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**Interactive
comment**

Interactive comment on "Average versus high surface ozone levels over the continental U.S.A.: Model bias, background influences, and interannual variability" *by* Jean J. Guo et al.

Anonymous Referee #1

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This manuscript presents an attempt to derive information about mean maximum daily 8-hour average (MDA8) O3 in the United States, based on ambient measurements and using the global model GEOS-CHEM. Sensitivity simulations examine different sources that affect the 10 highest O3 events and that affect the 10 days with highest model bias against observations for 2004 to 2012 for each 10 EPA regions.

General comments: The analysis is a valuable contribution to the current understanding of ground level O3 and air quality standard settings. The topic itself is highly relevant and thus will be of interest to the readers of ACP. Discussion of the results and their implications is also scientifically sound and the paper includes comprehensive analy-

ses. However, I feel that the paper tried to cover lots of information, which makes it a bit hard for the reader to follow key conclusions from this study. Thus I recommend that the paper should be published after addressing the following comments.

General Some comment about day of week effects and model biases in temperature as they relate to the questions raised in the paper seem warranted. There should be dramatic changes in the temperature dependence of ozone over this period coincident with the NOx changes. Those changes should have a day of week variation that might appear in the top 10 days.

Specific comments: The authors use terms "Baseline O3" and "U.S. background O3". U.S. background O3 is defined as "the O3 levels that would exist in the absence of U.S. anthropogenic emissions of precursors" and Baseline O3 is defined as "tropospheric O3 concentrations that have a negligible influence from local anthropogenic emissions". They sound the same, don't they? If yes, please be consistent in the text.

Page 4, lines 106-109, Please clarify if the authors apply Schnell et al. (2014)'s interpolation procedure or they use their dataset. Schnell et al. (2014) use surface MDA8 O3 measurements from air quality networks for 2000–2009, while this paper analyzes the data from 2004-2012.

A valuable addition would be a statement about the chemistry scheme applied in the version GEOS-Chem at the 2.3 section (GEOS-Chem model simulation). The authors mention issues of isoprene chemistry in last paragraph of Conclusions but a brief description or reference to the specific version of the chemistry should be presented before the last paragraph of the paper.

The last paragraph of page 6 needs elaboration where the authors state the sensitivity simulations. The notations for all model simulations should be mentioned and the description of Table 1 should be modified so that the Table is read from top to bottom.

Figure 3 : Observed O3 concentrations should be represented in a different color to be

more visible (maybe black instead of grey) and I would also suggest to plot the curves as an average for 2004-2012 period with associated error bars.

Minor comments: The tables start from Table 2 at the manuscript and Table 1 is referenced at Page 8 for the first time. Please fix ordering of table numbers as they appear in the text.

Page 7, line 195 : "a maximum in and" should read "a maximum in summertime and"