

***Interactive comment on “The Detailed Emissions Scaling, Isolation, and Diagnostic (DESID) module in the Community Multiscale Air Quality (CMAQ) Modeling System version 5.3” by Benjamin N. Murphy et al.***

**Anonymous Referee #1**

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This paper describes a new feature of tracking and modifying emission inputs in the CMAQ v5.3. It is delightful to read the well-organized manuscript, with clear explanation of the workflow and functionality of DESID and its implementation in the CMAQ model. The new development is a desired tool that will make it easier for researchers and regulatory model users who are not an emission expert to study sophisticated emission perturbation simulations to quantify source-receptor relationships. This manuscript provides a detailed description of the new feature that can benefit the CMAQ user community. Therefore, I recommend the publication of this manuscript, with some sug-

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gestions to further improve the usability of this tool.

- 1) While the description is comprehensive, it will be useful for the authors to provide some use cases with figures showing the emission changes or CMAQ output changes.
- 2) It should be pointed out the using some of the DESID features will require generating and retaining sector-level emission files and all more space to run the model, although most of these files are two dimensional.
- 3) Figure 1 shows the workflow of DESID in which both natural and anthropogenic source s
- 4) Future direction: All inline emission processes, including sea-salt, dust, biogenic and plume rise, are included in the VDIFF subroutine. As the addition of DESID, the emission module may be too complicated to be treated as a sub-subroutine. Has the team considered having emission as a separate subroutine in the science process file?

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