

## ***Interactive comment on “Ambient aromatic hydrocarbon measurements at Welgegund, South Africa” by K. Jaars et al.***

### **Anonymous Referee #2**

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This work by Jaars et al. presents a years' worth of aromatic hydrocarbon measurements at a rural site in South Africa and an analysis of the sources of the observed hydrocarbons at the site. The authors use back trajectory analyses, dividing the source region into three distinct sectors, use hydrocarbon ratios and correlation coefficients to explore hydrocarbon source types, and estimate ozone formation potential from the aromatic hydrocarbons observed. The authors also argue for NAAQS to include more than just benzene in the air quality standards, as toluene is clearly a more significant air pollutant in the region.

General Comments:

The authors did a very thorough job of introducing the topic of BTEX measurements

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and laying the ground-work for why this work should be published, i.e., that there is a knowledge gap in the literature for BTEX measurements in southern Africa, particularly in South Africa.

The back trajectory analysis is a good method for investigating the lack of seasonal cycles in the observations, and for creating a framework for the overall analysis of the data collected at the site. Overall, this paper provides information that is useful and relevant, and should be published, following a number of changes outlined below.

Specific Comments:

- 1) Page 4190, lines 5-6 - Measurements of (what?) were conducted? Be specific.
- 2) Page 4190, line 29 and page 4191, line 4 – Anthropocentrically is not the correct word to use here. It means “1. Regarding humans as the central element of the universe. 2. Interpreting reality exclusively in terms of human values and experience.” Even if it is true that the region is anthropocentric, which is applying a very specific term to a rather broad region, this is not a sociology paper, and the word anthropogenically is a more appropriate word.
- 3) Page 4191, line 6 – “Atmospheric measurements” of what? Be more specific. Gas-phase chemicals? Air quality indicators? Particles? Air temperatures and weather patterns?
- 4) Page 4193, lines 2-3 – to avoid confusion, add “in this region” or something similar after “conducted a study”.
- 5) Page 4198, lines 3-4 “. . . since toluene levels are usually two to four times higher than benzene concentrations.” – although this statement backed up with three references, the claim is too broad and requires more qualifiers. There are MANY situations globally where benzene concentrations are higher than toluene, so please specify where and/or under what circumstances toluene is higher than benzene.
- 6) Page 4203, line 29 – I have serious issues with this statement. One publication

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from almost 20 years ago from one city (Rome) does not constitute an absolute. I see that there is a second reference to the T/B ratio in Table 2, but again, this is from 20 years ago, and is also from Europe. To say that a value of 2.7 for the ratio of toluene to benzene is “usually an indication of fresh emissions from traffic” says nothing about the fleet of vehicles in question or the relative make-up of the gasoline/diesel mixture in the studied region. If the authors want to say something about the typical toluene/benzene ratio in the emissions of the vehicles in the region in question, they should cite something from that region, otherwise, they need to present a survey of the typical T/B ratios from regions with vehicular emissions that are expected to be similar to South African vehicles, and explain why.

7) Page 4205, lines 2-6. There seems to be a gap in the analysis here, specifically considering the varying lifetimes associated with aromatic hydrocarbons. It is entirely possible that the seasonal cycle that is attributed to solvent evaporation is simply due to differences in different aromatic hydrocarbon lifetimes between summer and winter. The authors should provide some simple modeling to show, given a constant emission of aromatic hydrocarbons, what the temporal TEX/total aromatics would look like for each region, and only \*then\* can they say that “it is clear” that solvent evaporation is contributing significantly to their observations. Otherwise, this entire paragraph is very hand-wavy and is not at all backed up, as pointed out in the last sentence of the paragraph “the magnitude of the contribution was not determined from this data.”

Technical Corrections:

- 1) Page 4192, line 4 – Since it is technically o-xylene, m-xylene and p-xylene, it is more appropriate to write “o-, m-, and p-xylene” here.
- 2) Page 4192, lines 8-9 – “producing peroxy radicals (RO<sub>2</sub>)” should be “producing peroxy radicals (RO<sub>2</sub>)”.
- 3) Page 4193, line 19 – this should read “100 km west of Johannesburg”.

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- 4) Page 4194, line 18 – remove “in order”.
- 5) Page 4201, line 6 – aforementioned is one word, not hyphenated.
- 6) Page 4205, line 13 – remove “on” from Tropospheric O<sub>3</sub> impacts on air quality. . .”

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 4189, 2014.

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