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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summertime weekly cycles of observed and modeled NO_x and O_3 concentrations as a function of land use type and ozone production sensitivity over the Continental United States" *by* Y. Choi et al.

Anonymous Referee #1

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Choi et al. present an analysis of weekly cycles in NOx and O3 over the US, based on EPA ground-based measurements, GOME-2 observations of NO2 and HCHO columns, and CMAQ model output. They divide the study domain into regions according to two different criteria. In the first case, they divide into urban, forested, and other areas based on AVHRR satellite data. In the second case, they divide the domain into NOx-saturated, transitional, and NOx-limited regimes based on HCHO:NO2 ratios of 1 and 2. For each of these regimes, they investigate the weekly cycle in the observed NOx and O3 concentrations as measured at the EPA sites.

The application of satellite data to look at this issue is fairly novel. Combining it with the ground-based observations and model output provides a strong toolkit for examining spatial and temporal transitions between NOx-limited and NOx-saturated regimes for ozone production.

However, I don't see scientific findings in the resulting analysis that are sufficient to merit publication in ACP. The main findings are 1) they see a weekly cycle in NOx concentrations for all land-use and HCHO/NO2 classifications, with higher NOx on weekdays and lower on weekends; and 2) the weekend effect (higher ozone on weekends) is more apparent at the NOx-saturated areas, as diagnosed by GOME-2 HCHO/NO2 < 1, than it is for the "urban" AVHRR classification, or for the CMAQ HCHO/NO2 < 1 areas. In the first case, we know already that NOx tends to be lower on weekends. In the second case, doesn't it stand to reason that a classification system based on actual measurements of atmospheric NO2 will have better fidelity to observed ozone production regimes than will a classification based on either model output or land-use? Yes, we can expect urban land-use to correlate to a degree with NOx, but it seems clear that a direct measurement of NO2 will be a better predictor of NOx-saturated ozone production regimes.

There is a fair amount of discussion of the observed and modeled day-of-week patterns (e.g. does the NOx maximum occur on a Thursday versus Friday in the model and observations), but very little interpretation of what this might tell us in terms of underlying processes. I.e., what did we learn?

Another question that is not addressed, to what extent should we expect meteorological variability to be modulating any of these patterns? In this sense, using a single month for analysis seems problematic in terms of statistics for looking at weekday-weekend differences. Don't we need a longer dataset to expect the effects of synoptic variability to average out? The situation isn't helped by the lack of any error bars on the plots or statistical analysis in the text.