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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Californian wildfire plumes over Southwestern British Columbia: *lidar*, sunphotometry, and mountaintop chemistry observations" *by* I. McKendry et al.

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General Response: We are grateful for the constructive and careful reviews by the two referees. Not only were they positively disposed to our work, but they were consistent with respect to what was required to improve the paper. On that basis, we have made significant revisions to the text as well as to figures. We have attempted to address all general and specific comments made and feel that the paper is much stronger as result. Below are the key reviewers' key comments (numbered) with our response.

Anonymous Referee #1 1. "The contents of this paper are descriptive and primitive, and

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their analysis is also qualitative. . .. . ..However, for the future step of analysis, I strongly suggest to combine with numerical transport model results (such as NRL aerosol global model) to get and show more detailed structure and transport of such a plume. “

Although we would argue that there is merit in descriptive/observational work, particularly when there is a novel suite of measurements available, we acknowledge that modeling should be considered a necessary next step in our research program. This is certainly our intention and we look forward to integrating observational and modeling work in a more sophisticated manner in the future.

Major Comments:

1. Kittaka et al. (2007a, b) is missing in the list – this is an oversight. Only one Kittaka reference was intended here – corrected in references and in text. The following reference is the only one used.

Kittaka, C., Pierce, B., Schaack, T., Al-Saadi, J., Soja, A., Tripoli, G., da Silva, A., Szykman, J., Lambeth, B. and Winker, D.: Synthesis of multiple observations using a regional aerosol assimilation/forecast model (RAQMS) and assessment of biomass burning emission estimates, 16th Annual International Emission Inventory Conference Emission Inventories: "Integration, Analysis, and Communications", Raleigh, May 14 - 17, 2007. (http://www.epa.gov/ttn/chief/conference/ei16/index.html#ses-10)

2. Section 2.2: Which version of CALIPSO data is used?

As shown in the new version of Figure 6, the older CALIPSO data from the original discussion paper has been replaced with Version 3.01 data, but both images show solid agreement on the features of interest.

3. Section 3.1: Which satellite data are used? What parameter does it show in Figure 2? From http://www.osdpd.noaa.gov/ml/land/fire.html; Hazard Mapping System + Analyzed Smoke product: “Product shows the detected hot spots and smoke plumes indicating possible fire locations. This is a blended product using algorithms for the

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GOES Imager, the POES, AVHRR and MODIS. A quality control procedure is performed by an analyst on the automated fire detections. Significant smoke plumes that are detected by the satellites are outlined by the analyst as well with an estimate of the smoke concentration provided. The graphical HMS product is finalized once daily". Appropriate sentences are added to the text.

4. Section 3.2: Do you examine color ratio of CALIPSO lidar data?

We did examine the color ratio for the data to ensure that it agreed with the rest of our findings, but found that the combination of the depolarization data and the aerosol subtypes mask – along the AERONET sunphotometer data and the backscatter and depolarization observations from CORALNet– sufficed to verify our conclusions. In addition, the color ratio images provided by the CALIPSO lidar are even more noisy and difficult to interpret than the depolarization images. Therefore, given the choice between the two, we decided the more illuminating option for inclusion in the figures was the depolarization ratios supplemented with the aerosol subtypes mask. It is worth noting that the color ratio data is (of course) used as a key component in the CALIPSO team's algorithm for determining the output for the aerosol subtypes mask.

5. Figure 1: I recommend adding the hysplit trajectory starting the CO peak time of Fig.7 (i.e. July 2nd – 3rd and, August 8th)

The back-trajectories associated with the Peak CO at Whistler shown in Figure 7 were run. Given their broad similarity to those already in Fig. 2 we decided to replace those in Figure 2 with those suggested by the reviewer (see new trajectories below). We consider this to be more efficient than adding two further trajectories.

6. Figure 2: Lidar attenuated backscatter ratio is used in this figure. Is it possible to make inversion of this data to extinction coefficient by assuming lidar ratio S1? If it is can, I recommend to draw averaged vertical profile during the observation peak period.

We assume the reviewer is referring to Figure 4 here? If so,. . .. . It is possible to plot

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a vertical profile of extinction but it would not really add to the information in the paper as to identifying the altitude and spatial extent of the plumes. It would also be very difficult to pick a representative profile on an event like June 29-July 2 where there is considerably dynamics in the vertical. We agree that plotting the extinction coefficient makes sense when you have Raman lidar data as you have a variable S ratio as a function of altitude. In our case, where the lidar S ratio is fixed, the extinction data would essentially look identical to the backscatter plots except with a different scaling parameter. Plotting extinction when one has a variable S ratio is important for radiative comparison studies – this is beyond the scope of this paper.

7. Figure 6: Are CALIPSO orbit paths of July 1 and April 26 correct? I examined the NASA CALIPSO lidar browse web site, but it seems different. Please make crosscheck of it. It might be useful to include the vertical feature mask and aerosol subtype analysis including in CALIPSO version 3.01 browse image.

We cross-checked and agree that one path was indeed in error. We have reworked this figure and added the vertical feature mask and aerosol subtype.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21047, 2010.

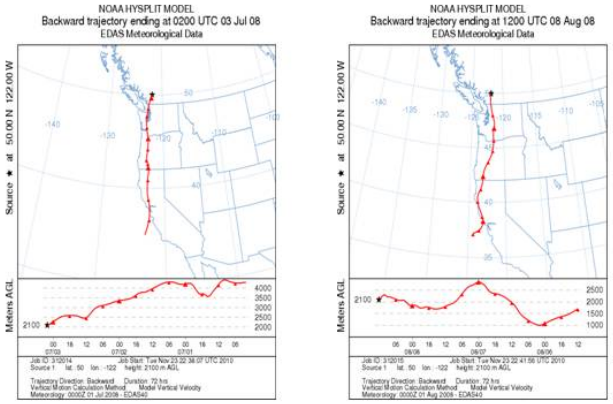

Fig. 1.

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