

## ***Interactive comment on “Benzene and Toluene in the surface air of North Eurasia from TROICA-12 campaign along the Trans-Siberian railway” by Andrey I. Skorokhod et al.***

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The authors thank the anonymous referee #2 for the constructive comments and corrections. Our response to all comments is given below.

1. Have the authors considered plotting the concentrations in Figure 3 in a logarithmic rather than in a linear scale? In its current form, only the major concentration pikes can be identified from the figure, while potential differences in "background" concentration C1 ACPD Interactive comment Printer-friendly version Discussion paper between the different regions are very difficult to see.

Reply: Thank you for this recommendation. We plotted the concentrations in a loga-

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rithmic scale.

2. The authors could explain a bit more why and how the T/B ratio can be used as an indicator of chemical ageing. Does the chemical activity of toluene mentioned in the text refer to its OH-reactivity? Is OH the only important oxidant for benzene and toluene, and if not, what does this mean in terms of chemical ageing?

Reply: The chemical activity of toluene mentioned in the text certainly refers to its OH-reactivity. OH-radicals are the main oxidants of all VOCs in the atmosphere, especially at the daytime. Toluene has a shorter atmospheric lifetime than benzene due to its faster photochemical removal by OH (rate constants of  $1.23 \times 10^{-12}$  and  $5.96 \times 10^{-12}$  cm<sup>3</sup> molecule<sup>-1</sup>s<sup>-1</sup> for benzene and toluene, respectively, at 298K by Atkinson and Arey, 2003). Thus, as toluene is more rapidly removed by oxidation, the T/B ratio decreases as air is transported over longer distances away from the pollution source. The chemical oxidation of benzene and toluene by NO<sub>3</sub> and O<sub>3</sub> is very weak ( $k \times 10^{-17}$  cm<sup>3</sup> molecule<sup>-1</sup> s<sup>-1</sup> and  $k \times 10^{-18}$  cm<sup>3</sup> molecule<sup>-1</sup> s<sup>-1</sup>, respectively for NO<sub>3</sub> and O<sub>3</sub>) with faster toluene oxidation comparing with benzene as well.

3. I do not understand the meaning of statement "with similar relation for benzene" following Eq. 1.

Reply: Agreed. It is corrected.

4. The same sentence is repeated starting from lines 13 and 17 on page 8. Concerning the follow up of the latter sentence, one cannot infer from this information that benzene emission from motor vehicle exhaust is 25% lower than toluene emission. The logic here is incorrect!

Reply: Agreed. It is corrected.

5. In the first sentence of page 9, do you mean "Observations in several locations have reported. . ."? If yes, then also the beginning of the next sentence need to be modified: "Contrary to these observations, no . . .".

A high pollution level itself cannot be a reason for the lack of observed diurnal cycle because, in principle, also high concentrations could be relatively evenly distributed. I would rather think that a lack of strong local pollution sources (or lack of very high concentrations above the mixed layer) would be the reason.

The times are not usually given in a.m. or p.m (rather 04:00 and 23:00)

Reply: Agreed. It is corrected.

6. I do not think "meaningful correlation" is proper statistical language. Furthermore, I am not confident that  $R=0.6$  can be considered as a high correlation. Reply:  $R > 0.5$  may be an evidence for (potentially) strong relationship ( $R= 0.5$  to  $1.0$ ) between the compounds observed. Some terminological corrections are included in the text (Section 3.3).

7. What is meant by "one-time maximum permissible concentration"? Also mentioned in section 3.1 and in abstract.

Reply: We meant a maximum concentration of the pollutant, short-term exposure of which (within 20 minutes) does not cause negative human effects. "Short-term exposure limit" would possibly be better. The values of such limits for benzene and toluene are presented according to the Russian regulations. Corresponding corrections are added in the text.

8. Can the statement made on lines 20-23 considered general, as indicated here? These results are based on few measurement data points, so one would expect somewhat different numbers at some other time when travelling the same measurement route. Reply: Agreed. It is corrected.

9. There are a few sentences that need to be re-written to make the text more understandable for the reader. A list of these sentences is given below.

Reply: Agreed. We tried to make them more understandable.

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10. Finally, there are a number of minor grammatical issues that need to be corrected. Below is a list of suggestions for such corrections:

Reply: Agreed. We thank the referee for the corrections. All of them were included in the text.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/acp-2016-858/acp-2016-858-AC2-supplement.pdf>

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-858, 2016.

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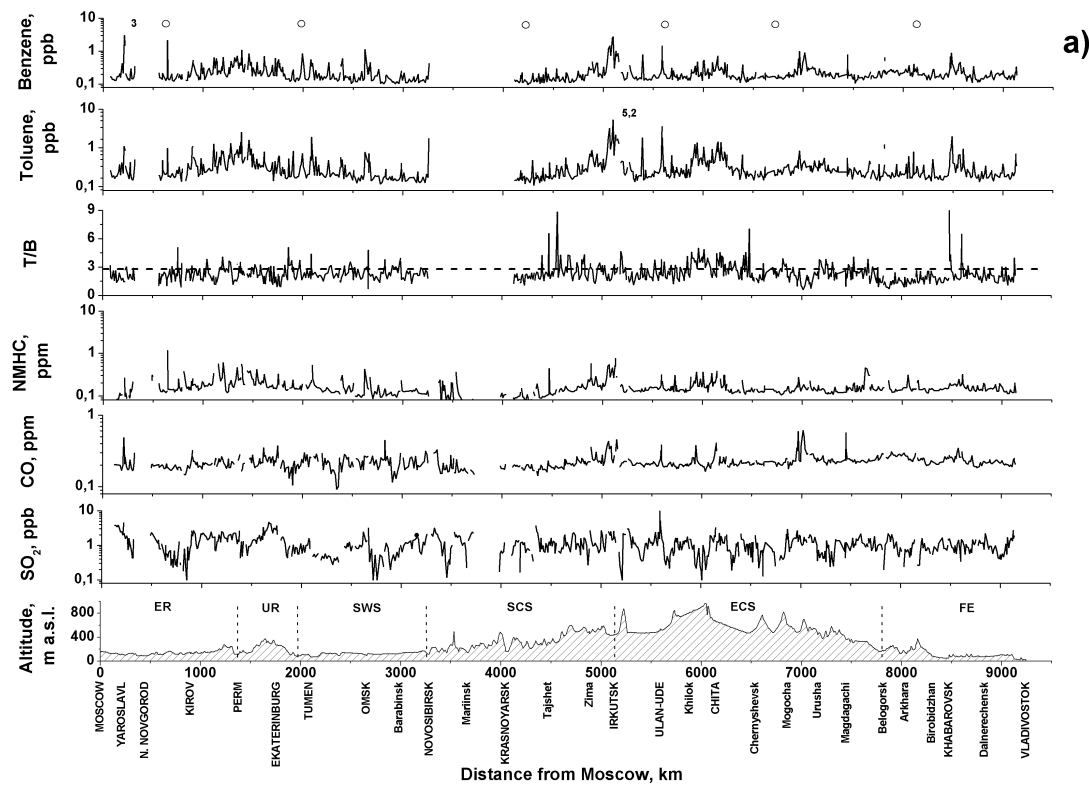


Fig. 1.

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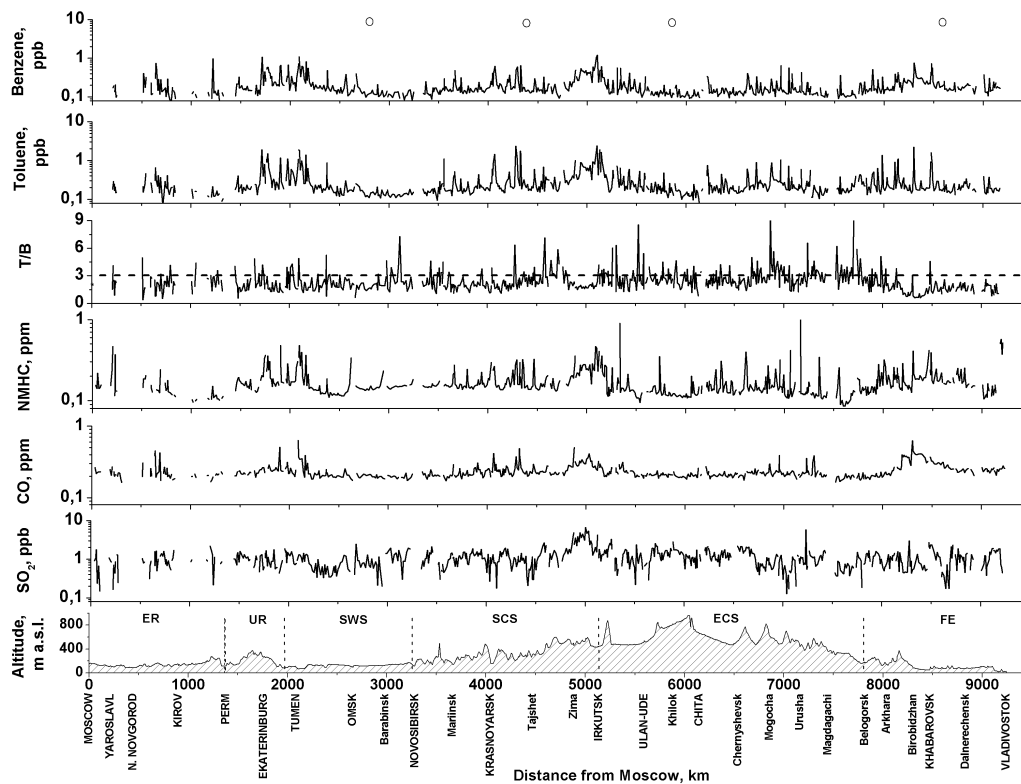


Fig. 2.

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