

# *The effects of diesel exhaust pollution on floral volatiles and the consequences for honey bee olfaction*

Article

Supplemental Material

Lusebrink, I., Girling, R. D. ORCID: <https://orcid.org/0000-0001-8816-8075>, Farthing, E., Newman, T. A., Jackson, C. W. and Poppy, G. M. (2015) The effects of diesel exhaust pollution on floral volatiles and the consequences for honey bee olfaction. *Journal of Chemical Ecology*, 41 (10). pp. 904-912. ISSN 0098-0331 doi: <https://doi.org/10.1007/s10886-015-0624-4> Available at <https://centaur.reading.ac.uk/43963/>

It is advisable to refer to the publisher's version if you intend to cite from the work. See [Guidance on citing](#).

Published version at: <http://dx.doi.org/10.1007/s10886-015-0624-4>

To link to this article DOI: <http://dx.doi.org/10.1007/s10886-015-0624-4>

Publisher: Springer Verlag

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the [End User Agreement](#).

[www.reading.ac.uk/centaur](http://www.reading.ac.uk/centaur)

**CentAUR**

Central Archive at the University of Reading

Reading's research outputs online

## Supporting online information

### THE EFFECTS OF DIESEL EXHAUST POLLUTION ON FLORAL VOLATILES AND THE CONSEQUENCES FOR HONEY BEE OLFACTION

Inka Lusebrink <sup>1,\*</sup>, Robbie D. Girling <sup>1,3</sup>, Emily Farthing <sup>1</sup>, Tracey A. Newman <sup>2</sup>, Chris W. Jackson <sup>1</sup>, Guy M. Poppy <sup>1</sup>

<sup>1</sup>*Centre for Biological Sciences, Life Sciences Building 85, University of Southampton, Southampton, United Kingdom SO17 1BJ*

<sup>2</sup>*Faculty of Medicine and Institute for Life Sciences, Life Sciences Building 85, University of Southampton, Southampton, United Kingdom SO17 1BJ*

<sup>3</sup>*School of Agriculture, Policy and Development, University of Reading, Reading; United Kingdom RG6 6AR*

\* Corresponding author: [I.Lusebrink@soton.ac.uk](mailto:I.Lusebrink@soton.ac.uk); phone: +44(023) 8059 4258

### *Comparison of peak areas of CFV and OSR volatiles measured by SPME*

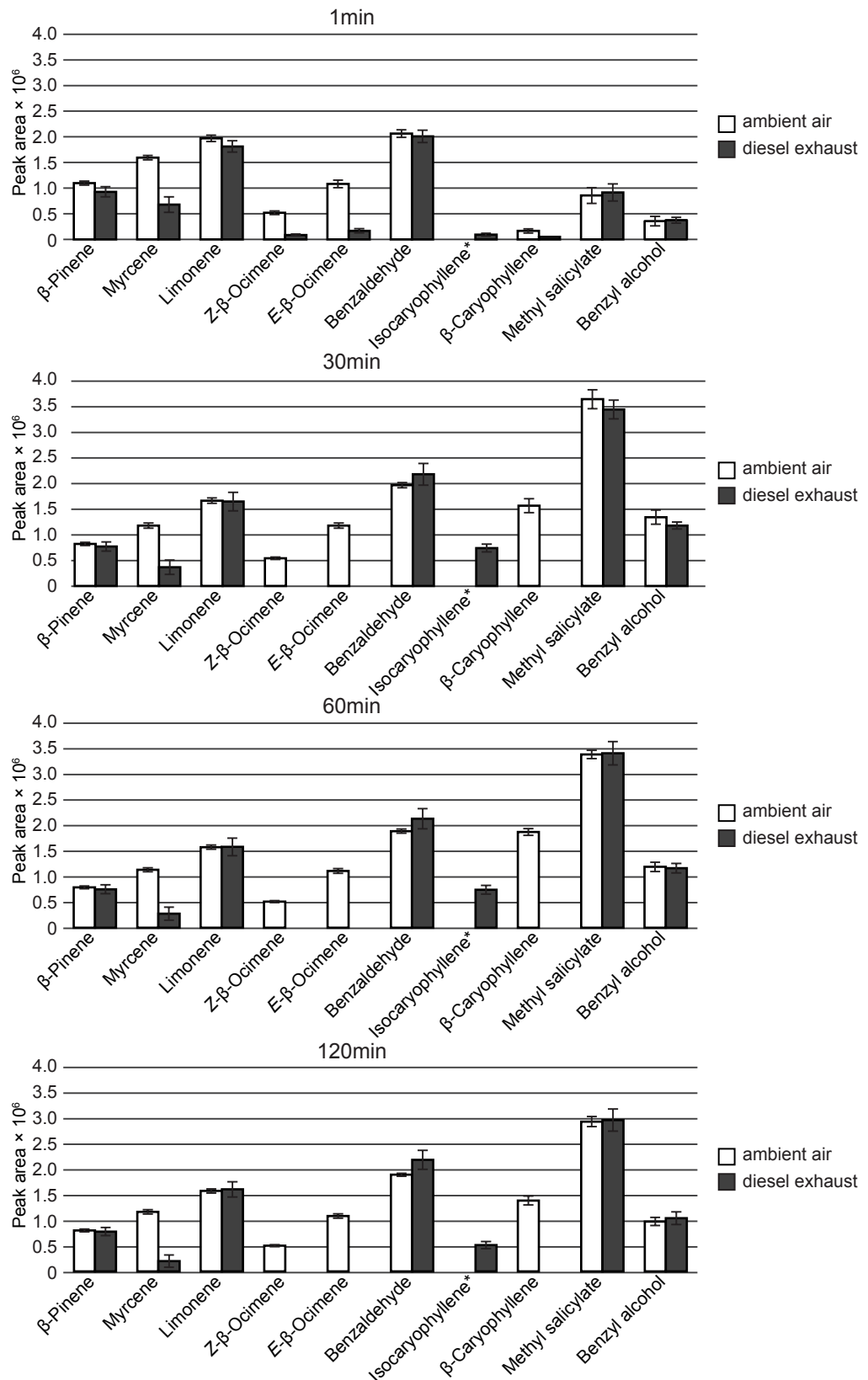
Due to the amount of volatile exposures samples in our study we needed to switch SPME fibers during data collection, however, the SPME fibers were from the same lot and the abundance data did not vary significantly (Fig. 6); especially when compared to the variation seen in the NOX exposure data that was collected using only one SPME fiber (Fig. 4).

For example the compound with the highest variation in the NOX exposure experiment from the ambient air treatment was limonene, its S.D. was 8.82% of the average abundance. Whereas, in the CFV blend exposures itself the S.D. of limonene was only 4.65% of the average abundance. This demonstrates that using SPME fibers from the same lot might allow comparative analyses of samples taken with more than one SPME fiber.

Comparative statistics were not conducted in our studies, but the peak area data of the CFV blend were plotted as bar graphs with 95% confidence intervals (C.I.) as error bars (Fig. 5). This allows a visual comparison between volatiles exposed to ambient air and diesel exhaust, since non overlapping error bars indicate a significant difference with a P-value less than 0.05 (Payton et al. 2003).

Payton ME, Greenstone MH, Schenker N (2003) Overlapping confidence intervals or standard error intervals: What do they mean in terms of statistical significance? *J Insect Sci.* 2003; 3: 34 doi:10.1093/jis/3.1.34

## Common floral volatile blend

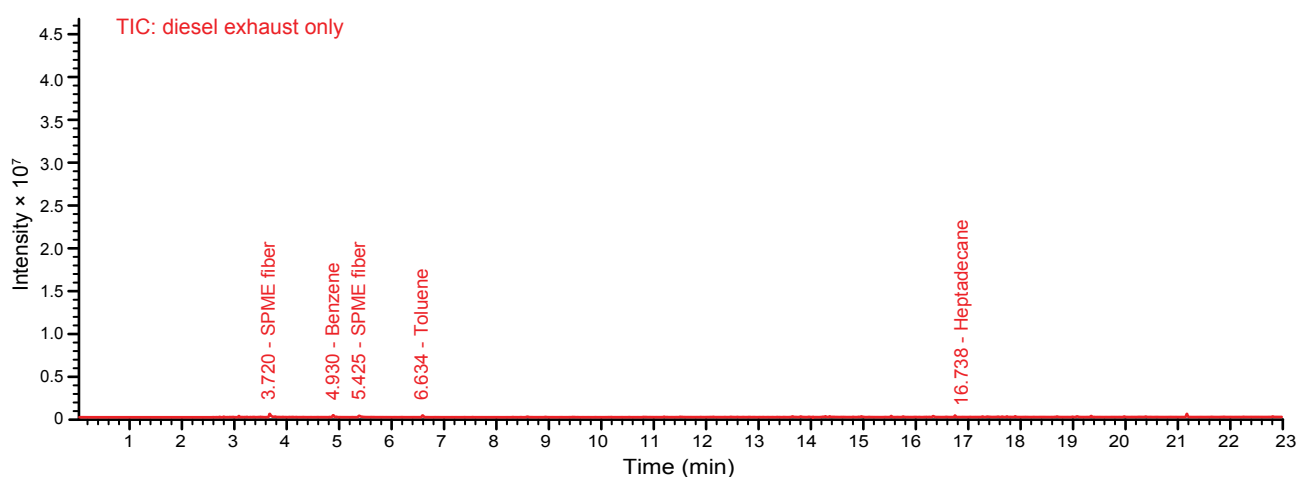


**Fig. 5** Peak areas ( $\pm$  95% C.I.) of the CFV blend under ambient air condition compared to peak areas after diesel exhaust exposure measured by SPME at different time points (1min, 30min, 60min, 120 min). Non overlapping error bars represent a significant difference. Isocaryophyllene\* is a rearrangement product of  $\beta$ -caryophyllene and not part of the original blend.

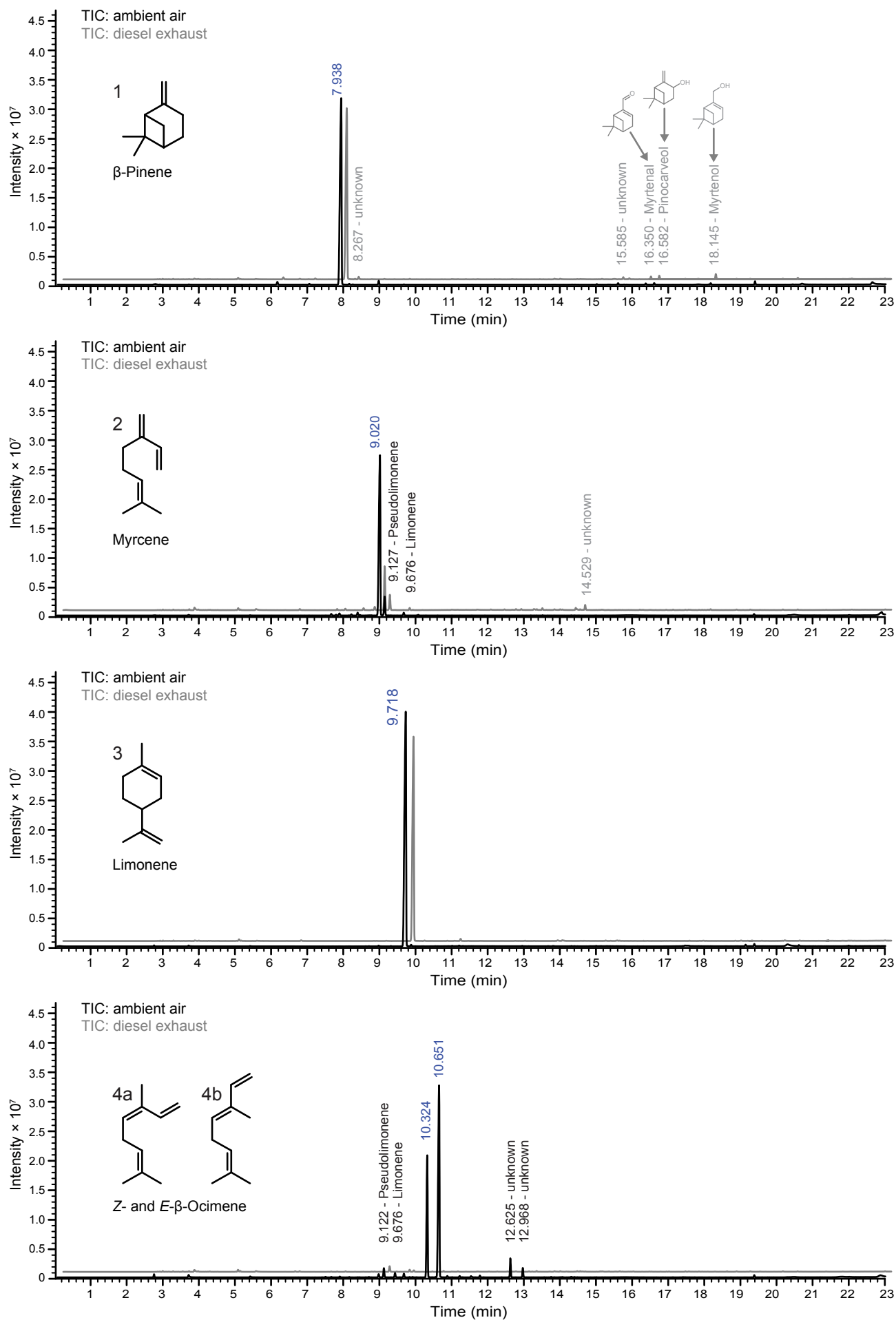
### *Fate of individual floral volatiles*

In order to determine the fate of all individual volatiles, we exposed every single compound to ambient air and diesel exhaust as mentioned in the main manuscript. For the analysis of the data we considered all peaks that were integrated by the chromatogram integration function in MSD ChemStation in either the ambient air or diesel exhaust TICs. Once a compound was found in either run, it was searched for manually in the other, if its abundance was below the detection limit of the integration function. As many compounds as possible were identified with standard injection or retention index and mass spectrum comparison.

The method used in this study did not allow to determine the possible destiny of all compounds in a diesel exhaust polluted environment (see all TICs on the following 2 pages; Fig. 6). See below for the TIC of diesel exhaust only, the measured abundance of all identified peaks was very low, therefore it appears almost like a flat line compared to all following TICs.

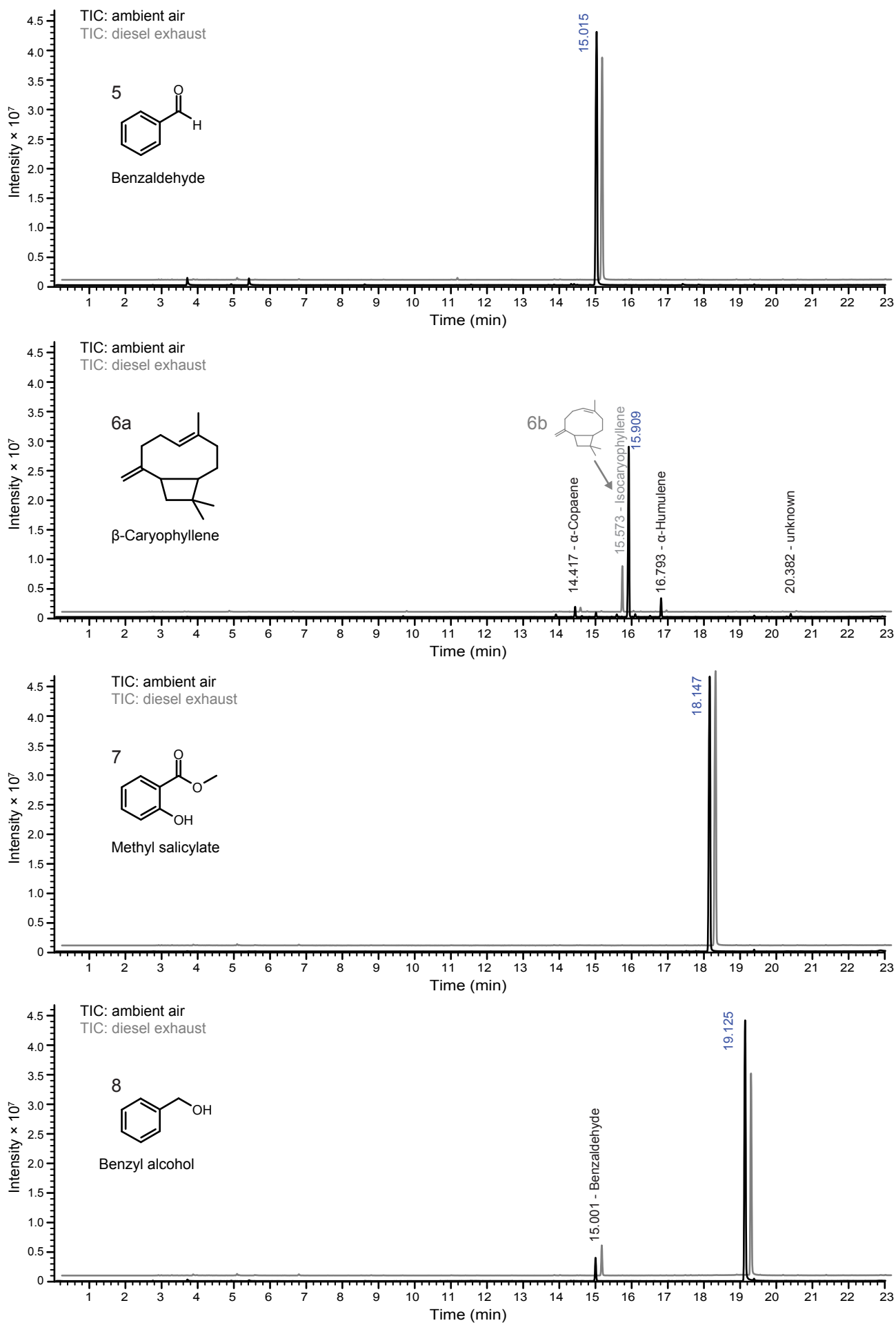


## common flower volatile blend



**Fig. 6** TICs of all individual floral compounds in ambient air and after 30min exposure to diesel exhaust.

## common flower volatile blend



**Fig. 6** TICs of all individual floral compounds in ambient air and after 30min exposure to diesel exhaust.