

This paper developed a method by fitting multiple CMAQ simulations with a set of polynomial functions to quantify responses of ambient PM_{2.5} and O₃ concentrations to changes in precursor emissions. The performance of the model looks sound. However, I suggest the authors to include more scientific findings based on the model developed in this study.

General comments:

1. The reason why pollutant responses to emissions can be characterized as a series polynomial functions by the previous developed regression-based RSM has not been clarified.
2. The authors use too many self-defined abbreviations in the text, for instance, PR, VNr, FR, which make the paper not very reader-friendly.
3. Page 8, line 1-5, please explain the reason why the performance of the pf-RSM with less than 40 training samples exhibited a noticeable discrepancy compared with that of the regression-based RSM, but not for those with over 40 training samples.
4. The uncertainty of the fitting results is missing.
5. Section 3.3. This section needs substantial improvement considering this is the only section discussing the application of the method. What are the new findings using the modified model, but not indicated by previous one? What is the advantage of the model compared to the existed ones? Otherwise, this paper seems to be more like a technical document, but lack scientific findings.

Specific comments:

1. The conclusion in the abstract, like “Thus, simultaneously reducing NH₃ and VOC emission along with NO_x reduction is recommended to assure the control effectiveness of PM_{2.5} and O₃”, is too general.
2. Page 2, line 5, the grammar of “significantly influences on” is not proper.
3. Page 3, line 31- 35, the sentence is too long to read. Please consider rephrasing it.
4. Page 8, line 9-10. The description about how to design scenarios is missing. For instance, why the moderate control is defined as ENO_x, ESO₂, ENH₃, EVOCs and EPOA = -49%, -45%, -20%, -64%, and -20%? Will the validation results change if you change the definition of scenarios?
5. Page 9, line 19-20. The sentence is confusing. Please try to rephrase it.
6. Figure 5. The font size of legend does not fit the graph.