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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Air quality in the eastern United States and Eastern Canada for 1990–2015: 25 years of change in response to emission reductions of SO_2 and NO_x in the region" *by* Jian Feng et al.

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I found the article by Feng et al. (Air quality in the eastern US and Eastern Canada for 1990-2015:. . .. scientifically appropriate and worth publication with some revisions. This paper addresses the changes in air quality that have occurred during a 25 year (or 27 year - there are data here that extend from 1990 to 2016) period in which emissions of NOx and SO2 have been substantially reduced in eastern North America. The paper's focus is on: 1) declines in air concentrations, of gaseous SO2 and HNO3, particulate SO4=, NO3- and NH4+ (all measured by the U.S. CASTNET and Canadian

CAPMoN networks) in four distinct regions, 2) the seasonal (cold versus warm season) differences, and 3) the temporal changes in partitioning of gaseous and particulate species. There are quite a few grammatical errors, and I have corrected some but not all of them. A careful reading of the text by the authors to correct this is recommended.

My comments for improvement of the manuscript are: 1) Pg 4 lines 10 to 15 . Break this up into two sentences.

2) Pg 4 line 20. The sharp increase in 2002 (not 2022) in NOx from on road vehicles is NOT due to a true increase in emissions. It is due to a change in methodology on how the emissions are calculated. The increase is a methodological change, and EPA does not go back and correct for that.

3) Pg 6 line 19. Environmental Protection Agency 4) Pg 7 line 20. . . ..is more stable. . ..

5) Pg 7 line 25. Figures S1 and S2 would be more useful to the reader if 89-91 data appear side by side with the 2014 –

6) 2016 data (as is done in Fig. S3).

7) Section 3.2 pg 10 lines 17 and 18. . ..Fig. 2.a for the cold season and Fig. 2.b for the warm season. . .. (cold and warm are in the wrong order here)

8) Section 3.2 This section had too much year to year (or 3 year etc.) detail that can lose the reader. This section should be shortened, skipping minor changes that don't address the overall patterns. The 3-year periods are too short and confusing when you are dealing with a 25 year record. The general trends are what is of interest. For example, in Section 3.2.2.2 pg 15 lines 6 to 9 are more concise and give the overall pattern.

9) Pg 18 line 5. . ..NH4+ was reduced by 12% and 29.8% during the cold and warm seasons, respectively. . .. (or is it the warm and cold season, respectively? It is not clear).

10) Pg 18 line 7. In general, for the first ten-year period, 1990-1999, SO2. . .. . .

11) Pg 18 line 14. During the 25-year period of 1990-2015, air quality. . ...

12) Pg 19 lines 24 & 25. The reduction during the warm season was much greater than in the cold season, ranging from a reduction of 11.4% in region 4 to a reduction of 23.9% in region 3.

13) Pg 20 line 19 & 20. SO4= was reduced by 73.3% for the whole region.

14) Pg 22 line 14. decreased

15) Pg 22 line 19-20. . . ..5th order polynomial. . ..

16) Pg 23 lines 8 and 9. . . ..differences in trends between 1989-2000 for 1 and 4.

17) Pg 25 line 8. There is a disparity in the reduction of SO2 and SO4= concentrations in response to emission reductions of SO2, ...

18) Pg 25 line21. . . ..in the first ten years, 1990 to 2000, but it was. . ...

19) Pg 26 lines 10 and 11. The text, referring to Fig. 9, describes “linear regressions, yet the relations shown appear to be curvilinear (and at the end of the paragraph (pg 27) the correlation of S04= vs. SO2 is described as a power-law relationship. “Linear regression” appears to be incorrect.

20) Pg 27 line 8. . . ..sea salts. . ..

21) Pg 29 lines 22. and 23 . . ..the trend was reversed after that.

22) Pg 30 line 3. . . ..decreasing trend even though the reduction. . ...

23) Pg 30 line 12. . . ..SO2 and NOx in the US were reduced. . ..

24) Pg 32 lines 9 and 10. . . ..in the region was in excess. . ...

25) Figure 4. Each graph should have a label for the Y-axis (SO4=, SO2) or have a label that makes clear what the dependent variable is.

26) Figure 6. caption . . ..derived from 4th order polynomial. . .. .and 5th order polynomial. . .

27) Figure 8 (b). the legend has R2,R2,R4. It should be R2,R3,R4. Why are some of the data points circled in both (a) and (b)? Explain in caption.

28) Figure 9. Why are some of the data points circled in both (a) and (b)? Explain in caption.

29) Figure 11. Explain in caption why some sets of data points have regression lines, and others do not.

30) Figure 13. Can the 2nd and 3rd graphs be combined, as is the case with the first graph?

General comment - The authors have more significant figures than they need in many places throughout the text, especially when referring to percentages (eg. SO4= was reduced 73% rather than 73.3%). Correcting this throughout the text would be a good idea. Overall, this is a very good paper that demonstrates the dramatic change in air quality brought about by clean air legislation in the US and Canada. Some grammatical work would improve the clarity of the presentation.

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