

## ***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.***

**J. D. Fast et al.**

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Reviewer: This paper provides a very good model/measurement based overview of the major trace gas transport patterns over the Sacramento region during CARES. The paper is thorough and well written and is appropriate for eventual publication in ACP. I have a few comments and queries that the authors need to address, as listed below.

My first comment is for the editors of ACPD/ACP rather than the authors. As is almost always the case the production of the manuscript for review results in many figures that are far too small to be clearly seen. For example Figures 3 and 11 are virtually illegible

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in printed form, I have to look at the pdf on my computer and drastically increase the magnification. I make this complaint almost every time I serve as a referee for ACPD, yet there is no improvement in the production standards.

Response: We agree. The original figures we provided should be viewable if expanded to fill in the left and right margins.

Reviewer: A paper from the CALNEX period has just been published and contains some relevant information that could serve as background information for this paper, including a comparison of baseline ozone along the California coast to ozone measured across the polluted regions of California; comparison of 2010 weather to climatology; information on the limited extent of biomass burning during Calnex.

Cooper, O. R., S. J. Oltmans, B. J. Johnson, J. Brioude, W. Angevine, M. Trainer, D. D. Parrish, T. R. Ryerson, I. Pollack, P. D. Cullis, M. A. Ives, D. W. Tarasick, J. Al-Saadi, and I. Stajner (2011), Measurement of western U.S. baseline ozone from the surface to the tropopause and assessment of downwind impact regions, *J. Geophys. Res.*, 116, D00V03, doi:10.1029/2011JD016095.

Response: Thanks for pointing this out, since CalNex papers are just beginning to be published at the same time as the CARES analyses. We have included a reference to this paper.

Reviewer: Page 29959 line 1 What is the source for the information on fire locations and intensity?

Response: During the campaign, the California Air Resources Board notified us of any planned burning activities. However, there was only one during the campaign in the vicinity of the Bay Area. For other fires, we have looked at MODIS hot spot data that indicated only a few fires in the immediate vicinity of the CARES sampling domain. A phrase has been added to indicate what this sentence is based on.

Reviewer: Page 29960 line 19-20 This climatology says nothing about 2010. What is

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the source of the data for 2010 and what comparisons were made to the climatology?

Response: We thank the reviewer for catching the reference that was incorrect. It has been removed and the text has been altered. We can find no published results yet on climatology over California during 2010, but these statements are based on conditions we observed from various data sources prior to the campaign.

Reviewer: Page 29963 lines 15-20 Specific humidity would be much more informative than relative humidity as it is not influenced by temperature and it gives a much better indication of air mass transitions.

Response: We agree and have included another panel for specific humidity, and modified the text to describe the time variation in specific humidity. Note that relative humidity was shown because it is more relevant to aerosol scientists (those using CARES data), since uptake of water on aerosols is governed by relationships based on relative humidity.

Reviewer: Figure 16a Do the colors correspond to the emission regions in Figure 2? If so, what do the numbers mean on the color bar to the right?

Response: Yes, the colors correspond to emission regions. However, it would be difficult to distinguish 20 colors. So, we have grouped some of the adjacent source regions together. The number in parentheses denotes how many source regions contribute to a specific color. The figure caption has been altered to clarify.

Reviewer: Figure 16b. The units of ppb km are very unusual. Did you just sum up the ppb values at every model layer above the site? This would weight the results to mixing ratios at higher altitudes. If you are going to talk about a column value you need to report CO as a mass.

Response: This panel has now been converted to mass in kilograms. The overall multi-day trends look the same, except that the units have changed.

Reviewer: Figure 17b. Are these winds from the model or the radar? In the minor  
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comments below, if no explanation is given please insert the recommended text into the appropriate place in the manuscript:

Response: The panel is for simulated values and the caption will be changed to clarify.

Reviewer: Page 29951 line 16 regional-scale

Response: Grammatical error fixed.

Reviewer: page 29951 line 20 Not sure what you mean by "periods"

Response: Changed to "time periods" to indicate that the downwind site was likely influenced by Sacramento pollutants during 23 time intervals over the campaign.

Reviewer: Page 29951 line 27 WRF-Chem

Response: This was correct in the paper we submitted, but "WF-Chem" occur in the type-setting process and we missed that error. It will be fixed in the final version of the paper.

Reviewer: Page 29951 line 29 that are then entrained

Response: Grammatical error fixed.

Reviewer: Page 29952 lines 23-25 don't really add anything and break up the flow of the text. I suggest removing this sentence.

Response: Deleted sentence as suggested.

Reviewer: Page 29966 lines 26-27 Information on the measurement techniques needs to be moved to the method section.

Response: Moved sentence to end of Section 2

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