Atmospheric
Chemistry
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Discussions

Interactive comment on "On the Limit to the Accuracy of Regional-Scale Air Quality Models" by S. Trivikrama Rao et al.

Anonymous Referee #1

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This manuscript separated short-term synoptic-scale fluctuations from long-term baseline component embedded in the daily maximum 8-hr ozone time series using a filter and estimated the limit of air quality model's accuracy (or predictability/uncertainties of air quality prediction). This is an interesting topic for air quality prediction.

But to my surprise, the authors did not even consider lead time when discussing air quality predictability (or limit of air quality prediction). What is the configuration of the air quality prediction? Was this one-day prediction? Two-day prediction? Prediction uncertainties/errors will change significantly with different lead time.

It is also surprising to see the authors suggesting improving simulation of the baseline concentration by focusing on the quality of the emission inventory and the model's treatment for the slow-changing atmospheric processes. I have no question for improv-

ing emission inventory, but I am confused by improving the slow-changing atmospheric processes. The huge advances of weather prediction during the past few decades has been focusing on 1-day or 2-day prediction. On such short-term synoptic-scale weather processes, our weather prediction did excellent job and has been improved through years. Such improvement can benefit air quality prediction significantly (Zhang et al., 2007).

I would thus imagine that such short-term practical predictability of air quality can be much improved through better model treatments and better initial conditions of meteorological and chemical variables, as well as emissions.

Other specific comments:

Many of the concept/discussion regarding inherent/practical predictability, reducible/irreducible uncertainties are questionable/wrong, or different from those used in weather prediction. For example, emissions are definitely reducible uncertainties and factors in practical predictability. Please carefully define those terms/concepts and refer to normally used/accepted definitions.

The writing is overly concise, particularly in many cases where detailed explanation is needed.

References:

Zhang, F., Bei, N., Nielsen-Gammon, J. W., Li, G., Zhang, R., Stuart, A., & Aksoy, A. (2007). Impacts of meteorological uncertainties on ozone pollution predictability estimated through meteorological and photochemical ensemble forecasts. Journal of Geophysical Research, 112, D04304. https://doi.org/10.1029/2006JD007429