DEVELOPMENT OF AN OZONE SCREENING TOOL FOR THE MIDWEST

Alexander Cohan*
Lake Michigan Air Directors Consortium, Rosemont, IL, USA

Scott Leopold
Illinois Environmental Protection Agency, Springfield, IL, USA

Greg Yarwood
ENVIRON, Novato, CA, USA

Kirk Baker
U.S. Environmental Protection Agency, Research Triangle Park, NC, USA

1. INTRODUCTION

Currently, EPA does not have a recommended approach for assessing the ozone impacts of individual sources in a prevention of significant deterioration (PSD) permitting context. Regional photochemical models provide appropriate science to support ozone formation. Approaches that provide credible screening level information based on state of the science photochemical grid models may be desired to support future single source ozone impact assessments. A screening level tool based on ozone photochemical grid modeling using source sensitivity estimates is being developed for the Midwest.

ENVIRON developed an ozone screening tool for stationary sources in Sydney, Australia based on a parametric model (Yarwood, 2011). The parametric model applies ozone sensitivities to source emission rates calculated by the Comprehensive Air Quality Model with extensions (CAMx) higher-order direct decoupled method (HDDM) in a second-order Taylor series to approximate the impact to ground-level ozone.

**Corresponding author:* Alexander Cohan, Lake Michigan Air Directors Consortuim, 9501 West Devon Ave., Suitre 701, Rosemont, IL 60018; e-mail: cohan@ladco.org

2. METHODOLOGY

In this study, we present the development of an ozone screening tool for stationary sources based on ENVIRON's parametric model. The tool uses CAMx HDDM sensitivities to train a fixed-effects (FE) non-linear statistical model that empirically relates the ozone sensitivities to a point source's emission rates, stack height, and location.

A case study is implemented for the state of Illinois. 4km CAMx HDDM modeling of Illinois during the summer of 2007 is performed using emissions and meteorology from the Lake Michigan Air Director's Consortium (LADCO) 2007 modeling platform. More than a dozen individual stationary sources with a variety of emissions rates, stack heights, and locations are explicitly modeled with CAMx HDDM.

3. RESULS AND CONCLUSIONS

The FE model is able to accurately characterize the first-order sensitivities, but has trouble with the second-order sensitivities involving VOCs. However, the second-order sensitivities involving VOCs are relatively small compared with the other first- and second-order sensitivities.

The parametric and FE models are evaluated against brute-force (BF) CAMx model results. The parametric, FE, and BF methods produce comparable impacts in their spatial extent and magnitude. The main advantage of the FE model compared with the parametric model is the ability to account for changes in source location and stack height in the ozone impact prediction. This tool could significantly reduce the regulatory work required to assess an ozone impact from a stationary source.

7. REFERENCES

Yarwood, G., Scorgie, Y., Agapides, N., Tai, E., Karamchandani, P., Bawden, K., Spencer, J., Trieu, T, 2011: A screening method for ozone impacts of new sources based on high-order sensitivity analysis of CAMx simulations for Sydney. Proceedings, *10th Annual CMAS Conference, Chapel Hill, NC.*