

Interactive comment on “Are biogenic emissions a significant source of summertime atmospheric toluene in rural Northeastern United States?” by M. L. White et al.

Anonymous Referee #2

Received and published: 25 June 2008

White et al. “Are biogenic emissions a significant source of summertime atmospheric toluene in rural northeastern United States?”

This interesting paper presents data taken a farm in the NE United States. Seasonal trends are interpreted as indicating a biogenic source of toluene, a species primarily thought of as anthropogenic. Data from static chambers and enclosures over crops and trees are also presented, strengthening the case. The paper therefore presents a new analysis of an extensive dataset which questions currently thinking. As such it is suitable for ACPD.

The quantitative assessment of the data is rather simple, and in particular the assess-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



ment of industrial sources needs to be improved, as detailed below. The following points should be addressed.

1)The title of the paper asks an interesting question, and yet in the conclusions or discussion the question is not addressed fully. It would seem reasonable to extrapolate the fluxes observed from alfalfa and coniferous trees to the state and northeastern US scale (based on crop areas) so as to gauge the relative impacts of anthropogenic/biogenic emission (or even country or global scale if you are more speculative). It would seem from the data that biogenic sources have an impact but how does it compare to the urban area x urban emission rate. What is the US toluene emission from anthropogenic sources for comparison ?

2)There is an interesting reference to biogenic toluene emissions to be found in Nature 1986 (Jüttner & Henatsch). The authors show appreciable amounts of toluene can be produced in the anoxic hypolimnion of a stratified lake. This begs the question, were the plants investigated producing toluene or drawing it, through transpiration, from underground water sources. i.e. was the plant producing it or was the plant a conduit. This would explain the good correlation with temperature.

3)One of the key points in the paper is the summertime increase in toluene. It is important for the paper to establish that this is not attributable to changes in wind direction or speed. An additional figure should be provided showing how the average wind direction and speed vary over the seasons, and particularly for summer versus winter. This would be best presented in combination with a regional map. If air comes from a different source region in winter and summer it does affect the analysis presented.

4)In order to assess the impact of industry a nominal 20 km radius is selected by the authors. The choice of 20 km is not explained and appears to be critical to the estimate of the contribution of industrial emissions to the site. If you take 50 km perhaps the value calculated for industrial emissions jumps as you will encompass more facilities? Perhaps a more objective method would be to examine the region upwind of the site

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



(may be different in different seasons) and use wind speed and say 1 toluene lifetime to determine the length upwind examined. The toluene emissions need not be local since a lifetime of several days allows cross country transport.

5) Have the authors considered using a factor analysis (e.g. Millet et al. JGR 2006) for source apportionment on this data rather than this more simplified analysis method.

6) In the summer, when biogenic toluene emissions are suspected, or from the branch enclosure experiments, how do the values correlate with light (as well as temperature). It looks from fig 6 as if temperature is well correlated but how does the light relate.

7) Figures 1-3 appear compressed in the vertical due to the presence of outliers. Can the authors use box and whisker type plots to display the data better.

Other points

a) Abstract; line 6. Consider "Consequently" b) Introduction page 3, I suggest altering this line to read "Toluene sources are understood to be primarily"

c) There are numerous references to Russo et al in preparation. A manuscript in preparation cannot be cited. Secondly from the number of references to this manuscript one becomes concerned as to the degree of overlap between these papers.

d) Page 4, line 9. "most likely reflects". I suggest replacing these words with "could simply reflect" since the seasonal cycle is in fact driven by OH, as the authors later conclude.

e) Page 5, line 16. "Regional toluene emitting facility" sounds clunky. How about "toluene emitting industrial region"

f) There are a couple references which could be cited for completeness. The original paper identifying acetonitrile as a biomass burning tracer is Lobert et al. 1990 Nature, and for the C₂H₂/CO ratio use for photochemical age the original paper was Smyth et al 1996 JGR.

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

