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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Variability of winter and summer surface ozone in Mexico City on the intraseasonal time scale" *by* Bradford S. Barrett and Graciela B. Raga

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1. Table 1 is a bit mysterious to me. I have some trouble precisely understanding the procedure used from the wording "ozone concentrations at average of all 5 stations either greater than the 90% percentile level or less than the 10th percentile level". At any rate the numbers in the table are all around 10% which makes sense if one picks the top 10% or bottom 10% of ozone. However, I don't understand what the deviations from 10% level mean. Is this due to station heterogeneity? The authors should clarify the exact procedure used for making this table and discuss how to interpret the findings.

Reply: We believe the reviewer refers to Table 2 in this comment.

The actual procedure to calculate extreme low and high ozone was described in the text in section 2. Data and Methods (page 8). To define days with extreme high and extreme low ozone concentrations, the following procedure as used: i) The frequency distributions for the datasets of standard anomalies for the afternoon (1200 to 1600 LT) for summer and for winter (using the 1986-2014 period), were computed to determine the values that correspond to the 90th and 10th percentiles. ii) A day with extreme low ozone concentration is determined when the average standard anomaly for the 5 stations for that day is less than the 10th percentile for the season. iii) A day with extreme high ozone concentration is determined when the average standard anomaly for the 5 stations for that day is greater than the 90th percentile for the season. iv) The extreme day identified as above is then related to the phase of the MJO, and then the relative frequency is estimated from the number of extreme ozone as a fraction of the total number of days in the particular phase.

We apologize for the not having a clear enough caption and we have re-written the caption so it now read as follows: "Table 2: Relative frequency of extreme ozone days in winter (top two rows) and summer (bottom two rows). A high ozone day was defined as one with a mean afternoon (1200 to 1600 local) ozone anomaly across the 5 observing stations greater than the long-term (1986-2014) 90th percentile. Similarly, a low ozone day was defined as one with a mean afternoon anomaly across the 5 observing stations less than the long-term 10th percentile. Bold values (winter phase 2; summer phase 6) indicate phases with highest mean ozone concentrations in those seasons; italics in italics (winter phase 8; summer phase 1) indicate phases with lowest mean ozone concentrations in those seasons. Number of days (n) in each active phase is given for each season, used to estimate the relative frequency."

2. Line 137. I assume the 30-day basis is a moving window. Please clarify.

Reply: Yes, it is a running average or moving window, and we have now added this information in the text in section 2. Data and Methods. The basis for this choice was explained in this same section "... the 30-day period was selected to avoid influence

from both seasonal variability and also the long-term trend."

3. Line 159. 'DFJ' should be 'DJF'.

Reply: We thank the reviewer for catching this typographical error, which has now been corrected throughout the manuscript and figure captions.

4. Figure 5 and similar figures. It would be preferable if the projections on all panels are the same.

Reply: Figures 5, 6, 8 and 9 have been re-done so that the panels on the first column have the same projection as all other panels. They new figures have been now included in the revised text.

5. Figure 7. How helpful is this as a forecast tool? It might be helpful to put in each figure the percentage of days in each category.

Reply: We have not attempted to use it as a forecast tool, but it would be simple to do. From the climatological work in this study, a particular phase associated with each day would be associated statistically high or low ozone. That would then be compared then with the normalized daily data (averaged over the 5 stations), classified as extreme high or low, to determine the skill of the prediction.

We have chosen not to include the percentage of days in Figure 7, since it would be confusing but mainly because the corresponding values were already listed in Table 2 and available to readers.

6. Lines 379-381. It looks to me like days with high ozone feature anomalous westerly winds in DJF.

Reply: We are thankful to the reviewer for pointing out this error. As was clearly seen in Fig 10, surface westerly winds anomalies are observed during winter high ozone events. We have corrected the text and it now reads as follows:

"In winter, days in phase 8 (lowest ozone concentrations) featured anomalous north-

easterly surface winds (blue vectors; Fig. 10), resulting in observed wind speeds up to 40% stronger than climatology (red vectors in Fig. 10). Days in phase 2 (highest ozone concentrations) featured anomalous westerly winds, resulting in winds up to 50% weaker in magnitude (Fig. 10) than climatology. In summer, days in phases 8 and 1 (lowest ozone concentrations) featured surface winds very similar to climatology in both magnitude and direction. In summer, the wind direction on days in phase 8 was more from the north-northwest, while climatology was from the north-northeast, resulting in a very small westerly anomaly. Days in phase 6 (highest ozone concentrations) also featured winds with similar direction as the seasonal mean, but with speeds up to 30% faster (Fig. 10). "

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