

Interactive comment on “Sensitivities of NO_x transformation and the effects on surface ozone and nitrate” by H. Lei and J. X. L. Wang

Anonymous Referee #2

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This manuscript analyzes observational data and model outputs to investigate the effects of temperature and NO_x emissions on the concentration of surface ozone and nitrate aerosols. The authors showed how the changes in NO_x emissions and tropospheric temperature are related to surface ozone and nitrate aerosols in the United States.

Unfortunately, the overall quality of this manuscript is poor. First, almost all data analyses here lack statistical robustness. Especially based on Fig 2 and Fig. 3, it is not convincing that we can trust the results from CAM-chem. The authors must provide a map of biases with confidence levels. The ozone bias of CAM-chem within the selected region in Fig 6. is large compared to the ozone change in Fig. 5. Statistical significance must be shown for the changes drawn in Fig.4, 5, 8 and 9. Fig. 7 and Fig.

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10 needs to show error bars in each month. Also please calculate temporal trends in Fig. 11 and Fig. 12 and test their statistical significance. The left panel of Fig. 10 also requires rescaling of its y-axis. Second, there are a lot of hand-waving explanations. For example, the significant role of hydrocarbon is mentioned in Section 3.2, but the current version of manuscript does not include even a single map of hydrocarbon concentrations. Also in Section 3.3, the authors argue that the NO_x concentration results from transport. Please show some supporting plots, tables or at least some numbers. Finally, the authors might want to highlight more what makes this study unique such as the results in Fig. 7 and 10. A lot of findings in this study are not something new. It has been well known that VOC and NO_x are related to surface ozone and nitrate aerosols. Please cite some related studies and compare your results with them. I have seen too many citation of the papers written by Dr. Lei.

Just as summarized above, I guess that most of the reviewers must reject this manuscript because of its quality, but I might perhaps save it if the authors improved the three points that I mentioned. So I admit keeping the review process, and my evaluation is asking major revisions, but I will reject the manuscript unless the authors satisfied me in the next round of reviews.

Specific comments:

Although I am not a native English speaker, some English wordings seemed strange. For example, Line 23 in Page 21962: which?

Caption of Fig. 1: I cannot understand this sentence. ‘Axes indicate the powers that push the transformation change.’

Fig. 1: Where are Rhombuses? Please provide a version with higher resolution.

Fig. 2 and Fig 3.: (Left) and (Right) must be (Upper) and (Lower). Also please make your own plot using the CASTNET observations.

Page 21962

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Line11: 'The decrease or small increase in ozone....' Please rewrite this sentence.
Line16: what is seasonal transfer? Is this a commonly used term?

Page 21963

Line 28: The entire study is about the changes of ozone and nitrate aerosols in the US. Why did the authors change the NOx emissions globally? Is there any reason for 25% of decrease and increase? Is '25%' related to any IPCC scenarios?

Page 21964

Line 7: To examine 'air quality change', the authors should focus on 8-hour maximum ozone and total PM 2.5 increases.

Page 21965

Line 9: Rather than saying the perturbation is stable, I would suggest other words such as 'symmetric'. How can we measure stability by comparing two perturbation simulations with the control run? Line 15: What is emission analysis?

Page 21966

Line 6: Did this study use NCEP2 reanalysis data or CCSM3 meteorology?

Line 16-18: I disagree with that the model can reproduce reasonable surface ozone.

Page 21967

Line 13: the east? Does it mean east coast?

Line 16-18, 22-26: This is an example of hand-waving explanations.

Page 21968

Line 8-10: The significance of changes must be measured based on statistical tests.

Page 21969

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Line 25-28: This is another example of hand-waving explanations.

Page 21970

Line 13-16: Please redraw Fig.10 with error bars.

Page 21971

Line 23-25: Please show some numbers and their statistical significance.

Page 21972

Line 6-7: This is not something new from this study.

Line 13-14: Please rewrite the sentence. Does this mean that Atlanta is in NOx-limited regime only in winter?

Line 21-24: Please mention that this study focused on only the contiguous United States.

Page 21973

Line 9-12: Please rewrite this sentence.

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