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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Boreal forest fire emissions in fresh Canadian smoke plumes: $C_{\vec{1}}$–$C_{\vec{10}}$ volatile organic compounds (VOCs), $CO_{\vec{2}}$, CO, $NO_{\vec{2}}$, NO, HCN and $CH_{\vec{3}}CN$" *by* I. J. Simpson et al.

Anonymous Referee #1

Received and published: 27 May 2011

This paper is about measurements and interpretation of VOCs, CO2, CO, NO2, NO, HCN, and CH3CN from fresh Boreal forest fires.

This is good contribution to the growing body of knowledge for fire emissions.

The paper is well written, well organized, and concise. CO2, methane , and CO were found, not surprisingly, to comprise nearly all of the carbon released from the fires. The speciated VOC measurements were comprehensive and showed that indeed a wide range of VOCs are emitted from these fires and that the amount of total carbon released

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in this form, although less than 2 % of the total carbon released, is notable as it has implications for global budgets for individual species. It was interesting that these were the first reported monoterpene emissions form Boreal forest fires. Although it is not surprising that there are emissions of these species from fires, as the authors correctly explain because of the stored terpene pools known to be present in the conifers of these forests, this is a new finding that can be used to improve models, with special implications for particle formation. The terpenes and C1-C2 species comprised the bulk of the VOC emissions from these fires. The strong contributions of the light VOCs have been established in the literature and this study supports that. The measurements of species found not to be emitted by fires is informative. The information obtained on the chlorocarbons is timely and helps with our understanding of the attribution of sources of these species and for specific compounds like dichloromethane provides hard data which points to little or no emission from Boreal fires in this region of the world.

The whole air sampling technique was employed in this study and the resulting air samples were analyzed by well established analytical techniques. Other key species were included in the analysis as noted above.

I believe the discussion on acetone p. 9531-95-32 should be left out because work by Hornbrook et al., (Observations of volatile organic compounds during ARCTAS – Part 1: Biomass burning emissions and plume enhancements, Atmos. Chem. Phys. Discuss., 11, 14127-14182, doi:10.5194/acpd-11-14127-2011, 2011.), also taken from the ARCTAS DC-8 measurements but using other data that were available on the plane and looking at in more detail, show that there is little or no discrepancy for the acetone ERs (or more specifically enhancement ratios) with literature values.

Minor points:

P9524 line 24: lifetime is given but under what assumptions?

P9528 line 28: ....they are difficult to speciate using these techniques due to spectral overlap ... this is strictly true for IR techniques – for the MS technique it is more correct

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to state that it is difficult to speciate because the mass spectrum resulting from ionizing the various terpenes results in an identical, indistinguishable, isobaric product ion.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 9515, 2011.