Atmos. Chem. Phys. Discuss., 13, C993–C995, 2013
www.atmos-chem-phys-discuss.net/13/C993/2013/

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.

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Received and published: 4 April 2013

We thank both reviewers for their comments and employ the same numeration they do when responding to their specific comments. We also note that, to be consistent with revisions made to nomenclature in companion papers after this study was submitted, we now refer to LAI as Insoluble Light Absorbing Particles (ILAP).

2. Reviewer No. 2

General comment We find this comment quite surprising. We have already addressed how this study differs from that of Wang et al in our response to Reviewer No. 1 (response 1.1) but the general observation of the reviewer strikes us as an unusual interpretation of originality. A fairly substantial fraction of the published papers in the

scientific literature are devoted to differing analyses of the same basic data set. Indeed this is the case for any number of the data sets generated by large, international field studies. Our analysis is quite distinct from that of Wang et al.

Specific comments

2.1 Bond citation Now that it has appeared in the literature, we are happy to cite the Bond et al study.

2.2 Ho et al citation While an interesting study, it is not clear to us that the Ho et al analysis is particularly relevant to the discussion here. Ho et al report air concentrations of various carboxylic acids in selected Chinese cities whereas we are using data on the concentration of (a few) dicarboxylic acids in snow at locations which are in general well removed from cities. The values are not directly comparable and only comparable at all after numerous rather speculative assumptions have been made. We prefer not to do this.

2.3 Type of snow sampled and dry deposition Very little of the sampled snow was "fresh" in the sense that it had fallen the day of the sampling. On the other hand, as noted in section 2.4, all samples were from the top 6 cm of the snow pack. The age of the snow will of course depend on the deposition rate, which varies for each site, but could have been as much as 5 months for some of the accumulations. Due to the need to sample considerable volumes of snow, essentially each sample was an integral over this deposition period. It is for this reason that trajectories were run over the entire 5 month (or so) period. As to dry deposition, yes, it could, and almost certainly did, occur . If we were trying to partition the deposition between wet and dry this would be an important issue. However, the type of deposition has no impact on the deposition period, which is determined by the snow accumulation rate, and is the only parameter we derive from the snow sampling depth. To help clarify what has been done, we now note in section 2.1 that only the top layers of the snow are used in the analysis presented here and refer the reader to section 2.4.

2.4 Uncertainty in the estimated deposition periods The reviewer is quite right in that the deposition periods have a good deal of uncertainty. As we noted in the text (p. 2163, line 7), ". . ..the chronology of the deposition is unreliable." If we were trying to determine the time of deposition for a particular "spike" or event in the snow profile, we would only be able to do this in the most rudimentary way. However, we are looking at integral concentrations over the entire deposition period and for this there is much less need for high accuracy. We simply want to make sure, within a week or so, that we are running trajectories for the entire deposition period.

2.5 Citation of Kawamura et al Again, we are not entirely sure what the reviewer is getting at here. Nevertheless, we now cite it one line 1 of p 2164 , right after the Kehrwald et al reference, as follows. "Indeed, levoglucosan has been found in Asian ice cores in regions of frequent biomass burning (Kawamura et al, 2012)."

2.6 Color coordination of Figures 3 and 4. We have modified Figure 3 to render the color code as close as possible with that of Figure 4 (they were made with different programs and this is difficult).

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 2155, 2013.