Specific comments: 1. Introduction section. Recently, Bond et al. (2013) reported that black carbon is a much larger cause of climate change than previously assessed. This reference needs to be added in the revised manuscript. 2. Ho et al. (2007) reported

OC/EC and organic acid compositions including oxalic acid, which could be compared with the authors' results in the revised text. 3. Section 2.1 Snow sample collection. Although many snow samples were collected in this study, it is not clear if fresh and old (aged) snows were differentiated or not. The authors need to describe about this point. Dry deposition of dust should also fall on the snow surface and contribute to the chemical composition of snow. 4. Page 2162, lines 25-. I wonder the accuracy of the calculated calendar date. What are the uncertainties of the estimated date? Snow does not fall continuously while soil dust event occasionally occurs; thus I can imagine that the estimated dates that are used for air mass trajectory and MODIS hotspot map should contain a significant uncertainty. The authors need to discuss this point in the text. 5. Page 2163, line 1. Recently, biomass-burning tracer, levoglucosan, has been reported in an ice core from Kamchatska Peninsula, an outflow region of Asian dusts (Kawamura et al., 2012). This reference should be included in the revised manuscript. 6. Figs. 3 and 4. Same colors should be used for the same categories. For example, soil dust is yellow in Fig. 3 whereas it is orange in Fig. 4, which is not convenient for the readers.

References: 1. Bond, T. C.; Doherty, S. J.; Fahey, D. W.; Forster, P. M.; Berntsen, T.; DeAngelo, B. J.; Flanner, M. G.; Ghan, S.; Kärcher, B.; Koch, D.; Kinne, S.; Kondo, Y.; Quinn, P. K.; Sarofim, M. C.; Schultz, M. G.; Schulz, M.; Venkataraman, C.; Zhang, H.; Zhang, S.; Bellouin, N.; Guttikunda, S. K.; Hopke, P. K.; Jacobson, M. Z.; Kaiser, J. W.; Klimont, Z.; Lohmann, U.; Schwarz, J. P.; Shindell, D.; Storelvmo, T.; Warren, S. G.; Zender, C. S., Bounding the role of black carbon in the climate system: A scientific assessment. Journal of Geophysical Research: Atmospheres 2013, DOI: 10.1002/jgrd.50171. 2. Ho, K. F., J. J. Cao, S. C. Lee, K. Kawamura, R. J. Zhang, J. C. Chow, J. G. Watson, Dicarboxylic acids, ketocarboxylic acids and dicarbonyls in the urban atmosphere of China. J. Geophys. Res., 112, D22S27, doi:10.1029/2006JD008011, 2007. 3. Kawamura K., Izawa Y., Mochida M. and Shiraiwa T., Ice core records of biomass burning tracers (levoglucosan and dehydroabietic, vanillic and p-hydroxybenzonic acids) and total organic carbon for past 300 years in the

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Kamchatka Peninsula, Northeast Asia (2012), Geochimica et Cosmochimica Acta, 99, 317-329.

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