

Interactive comment on “Simulation of atmospheric carbon dioxide variability with a global coupled Eulerian-Lagrangian transport model” by Y. Koyama et al.

Anonymous Referee #1

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General Comments The present paper aims to describe coupled Eulerian model and a Lagrangian particle dispersion model in global domain. The Lagrangian particle dispersion model has a merit of good precision in transport and high resolution surface flux. However, if we adopt this model in whole atmosphere, we need huge computational resources to simulate. The authors overcome this issue in combining with Eulerian model. The model is unique in its region and shows better performance than current Eulerian model. I consider this paper is suitable for GMD journal after some minor revisions. My comment and suggestions are below.

Abstract I consider that the abstract (also Conclusions) needs to be completed with

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some explicit quantification of the results. This may help to understand the merit of this model.

Section 2: Materials and methods

P-2056, L14: I consider the simulation results are sensitive to a value of Z_s . I consider the suitable value is depending on atmospheric conditions (ex. stability). Please comment on this.

Section 3: Results and discussion

In general, there is no discussion about the effect of vertical transport. I consider that the precision is relatively reduced in this model when an air parcel is from free atmosphere. Is it possible to calculate correlation coefficients in such a case or comment on this issue?

P-2059, L16: The considerable reason why the correlation coefficients are similar between two models in BRW is not shown. Please comment it.

Section 4: Conclusions

P-2060, L23: I agree the merits of this combined model. However, there are some issues (vertical advection, transport and atmospheric stability) which we need to consideration in using this model in inverse model or data assimilation. Could you comment on this?

Tables and Figures

Fig.1: I consider it is not easy to distinguish color of lines between Observation and NIES TM. The Fig.2 has the same issue.

Fig.3: I consider it better to show some mismatch value (ex. RMSE) in the figure or table as they have some meaning to show model performance.