A CHEMICAL SENSITIVITY ANALYSIS WITH CMAQ : DIAGNOSTIC TESTING IN BASE CASE AND EMISSIONS CONTROL STRATEGIES IN THE SOUTHEAST U.S.

J.R. Arnold* and Robin L. Dennis
Atmospheric Sciences Modeling Division, NOAA-ARL / USEPA-ORD
e-mail: arnold.jeff@epa.gov
Voice 206.553.8579 Fax 206.553.8210

1. INTRODUCTION

Model-to-model sensitivity testing was performed with an ensemble of CMAQ models using three chemical mechanisms – Carter's SAPRC99, the CB4 of Gery *et al*., and Stockwell *et al*.'s RADM2 – on four grid domains: a continental U.S. 32km domain, an 8km southeast U.S. domain, and two 2km domains centered on Atlanta, GA and Nashville, TN. The modeling series included full emissions base case runs and three control strategies of 50% NO_X or 50% VOC or a combined 75% NO_X and 25% VOC control in all grid domains and with each of the chemistries for a 4 – 14 July 1999 period of analysis.

Modeled full emissions base case simulations were evaluated against ambient measurements at three chemistry supersites: the SOS/Nashville 99 Cornelia Fort Airpark (CFA) site downwind of Nashville, the SEARCH/USEPA supersite at Jefferson Street (JST) in the Atlanta urban core, and the SEARCH suburban/exurban Atlanta companion site at Yorkville, GA (YRK).

2. RESULTS

We note that grid scale influences the model O_3 control response for larger urban areas like Atlanta such that finer grid spacings enhance differences between the two older chemistries CB4 and RADM2 and the newer SAPRC99. We also note differences in the O_3 control response across space from the large urban core at JST to the exurban site at YRK and to CFA, downwind of the small urban area of Nashville. Moreover, NO_X processing, and changing the rate of that processing by means of a change in chemistry or grid scale, is a key element in determining the model's control sensitivity.

Most importantly, these results show that while the models can demonstrate substantial O_3 sensitivity to changes in chemistry, changes in their relative O_3 response to precursor controls with the same perturbations is highly varied and complex and cannot be predicted from the model performance in the full emissions base case.

* *Corresponding author address:* J.R. Arnold, Atmospheric Sciences Modeling Division, NOAA-ARL / USEPA-ORD 1200 6th Avenue / OEA-095 / 9th FL Seattle, WA 98101-1128