Electronic Supplementary Material (ESI) for Environmental Science: Processes & Impacts.

Electronic Supplementary Information

Figure 1 – flow schematic showing GCFIDQMS instrument setup

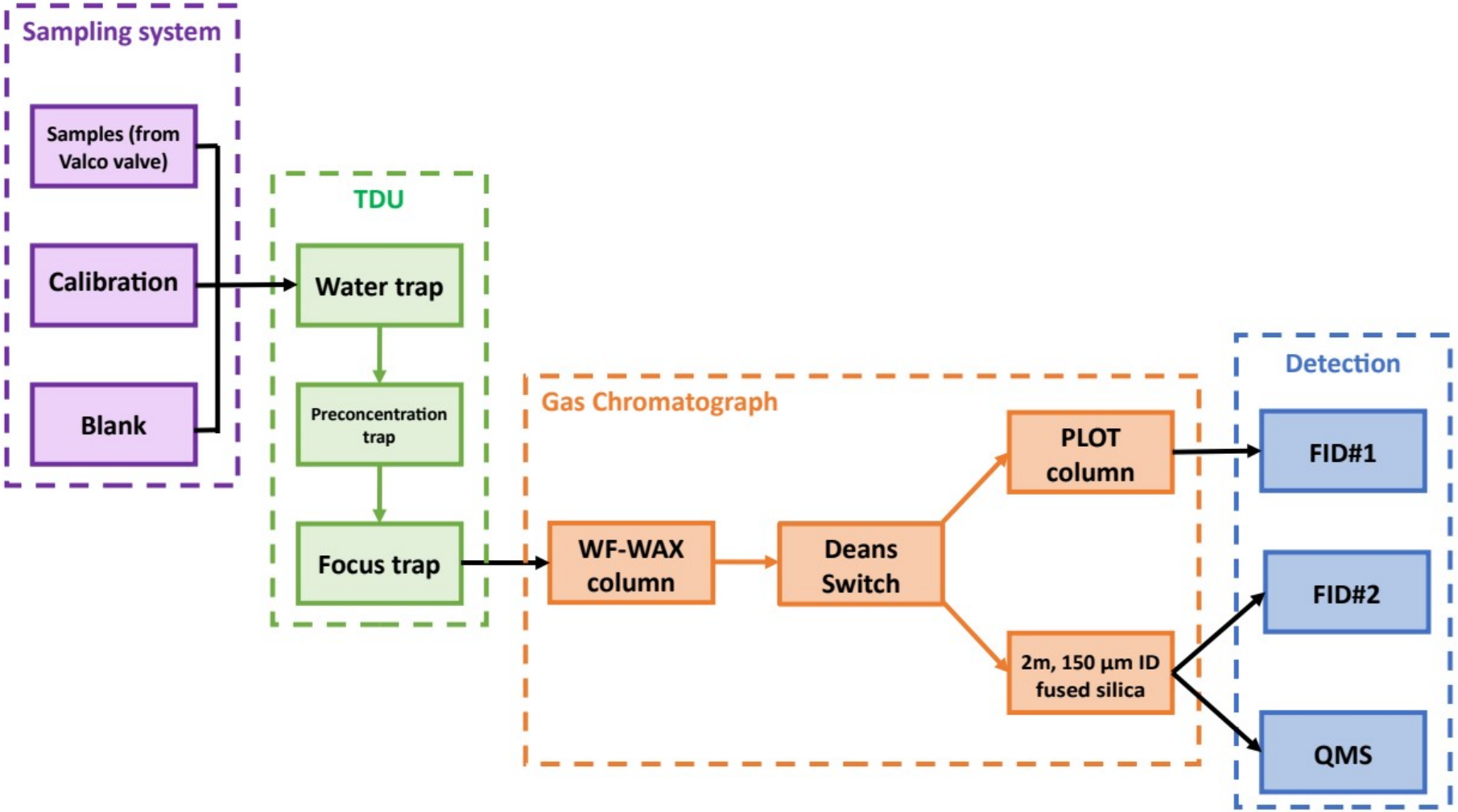

Figure 2 – table showing the list of species quantified and the quantification method used.

Species name	Quantification method
Ethane	Direct calibration using NPL 30
Ethene	Direct calibration using NPL 30
Propane	Direct calibration using NPL 30
Propene	Direct calibration using NPL 30
iso-butane	Direct calibration using NPL 30
n-butane	Direct calibration using NPL 30
Acetylene	Direct calibration using NPL 30
But-1-ene	Direct calibration using NPL 30
cis-but-2-ene	Direct calibration using NPL 30
isopentane	Direct calibration using NPL 30
n-pentane	Direct calibration using NPL 30
cis-pent-2-ene	Direct calibration using NPL 30
n-hexane	Direct calibration using NPL 30
Isoprene	Direct calibration using NPL 30
n-heptane	Direct calibration using NPL 30
n-octane	Direct calibration using NPL 30
Ethylbenzene	Direct calibration using NPL 30
m-xylene	Direct calibration using NPL 30
o-xylene	Direct calibration using NPL 30
1,3,5-trimethylbenzene	Direct calibration using NPL 30
1,2,4-trimethylbenzene	Direct calibration using NPL 30
1,2,3-trimethylbenzene	Direct calibration using NPL 30
Benzene	Direct calibration using NPL 30
Toluene	Direct calibration using NPL 30
Styrene	Equivalent carbon number using toluene as reference
Acetone	Equivalent carbon number using toluene as reference
Acetaldehyde	Equivalent carbon number using toluene as reference
Hexanal	Equivalent carbon number using toluene as reference
Butan-2-one	Equivalent carbon number using toluene as reference
Methanol	Equivalent carbon number using toluene as reference
Benzaldehyde	Equivalent carbon number using toluene as reference
Ethanol	Equivalent carbon number using toluene as reference
Ethyl acetate	Equivalent carbon number using toluene as reference
Butyl acetate	Equivalent carbon number using toluene as reference
Propyl acetate	Equivalent carbon number using toluene as reference
Acetonitrile	Equivalent carbon number using toluene as reference
Dichloromethane	Equivalent carbon number using toluene as reference
α-pinene	Equivalent carbon number using toluene as reference
β-pinene	Equivalent carbon number using toluene as reference
D-limonene	Equivalent carbon number using toluene as reference
Eucalyptol	Equivalent carbon number using toluene as reference
β-terpinene	Equivalent carbon number using toluene as reference
γ-terpinene	Equivalent carbon number using toluene as reference
δ-terpinene	Equivalent carbon number using toluene as reference
3-carene	Equivalent carbon number using toluene as reference
β-myrcene	Equivalent carbon number using toluene as reference
p-cymene	Equivalent carbon number using toluene as reference

Figure 3a – Porous layer open tubular (PLOT) column elutions of a canister air sample with signal strength/response units on y-axis and retention time (RT)/acquisition time on x-axis. The first three signals from the left show a split ethane signal starting at roughly RT 9min and ending at roughly RT 10.2min, ethene signal just before RT 11min, and a split propane signal starting at roughly RT 12min and finishing at roughly RT 13min.

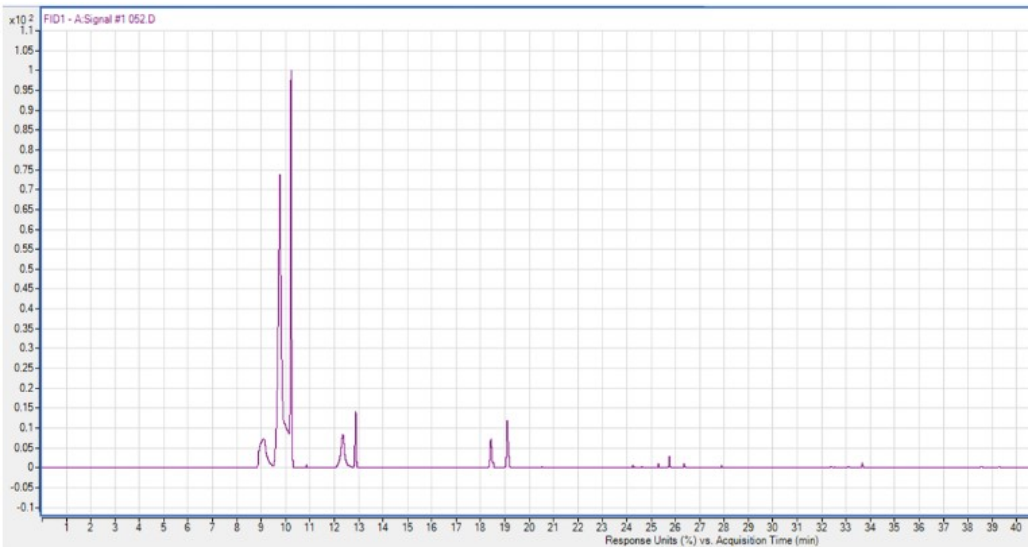

Figure 3b – The same canister sample run in Fig. A run a second time, showing better signal responses and resolution. Only data obtained from Fig. B was used in data workup.

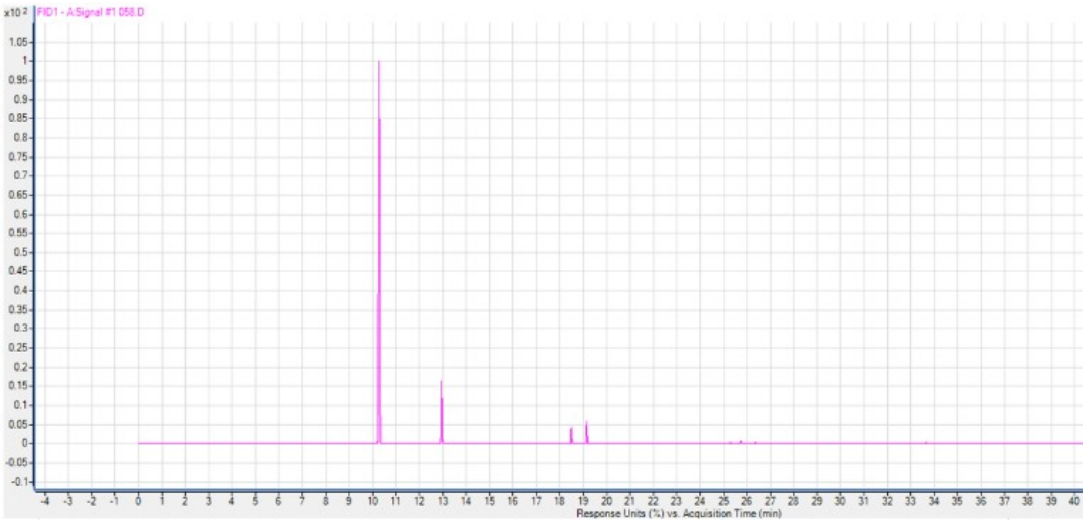

Figure 4 – images showing the plug-in diffuser used in this study. It consists of a standard UK three-pin plug, and a small tank containing the fragrance oil and wick, covered with a fascia plate.

Figure 5 – the questions presented in the iPad-based questionnaire given to participants to fill out each day during each sampling period

All Questions

Thank you for volunteering to take part in this test

Please read the instructions carefully on the next page before starting the test

Indoor Atmosphere Survey

The results of this survey will remain completely anonymous to any third party. Please answer all questions in this short survey. The Canister ID is located on the canister itself, please enter the ID in the box below, so we can link the measurements to the data you provide here.

1: **Full Name**

2: **Please enter your Canister ID: (this is the number on the white label titled serial number)**

Section I – Building Environment

3: **Number of bedrooms in your house:**

- Studio
- 1
- 2
- 3
- 4

☐ 5+

4: **Property Type:**

☐ Studio/Apartment
☐ Terraced
☐ Semi-Detached
☐ Detached

5: **Property Era:**

☐ Victorian or earlier
☐ 1920's - 1930's
☐ 1940's - 1950's
☐ 1960's - 1970's
☐ 1980's - 2000's
☐ 2000+

6: **Do you have a garage built into your property?**

☐ Yes
☐ No

7: **Is your home mostly**

☐ Single Glazed
☐ Double/Triple Glazed

Demographic Information

In this section please provide some basic information on the people in your household.

When giving details you (the person completing the form) is Resident 1.

8: **Number of residents living in your house:**

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5+

Resident 1 (person completing the form)

9: **Please select your Gender**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

10: **Please select the age category for each member of the household**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 1 (person completing the form)

11: **Please select Gender for Resident 1**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

12: **Please select the age category for Resident 1**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60

61 - 75
75+

Resident 2

13: **Please select Gender for Resident 2**
Male
Female
Prefer not to say

14: **Please select the age category for Resident 2**
Under 18
18 - 30
31 - 45
46 - 60
61 - 75
75+

Resident 1 (person completing the form)

15: **Please select Gender for Resident 1**
Male
Female
Prefer not to say

16: **Please select the age category for Resident 1**
Under 18
18 - 30
31 - 45
46 - 60
61 - 75
75+

Resident 2

17: **Please select Gender for Resident 2**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

18: **Please select the age category for Resident 2**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 3

19: **Please select Gender for Resident 3**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

20: **Please select the age category for Resident 3**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 1 (person completing the form)

21: **Please select Gender for Resident 1**

Male
Female
Prefer not to say

22: **Please select the age category for Resident 1**

Under 18
18 - 30
31 - 45
46 - 60
61 - 75
75+

Resident 2

23: **Please select Gender for Resident 2**

Male
Female
Prefer not to say

24: **Please select the age category for Resident 2**

Under 18
18 - 30
31 - 45
46 - 60
61 - 75
75+

Resident 3

25: **Please select Gender for Resident 3**

Male
Female
Prefer not to say

26: **Please select the age category for Resident 3**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 4

27: **Please select your Gender**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

28: **Please select the age category for each member of the household**

- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 1 (person completing the form)

29: **Please select Gender for Resident 1**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

30: **Please select the age category for Resident 1**

- [ ] Under 18

- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 2

31: **Please select Gender for Resident 2**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

32: **Please select the age category for Resident 2**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60
- [ ] 61 - 75
- [ ] 75+

Resident 3

33: **Please select Gender for Resident 3**

- [ ] Male
- [ ] Female
- [ ] Prefer not to say

34: **Please select the age category for Resident 3**

- [ ] Under 18
- [ ] 18 - 30
- [ ] 31 - 45
- [ ] 46 - 60

61 - 75
75+

Resident 4

35: **Please select your Gender**
Male
Female
Prefer not to say

36: **Please select the age category for each member of the household**
18 - 30
31 - 45
46 - 60
61 - 75
75+

Resident 5

37: **Please select your Gender**
Male
Female
Prefer not to say

38: **Please select the age category for each member of the household**
18 - 30
31 - 45
46 - 60
61 - 75
75+

39: **Do you, or does anyone in your household, smoke or use e-cigarettes/Vaping (even if only outside)?**

Yes
No

Section 2 – Domestic Fuel Use

40: **Please indicate below the type of Heating that you currently use in your house:**

Wood Stove	Coal	Log Burner	Other Solid fuel (please specify in the box provided below)	Gas central heating	Electric central heating	Oil central heating	LPG central heating
☐	☐	☐	☐	☐	☐	☐	☐

41: **If you stated 'other solid fuel' - please specify below which you use.**

42:
Please indicate below the type of fuel that you currently use in your house for cooking:

Gas	Electric	Solid fuel (please specify in the box provided below)
☐	☐	☐

43: **Solid fuel - please specify below:**

Section 3 – Consumer Product Use

In this section please indicate the number of times that each of the below products has been used during the day. This relates to all people within the household. i.e total use of products by all residents in the home.

If you have not used the type of product indicated, please put a '0' in the corresponding box.

44: **Personal Care Products**

Antiperspirant/Deodorant
Aftershave/Perfume
Hairspray

48: **Household Products**

Air fresheners sprays
Plug-in air fresheners (please indicate the number of devices you have switched on)
Cleaning sprays
Furniture polishes
Insecticides / fly spray
Candles

55: **Solvent Products**

Paints (gloss or water based)
Glues

Sealants or mastic

59: **Have you cut flowers/flowers in bloom in your house today?**

Yes
No

60:
Have you or anyone else in your household smoked or used E-Cigarettes or Vape even if ONLY outside during the day?

Yes
No

Many thanks for your help in completing this survey.

Please 'submit' your answers.

Figure 6 – Boxplots showing different species concentration values, aggregated across all houses and separated by diffuser status. The y-axis has been transformed to a $\log_{10}$ scale to aid presentation.

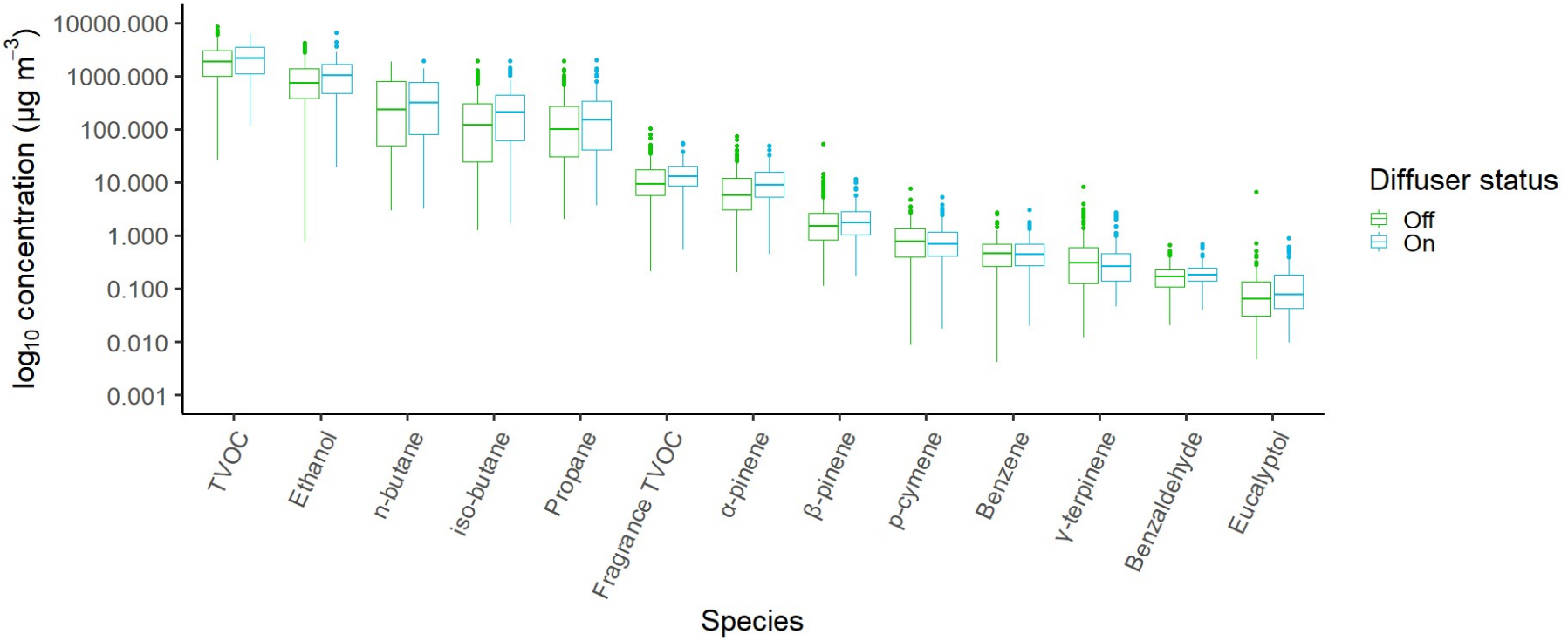

Figure 7(a) – correlation matrix showing inter-VOC correlations when the diffuser was off. A forward slanting blue line indicates a positive correlation, a full circle indicates no correlation, and a backward slanting red line indicates a negative correlation. A more intense colour and a narrower line indicates a stronger correlation.

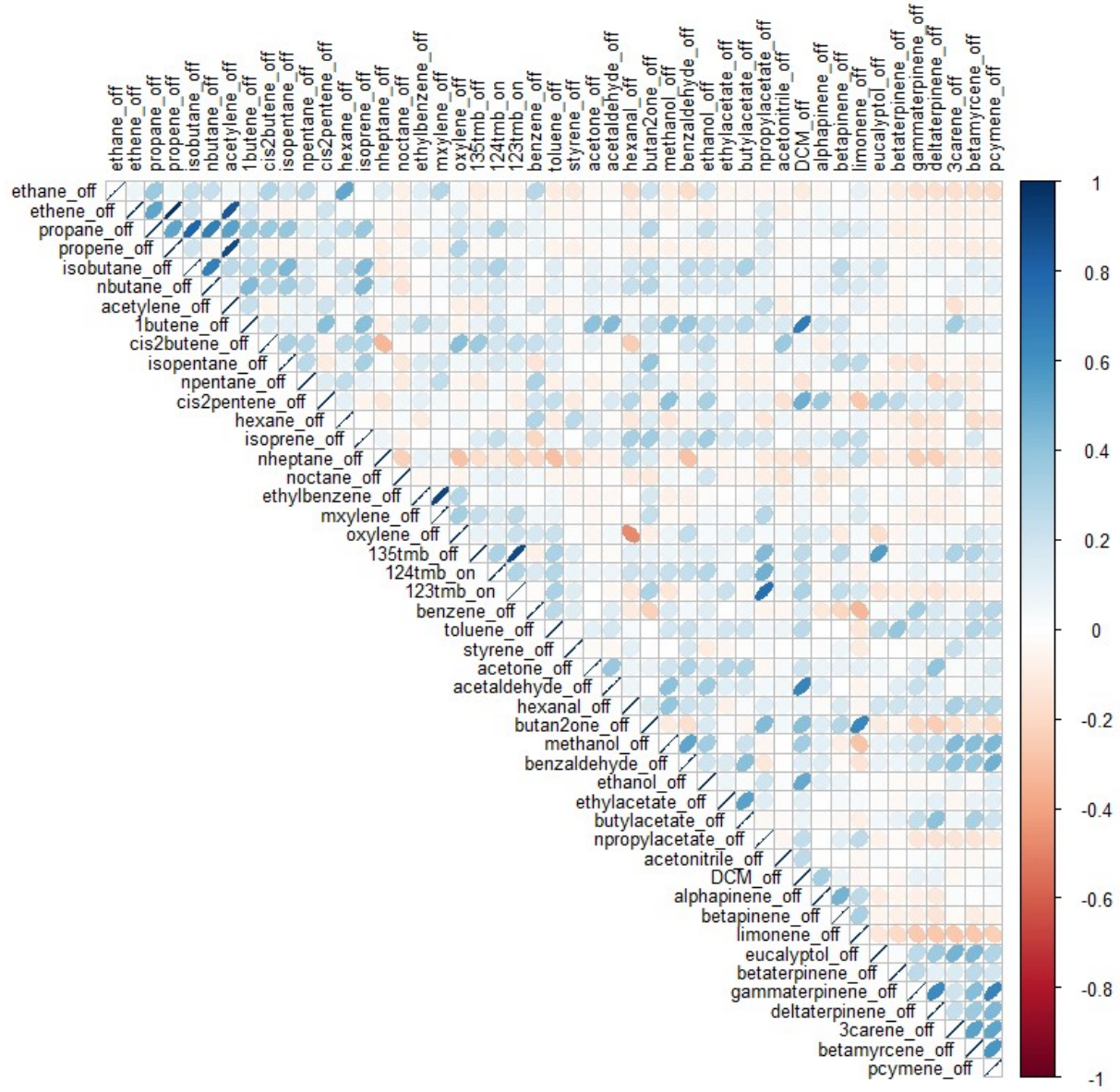

Figure 7(b) - correlation matrix showing inter-VOC correlations when the diffuser was on. A forward slanting blue line indicates a positive correlation, a full circle indicates no correlation, and a backward slanting red line indicates a negative correlation. A more intense colour and a narrower line indicates a stronger correlation.

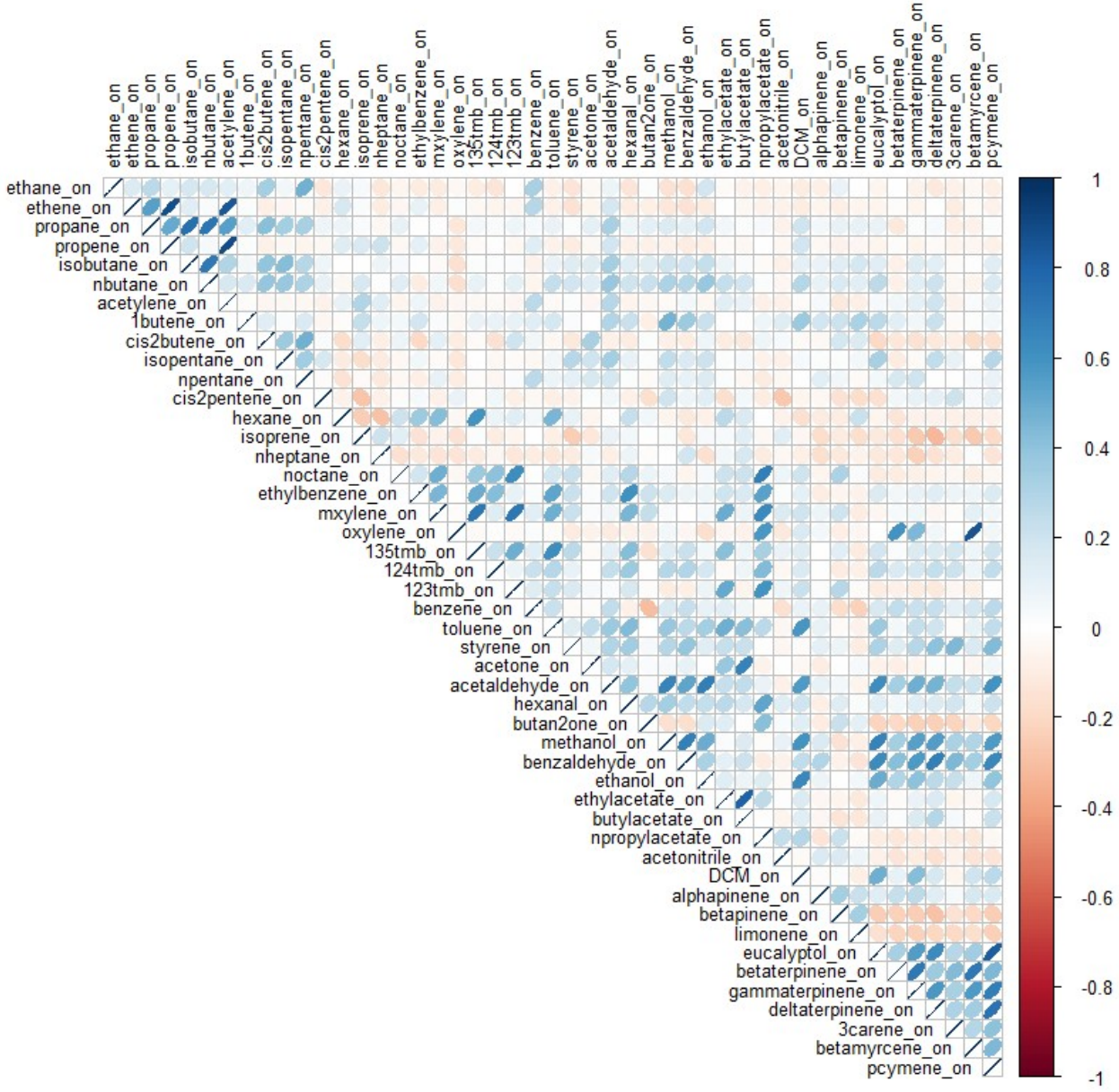

Figure 8 – plots showing the mean changes in concentration separated by diffuser status. Plots were made treating each house as a separate series of samples.

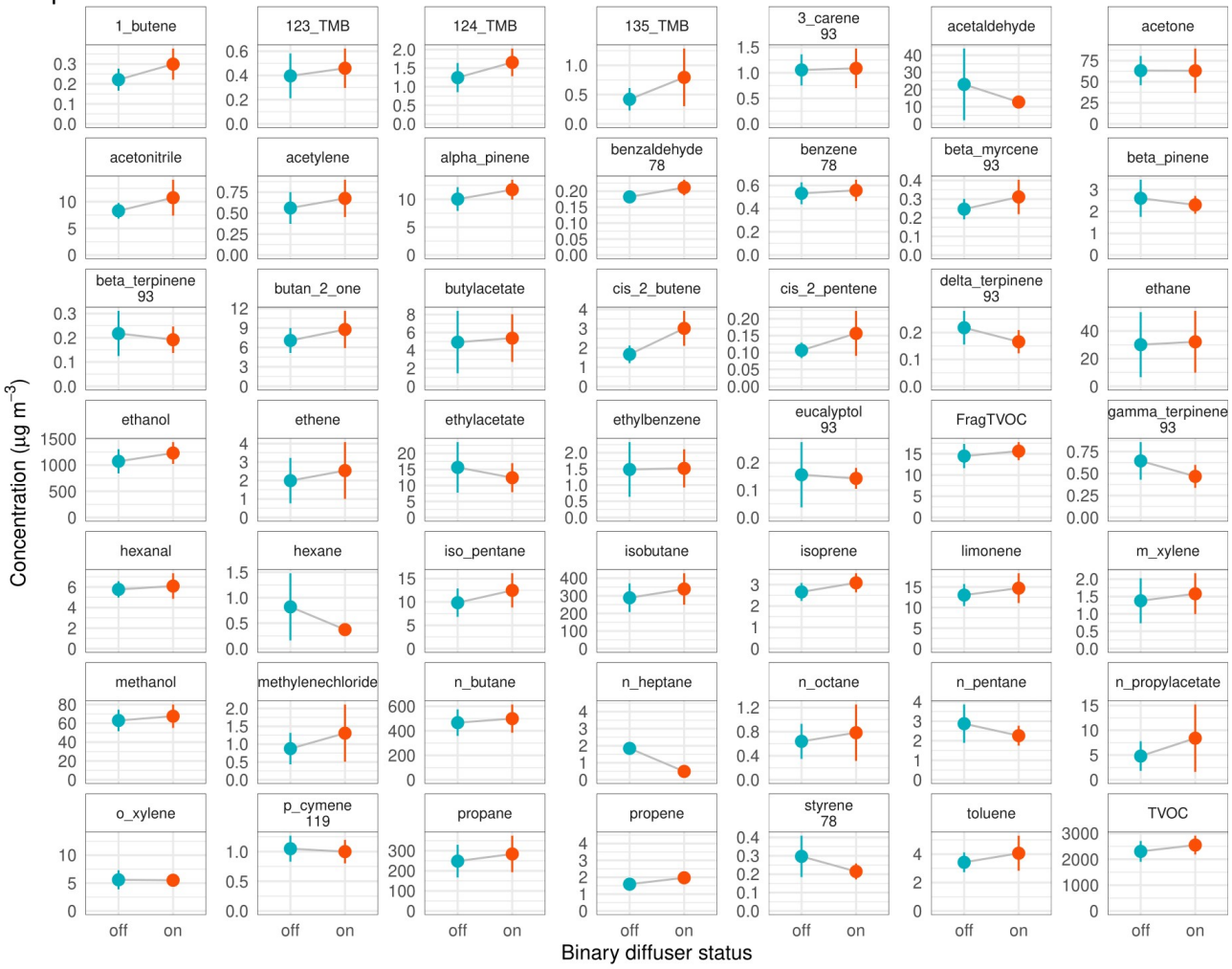

Figure 9 – total product use over each sample period plotted against TVOC concentrations for the sample taken during the same period, split into quantiles based on baseline TVOC concentrations. Q1 contains the houses with the 25% highest baseline TVOC concentrations, indicative of the 25% lowest AER, and Q4 contains the houses with the 25% lowest baseline TVOC concentrations, indicative of the 25% highest AER.