

"E3SM Chemistry Diagnostics Package (ChemDyg) Verions 0.1.4" [10.5194/gmd-2023-203]

Responses to the Comments of the Anonymous Referee #2

We very much appreciate the constructive comments and suggestions from this reviewer. Our point-by-point responses to the reviewer's comments are as follows (the reviewer's comments are marked in *Italic fort*).

General Comments:

This manuscript discusses the E3SM Chemistry diagnostics package (ChemDyg), which is open-source software written in Python. It was developed to support the Department of Energy's Energy Exascale Earth System Model (E3SM). ChemDyg version 0.1.4 generates various diagnostic plots and tables (11 types of plots and 4 types of tables) for comparing model outputs to both other models and observational data. These include 2-dimensional contour mapping plots, diurnal and annual cycle plots, time-series plots, and comprehensive processing tables. ChemDyg is executed by zppy, a post-processing toolchain for E3SM written in Python. The codebase of ChemDyg is modular, with each diagnostics set being self-contained. Each set has its own driving script for file input/output and a main Python script for calculation and plotting. The outputs, including figures and tables, are organized in an interactive HTML page accessible through a browser.

The manuscript is well structured and written. It provides a detailed description of E3SM ChemDyg version 0.1.4, including the specifics of each diagnostics set and the required input data formats. It also highlights the tool's flexibility for future developers to incorporate new observational datasets and diagnostics sets.

The manuscript lacks direct comparisons with existing tools. A paragraph on the tool's novelty and added value compared to other evaluation tools is essential. Highlighting specific features or functionalities that distinguish ChemDyg from other evaluation tools would provide readers with a clearer understanding of its unique contributions to model evaluation tasks.

Thanks for the suggestion. As the reply to the reviewer 1, in the revised manuscript, we have underscored the distinctive diagnostic features within ChemDyg. We've also incorporated additional novel diagnostic plots, such as the spatiotemporal pattern of stratosphere-troposphere exchange (STE) flux of ozone and quasi-biennial oscillation (QBO)-ozone diagnostics. Our updated version of ChemDyg (v1.0.1) boasts high temporal resolution data on ozone hole and temperature variation with equivalent latitude, along with detailed chemistry tendency tables for each chemical process. Approximately half of the plots and tables in ChemDyg are utilized for model evaluation, while the remaining half are tailored for specific scientific contributions, providing unique insights that other diagnostic tools struggle to replicate.