

Interactive comment on “Sensitivity to grid resolution in the ability of a chemical transport model to simulate observed oxidant chemistry under high-isoprene conditions” by Karen Yu et al.

Anonymous Referee #1

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The manuscript by Yu et al. is a valuable contribution to a long-term discussion on the role of spatial resolution in determining the total error of an atmospheric chemistry-transport model. In brief, the authors focus on the analysis of an aircraft campaign in the South-Eastern US, which is a region characterized by large biogenic isoprene emissions, and compare the observations with simulations carried out with the same model (GEOS-Chem) at three spatial resolution (increasing from c.a. 400 to c.a. 28 km). They found a little impact by increased resolution on simulated values of ozone and NO_x, especially in the free troposphere. They thus conclude that a coarse resolution model is adequate to resolve regional contributions to ozone export on a global perspective.

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Discussion paper



I found the manuscript concise, clear and well written, and I tend to agree with the main conclusions of the authors, based on the material showed here. I only have a few comments, which are more requests of clarification from an interested reader, that may further improve the interpretation of some of the results:

- page 2, lines 19-29: in this paragraph the authors review previous similar studies on the horizontal resolution issue, but at the end of the manuscript it is not clear to the reader what is the advancement/difference/similarity (if any) with these studies. I recommend including a short paragraph in the conclusions on that.

- page 5, lines 4-5: the varying ISOP-NO_x relationship in the model is one of the most intriguing results presented in the manuscript. However, its interpretation is left too much to speculations by the reader. Can this analysis be improved? For example, can the referred statement on "temperature and stagnation" be proved calculating correlations with temperature and a stagnation index?

- page 5, lines 13-15: The role of OH is recurring here and throughout the manuscript. Please consider to include some visualization of the changing OH or related species fields, this may help the reader in the interpretation of results.

- page 6, lines 26-27: I do not completely agree with this statement, in particular for isoprene. Looking at Figure 4, all the model realizations look pretty similar to observations, however Taylor diagram in Figure 5 display a dramatic decrease of model skills with increasing resolution. It is not clear to the reader why it happens at this point, it comes as some sort of surprise, so it needs further analysis and discussion. Perhaps, here and for other purposes it would be beneficial to include some sort of more direct visualization of the model-to-obs comparisons (e.g. simple timeseries of data, or scatter plots), maybe in the supplement, in order to keep the main text concise.

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