Geoscientific
Model Development
Discussions

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Interactive comment on "Systematic bias in evaluating chemical transport models with maximum daily 8-hour average (MDA8) surface ozone for air quality applications" *by* Katherine R. Travis and Daniel J. Jacob

Anonymous Referee #1

It was a pleasure to read the manuscript by Travis and Jacob and follow their analysis on GEOS-Chem model biases with respect to simulations of ground-level ozone concentrations and their diurnal cycle. The text is well structured and clearly written, the figures are of good quality, and the science is sound and well documented. I therefore suggest publication of this work after minor revision as detailed below.

Abstract: the wording of the abstract could be improved to better emphasize the identification of three problems that are to some extent linked to each other as it is presented in the Discussion. In particular, the interplay between statistics (MDA8 sampling inter-

val) and science, or model deficit (transition from daytime to nighttime boundary layer) could be made more explicit.

p2, l. 29: please mention model top (72 levels from surface to where?)

p3, l.4: remove final semi-colon in citation

p3, l.11 – don't speak about "statistical significance" (see https://www.nature.com/articles/d41586-019-00874-8)

p5, l.25: replace "pdf" by "histogram" as you show discrete hours in figure 4

p5, l.29: I don't understand this argument: According to the model description, 65 m is the center altitude of the lowest model layer. It is this model layer on which dry deposition will act to reduce ozone concentrations – so, how can 65 m be "decoupled from the surface" in the model?

p6, l.12: remove "insignificant" (see above)

p6, l.22 an obvious solution here could appear to increase model vertical resolution near the surface (for example, the ECMWF model has 10 m as its lowest center altitude). This option should probably be mentioned and perhaps briefly discussed.

p7, l.4: the model data (at least a reasonable subset that allows to reproduce the results, for example, time series extracted at the CASTNET locations) must also be made available.

figure 4 - caption: what is shown here is a histogram rather than a pdf since you have discrete hour values