

Interactive comment on “Transport and mixing patterns over Central California during the Carbonaceous Aerosol and Radiative Effects Study (CARES)” by J. D. Fast et al.

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Reviewer: This manuscript documents the overall meteorological conditions that affected the transport and mixing of trace gases and aerosols in the vicinity of Sacramento, California, during the Carbonaceous Aerosol and Radiative Effects Study (CARES) field campaign in June 2010, using a combination of measurements from the campaign and modelling results from the Weather Research and Forecasting (WRF) model. The manuscript is well written and provides useful information. The modelling approach has been thought through and is sound. I am pleased to recommend the manuscript for publication in ACP after the authors clarify a few minor points (some

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editorial), which are detailed in the following. Counting all the lines and referring to the page number:

Response: We thank the referee for pointing issues that needed further clarification as well as grammatical errors that needed to be corrected. We have changed the manuscript as suggested.

Reviewer: P29955, L16: Lake Tahoe and the Blodgett Forest site are not visible in Fig. 1. Please indicate where they are located.

Response: The Blodgett Forest site is denoted by “BEARPEX”, the campaign name, in Fig. 1. However we omitted labeling Lake Tahoe. Both of these sites will be fixed in the revised manuscript.

Reviewer: P29959, L17: ‘CalNex’ has not been introduced. Please explain what ‘CalNex’ is about. P29959, L22: Please add ‘to’ before ‘predict’.

Response: The CalNex acronym is now defined and a reference has been included for that field campaign. Fixed text as suggested.

Reviewer: P29962, L27-28: What is setting the direction of the nocturnal downslope flows? Please explain.

Response: The T1 site and Cool, California are located on a gently rolling plateau just above the American River Canyon. The local slope at T1 is oriented from the southeast (higher hills) to the northwest (American River). However, the local slope is embedded in the larger-scale valley in which the American River that runs from the northeast to the southwest is the lowest elevation. That is why the nocturnal down-slope winds are from the southeast or the northeast. Southeast down-slope flows imply they are local slope flows, but the down-valley flows were evidently deeper after June 20 so that they enveloped the T1 site. The text has been modified to clarify and a local topography map of T1 has been added to Figure 1 denoting the nocturnal flows.

Reviewer: P29963, L10: Please delete ‘initially’.

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Response: Deleted

Reviewer: P29964, L21-24: What could be responsible for the differences in ozone concentration between the two sites? Titration in urban areas? Please explain.

Response: Yes, titration will be different between these two sites, since T0 is located in an urban area and has significantly higher local emissions of NO. Differences during the day are likely due to transport and additional photochemical production downwind of Sacramento. A sentence has been added to include processes likely contributing to the differences.

Reviewer: P29968, L28-29 and P29969, L1: I have had difficulties in getting this information from Fig. 12a. This needs further explanation/description.

Response: We agree that this figure is complicated, partly because multiple transects of the aircraft occurred over the same region. For the placement of the plume centerline, we are primarily referring to the segments from A to B and from C to D. C to D is where the plane flew from C towards the NE end of the segment and then back to the SW to D. The model predicts the peak CO value at 0930 occurred somewhere NE of points C and D. The broad high values in the model are in contrast to the abrupt increases over shorter time intervals seen in the data, which is why we refer to the simulated plume being too wide. The text associated with this discussion has been changed.

Reviewer: P29969, L6-8: I have had difficulties in getting this information from Fig. 12b. This needs further explanation/description.

Response: The peak CO values in the morning occurred near points C and D in Fig. 12a. In the afternoon, the peak values occurred east of this location (denoted by green and yellow values). This was caused by shifts in the winds that had a somewhat larger westerly component. A sentence has been added to clarify.

Reviewer: P29977, L16: Please order the references by year.

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Response: Changed order of references as suggested.

Reviewer: P29979, L10: What would the errors in the boundary-layer growth rate be attributed to? Please explain.

Response, Added a phrase "that is affected by predicted ambient temperatures, surface heat fluxes, as well as the treatment of vertical mixing" to indicate what affects simulated boundary-layer growth rate.

Reviewer: P29990, caption of Table 3: Please delete 'both'.

Response: Deleted

Reviewer: P29999, caption of Fig. 9: Please add 'were' before 'obtained'.

Response: Added 'were'.

Reviewer: P30004, caption of Fig. 14: There are no arrows.

Response: The arrows in this figure were inadvertently left off the original version. This also happened in Fig 15. Arrows will be included in both figures in the revised manuscript.

Reviewer: P30006, Fig. 16b: Please explain how the total column burden above the PBL has been calculated. The unit of ppb km is not common.

Response: The units have been converted to mass, in kg. The overall multi-day time variation does not change, however.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 29949, 2011.

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