

Interactive comment on “Summertime cyclones over the Great Lakes Storm Track from 1860–2100: variability, trends, and association with ozone pollution” by A. J. Turner et al.

Anonymous Referee #1

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This manuscript examines the relationship between high ozone episodes and mid-latitude cyclones in the Northeastern United States using simulations from a global coupled chemistry-climate model. Results from several different types of simulations (Pre-industrial Control, Historical, and Future) are examined. It is found that there is a relationship between summertime cyclones and high-O₃ events in the model, and that the frequency of cyclones decreases in projections for the 21st century. However, the change in frequency explains less than 10% of the variability in high-O₃ events.

These are important results and of interest to readers of ACP. The manuscript is well written and is acceptable for publication in its current form.

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I have a few suggestions for the authors to consider.

Specific Comments

1. The natural variability of cyclones is examined in the Pre-Industrial run, but there is no analysis of ozone (or high ozone events). Wouldn't this long simulation give a more robust definition of the relationship (correlation) between high-O₃ events and cyclones? This would require redefining high-O₃ events, but this can be done as for the historical simulation. I think a version of fig 4 showing time series of frequency O₃ events, together with scatter plot of cyclones versus O₃ events (e.g. Fig 8c) would be helpful additions to the paper.
2. The main conclusion is that the sensitivity of high-O₃ to cyclones does not explain much of the variability. This then raised the question of what are the factors that determine the variability. I think there needs to be some discussion / speculation of the possibly important factors.
3. I understand the desire to use a comprehensive storm tracking algorithm, but how dependent are the results to this. Would the results be any different if you had used a simpler scheme (e.g., just use the statistics from first part of algorithm before tracking)? I am not sure how much is involved to do this, but it would be useful to know if tracking is really needed (especially as 6 hly data is not always available).

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 21679, 2012.

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