**Atmospheric
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Interactive comment on "Organic functional groups in aerosol particles from burning and non-burning forest emissions at a high-elevation mountain site" *by* S. Takahama et al.

Anonymous Referee #2

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This paper describes an extensive sampling campaign at a remote mountain-site. Multiple analytical techniques including FTIR, ACMS, NEXAFS, XRF, IC, particle number, SP2 were used to characterize the organic aerosols at this site and multiple statistical tools were used to analyze the data. Characterization of remote sites is not common in the literature especially with this large number of measurement techniques deployed. This limitations of this paper is that it is not focused and is difficult to read. The abstract and conclusions are descriptive of the functional groups measured on average but do not give the reader a clear picture of the main points of the paper or state "why this work is important". Work to simplify and clarify the paper is needed prior to publication. Abstract: As stated above, the abstract does not focus the reader on the key points

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of the paper. Introduction: The introduction describes why characterization of high elevation sites is important. It would be helpful to also make the link why functional group analysis is particularly useful and to put the current work in context of similar remote and/or high elevation studies. Methods: How this work relates to past research and data from this Environment Canada site is not made clear so the first couple of sentences appear irrelevant. Although most of this paper is devoted to FTIR measurements, the description of the FTIR analysis is given the less thorough description than other techniques that are only mentioned once. This should be expanded to give a more complete description of what is being measured and what the sensitivity and MDLs of the method are. In this section, each sampling event is said to last for 3 days but the graphs and later discussion state that it is sometime 5 days. That information should be stated in the methods section. Inclusion of the sampling description in the middle of paragraph about the IR is awkward. The list of what functional groups IR can measure and what is actually able to be measured at this site should be close together in the paragraph. The particle number measurement paragraph is very confusing and should be simplified. There is a repeated sentence in the SP2 paragraph. The description of the analysis of ACSM data is not clear. Explain "to compare similarity." Results: 3.1 Splitting up the analysis of the data by the unfortunate gap in the data is not atmospherically relevant and should be avoided. Comparisons of the two data sets are misleading in part because there are many more samples in the second time frame than the first. I would suggest seasons or monthly time periods. Paragraph 2: What is the detection limit of ketones. Is the large % of ketones in the samples were it is above the MDL due to masses of ketones way of the MDL or are all the data near the MDL so that the MDL cut-off is driving the 0% for some samples and 27% for other samples on average? Describe why the list of characteristics that correlate with ketones supports your hypothesis that these are biogenic. Are there other functional groups that correlate similarly with these characteristics that you don't think are biogenic? Figure 3 could be moved to supplemental material. Although this bit about the NEXAFS is interesting, there is so much going on in the paper that this strikes me

as something that could be omitted. I don't know much about tarballs but surely that have more than just a ketone absorption so this does not provide definitive connection between ketones and bb aerosol. 3.2 Figure 4, the legend is incorrect. The caption mentions asterisks labels but they do not show up on my copy of the figure. Figure 5 could be moved to supplemental material or excluded. Adding a few soil related elements to figure 6 would be useful for comparison. XRF measurements elements not just metals and not all of them are trace so the term trace metals is incorrect here. State what the fact that soil is higher during the day adds to your story or helps explain. In the sentence that starts "The lack of large. . ..the word organic is missing just prior to "aerosol originates. . ." 3.3 Comparisons to previous work by your group at this site are confusing. For instance in the first sentence you talk about spring at Whistler. Is that this sampling campaign or the one from earlier? "in perceived chemical characteristics" is unclear It is not clear from Figure 7a that the burning and non-burning are different. Perhaps plotting the relative fraction instead of the absolute data would be helpful. Line 5 on page 2667 regarding figure 7a, you say organic and sulfate but mean nitrate and sulfate. Caption should state that white or no-shading is anthropogenic. This section is too long and without any demarcation to guide the reader. The clustering and PMF of IR spectra both seem to be useful tools for analysis. Are both necessary? Line 16 on page 2669 has a missing reference. Page 2672. Ketones were not observed in the total samples. This is a curious result that would be valuable to provide more insight into. Is the ketone peak hidden when mass is large and if so this could be a bias in our results? Or is the ketone apportioned to CA in thte total but not in the more time/size resolved samples? What does this state about limitation of the method? Could you decrease the number of PMF solutions and still provide a complete picture. The discussion on 4 factor results is confusing given that you show 6 factor result that is useful. Conclusions: The first paragraph is summary material that is not necessary to repeat. The second paragraph focuses on the one paragraph analysis immediately preceding the conclusions and which seems excessive. Focus on important points.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 2655, 2011.

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