

## ***Interactive comment on “Characterizing summertime chemical boundary conditions for airmasses entering the US West Coast” by G. G. Pfister et al.***

**Anonymous Referee #3**

Received and published: 27 January 2011

This paper aims to characterize chemical Boundary Conditions (BC) on the West coast of the US and evaluate its impact on regional air quality modeling. To do so, aircraft in-situ measurement taken during the ARCTAS campaign are compared to global model (MOZART) concentrations (as global models are used to provide BC to regional models). Comparison is further conducted with satellite data (TES) and MOZAIC data over 4 years. Once chemical BC are characterized and differences in observation and simulation are analyzed, authors evaluate the impact of those BC on regional model results.

Impact of BC on regional modeling is an important topic, related to long-range transport problematic. Several older studies focus on the difference between BC from different

C12866

global model, and their impact on regional modeling. Here the originality is the characterization of BC using measurement, and the comparison with global model simulation. Several measurement (including relatively new dataset and also long time period dataset) are used and their comparison with model results are well explained with Figures but also Tables. The paper is, on general, very well written and clear. I would recommend this paper for publication in ACP once the following comments have been addressed:

Page 28923, line 26: “The combined variability of CO in AVGRegionTime is up to about 40 ppbv”. I guess author used “variability” for “standard deviation”. Is it a common used for “variability”? If not, you should simply indicate what “variability” stands for.

Page 28919, line 20: Here is mentioned for the first time, the exclusion of Californian forest fire air masses from the dataset. As its exclusion is further explained section 3.1.3, you can make here a reference to section 3.1.3.

Section 3.1.4 : Table 2 shows statistics for the 10th, 50th and 90th percentiles. However 50th percentile is never mentioned when the 99th percentile is described in the text. This 99th percentile is useful as it probably represents long-range transport events with highly polluted plumes, as observed in the measurement. It may be interesting for the reader to see the 99th percentiles and not the 50th one in Table 2. By showing this 99th percentile, you can be more clear on your “CO discussion”: an overestimation of CO background and low CO value, and an underestimation of long range transport event (as the 99th percentile should be strongly underestimated by the model).

Page 28929, line 17 : “Average FT CO concentrations over land are 95 ppbv and 104 ppbv for modeled and observed flight track data”: I think “modeled” and “observed” should be exchanged.

Page 28931, line 22: it is said that model calculation indicates that the TES region is influenced by fresh plumes with high CO concentrations. How can you be sure it's fresh plumes? It is clear that plumes are fresh when CO is very high and O3 very low

C12867

(and often with a negative correlation between them). I did not see in the model data such plume (O<sub>3</sub> is not lower than around 50 ppbv).

Page 24, line 24: same question, it is difficult to be sure it's fresh plume when O<sub>3</sub> is around 50 ppbv (but on those dataset, I agree that some plumes are typical of fresh plumes with negative CO/O<sub>3</sub> correlation and O<sub>3</sub> around 20-30 ppbv).

Section 3.3.2: it is a very good idea to look at data over 4 years. It put the measurement performed during the campaign in more context. However, I found that you did not enough use such data. Is it possible with this dataset, to evaluate the number of 'extreme' plume case ? You can for example choose a CO limit that would represent strong plume events (180 ppbv ? 200 ?), and evaluate the percentage of time when such event are encountered (this is just an example). As you suggest several time that the 22 June flight is atypical compared to other day, this would help to evaluate how often happened such case, and how significant is the error made by the model when it does not represent such event.

Page 28935, line 25 : does Parrish et al, give explanation for this pattern ? If it is so, can you explain it here ?

Page 28936, line 4 : can you explain why more photochemically driven species are more influenced than source driven species (I guess it's because source driven specie are dominated by local emission when other specie can be formed 'en route'). It may seem trivial, but it's better to explain it briefly.

Page 28936, line 24: you may also mentioned that, as has been shown in Section 3.1, global model underestimate strong LRT events. If they were better represented in the BC, the influence of pollution inflow would be even larger.

---

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 28909, 2010.

C12868