Atmospheric
Chemistry
and Physics
Discussions

Interactive comment on "Extremal Dependence between Temperature and Ozone over the Continental U.S." *by* Pakawat Phalitnonkiat et al.

Anonymous Referee #1

Received and published: 21 December 2017

General comments:

This manuscript uses the results from 3 models runs, in addition to measurement data, in order to investigate the relationships between ozone and temperature extremes. The authors present a new methodology to evaluate the spectral dependence of ozone and temperature extremes.

The manuscript is well written and presents some interesting results. However, I find the manuscript to be lacking in explanation of how the results could be of use to the climate modelling community. In many cases, there are weak correlations between ozone and temperature extremes, but the authors do not explain the significance of these results. It is not clear whether the authors are proposing that weak correlations are due to inaccuracies in the model, or whether the weak correlations mean that

ozone extremes are unlikely be significantly affected by the increasing temperatures associated with climate change. To enhance the readability of the article, I recommend that the following specific comments be addressed.

Specific comments:

Abstract: I suggest adding a concluding sentence to emphasize how the results of this paper are useful to the climate modelling community at large.

Introduction: The first sentence about climate change ozone penalty is an odd choice for the opening sentence of the paper, as the rest of the paper doesn't mention ozone penalty again. I suggest that the introduction be reorganized so that it starts with general background information about the relationship between ozone and temperature, followed by a discussion of how air quality and temperature are expected to change in the future, etc.

Page 2, line 3: Need to clarify that the emission of precursors is the key driving factor for future pollutant levels.

Page 2, line 12: The increase of 2-8 ppbv ozone per degree of Celsius seems rather high. It seems to me that Brown-Steiner et al. (2015) estimate the ozone-temperature relationship to be 0-6 ppb per degree K, not 2-8. Several other studies have lower estimates.

Page 2, line 22: This sentence is confusing as written because how can an increase in return period (which is measured in years) be similar to an increase in temperature (measured in degrees)? Please clarify.

Page 2, line 23: Seneviratne et al. (2012) use the results of CMIP3, not CMIP5.

Page 3, line 7: It would be useful to have a bit more information about how the stations were chosen (e.g. do the sites have to have data for every year in the 1992-2005 period? What percentage of the data can be missing?)

Page 3, line 16: Please clarify where the CO2 concentrations in the GCM come from.

Page 7, line 17: This appears to be 2 ppb, not 3 ppb.

Page 10, line 5: Please clarify how the return level analysis is different from looking at the difference between the 90th percentile and the average, so that the reader can better understand why both of these analyses were used. The results of the return level analysis seem to be consistent with the difference between the 90th percentile and the average, so the benefit of including the return level analysis is unclear.

Page 10, line 15: Are there enough measurement stations in the West and Midwest to be able to draw any meaningful conclusions?

Page 15, line 4: Why were these 3 CASTNET sites chosen?

Page 19, line 10: The Northwest and Southeast have the best correlations, but isn't this partly due to the fact that there are more measurement stations in these areas?

Page 19, line 17: It is misleading to say that there is a strong dependence of ozone upon temperature, because, as your results demonstrate, the relationship between ozone and temperature is complex.

Page 21: I feel that the conclusion is lacking an explanation of how the results of this paper are useful to the climate modelling community. On line 7, for example, what conclusions can you draw from this geographical mismatch? On line 21, you state that the correlation is 0.3: what does this correlation mean for modelers and for future studies?

Technical corrections:

Page 1, line 3: I think it's worth specifying that you are talking about "tropospheric" ozone.

Page 2, line 23: Spell out the acronym CMIP.

Page 3, line 10: Spell out the acronym MERRA.

Page 5, line 11: Missing the word "Appendix" before the letter C

Page 6, caption of Figure 1: Subject (Examples) does not agree with verb (shows)

Page 7, line 23: Please fix this sentence so that it doesn't contain two occurrences of the word "while"

Page 7, line 32: "Northwards" (a direction) should not be capitalized, whereas d"Midwest" (a proper noun) should be capitalized. Similar capitalization errors are found throughout the document.

Page 17, line 2: "in interior" should be "in the interior"

Page 22, line 2: Spell out the acronym MLE.

Page 22, line 12: Spell out the acronym iid.

Page 22, line 16: What is Rd?

Page 22, line 17: It would be helpful to note that L^2 is the least squares regression.

Page 22, line 22: What is A?

Throughout: When previous studies, of the type "Author et al.", are used as the subject of a sentence, the verb that follows should be conjugated in the plural form. The paper currently has a mixture of both singular and plural verb forms after "Author et al."