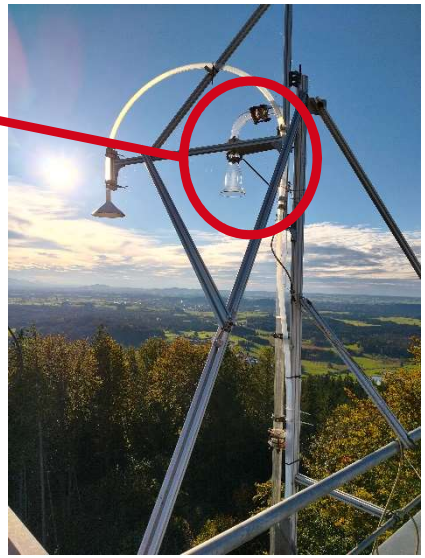
VOC data Hohenpeissenberg 2024 - Issues and open questions

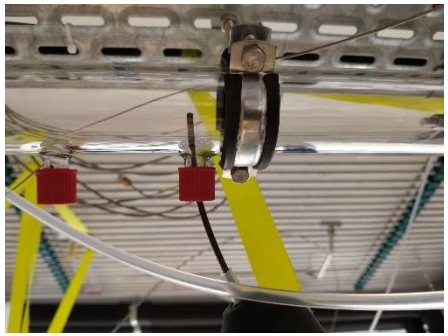
Anja Claude, Felix Klein, Katja Michl, Erasmus Tensing, Elisabeth Eckart, Barbara Naßl, and Dagmar Kubistin
Meteorological Observatory Hohenpeissenberg, DWD, Germany

Instrument set-up

- 17m above ground
- 2m above building

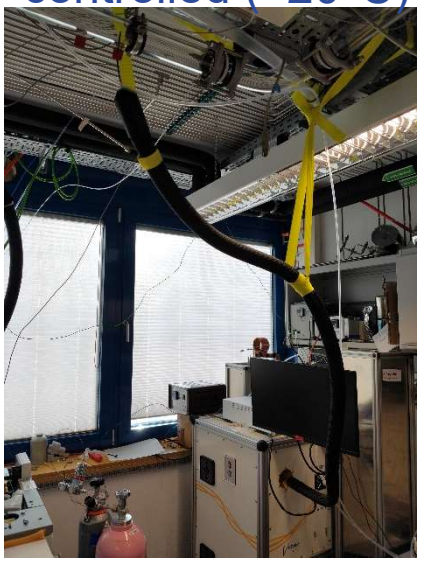
- 4cm glass manifold
- 12 m/s flow





- Core sampling 7m from inlet
- 2m heated (40°C) 1/16“ silconert line
- Residence time ~1s

- Temperature controlled (~20°C)



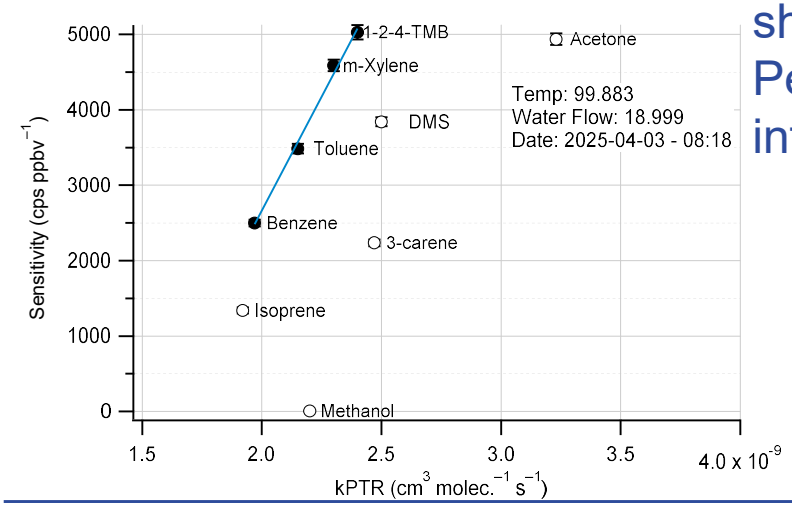
Calibration and maintenance

- ➔ Zero (10 min) every 9 hours
  - ➔ Zero air from 400°C Pt/Pd catalyst
- ➔ Calibration (10 min) every 9 hours
  - ➔ 12 compounds 1ppm NPL calibration standard diluted 1:500 (~2ppb)
- ➔ Target standard (diluted NPL 100) once a month
- ➔ Test of single compounds planned with LCU

- Maintenance
  - ✓ Refill water bottle (1/month)
  - ✓ Exchange forepump ballast outlet filter (4/year)
  - ✓ Exchange MCP (>1/year)
  - ✓ Clean/exchange source (<2years)
  - ✓ Exchange/clean capillary (if needed)

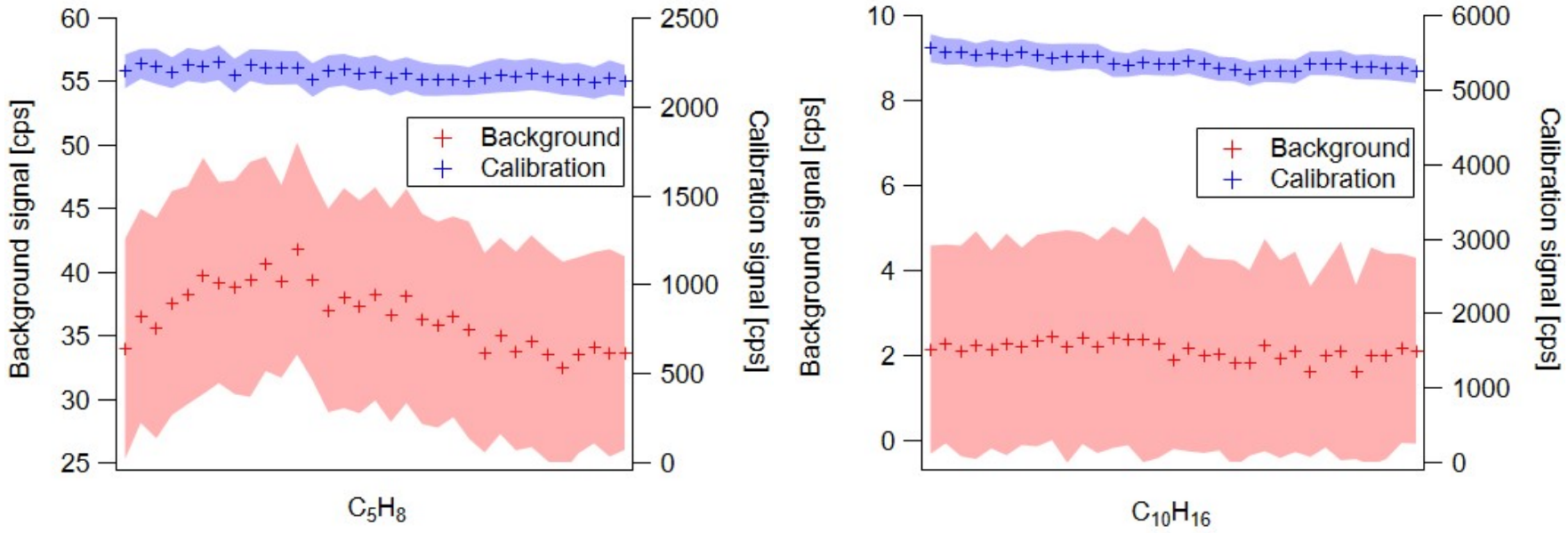
Data treatment

1s raw data → **Tofware** Pre-averaging → 1min raw data → **Tofware** Masscalibration, Peak shape/width, Peak (374) integration → cps → **Vocus Toolkit** Zero subtraction, Sensitivity calibration, Transmission calibration → Mixing ratios

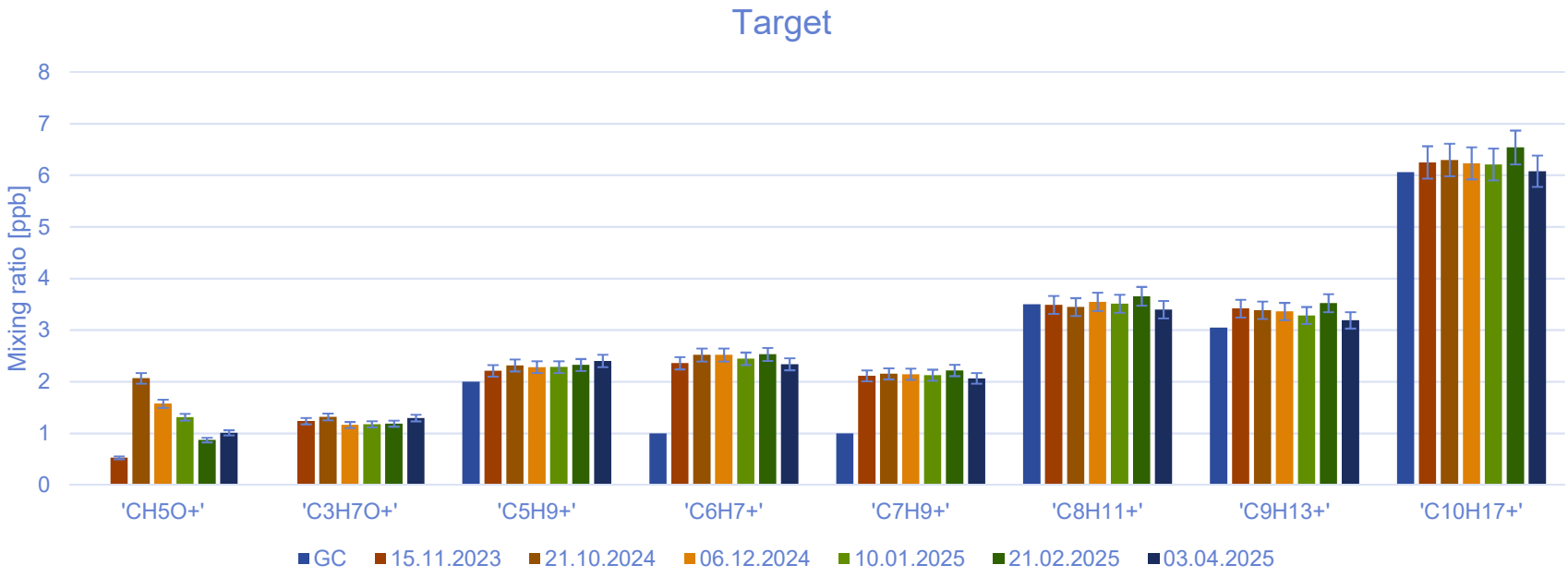


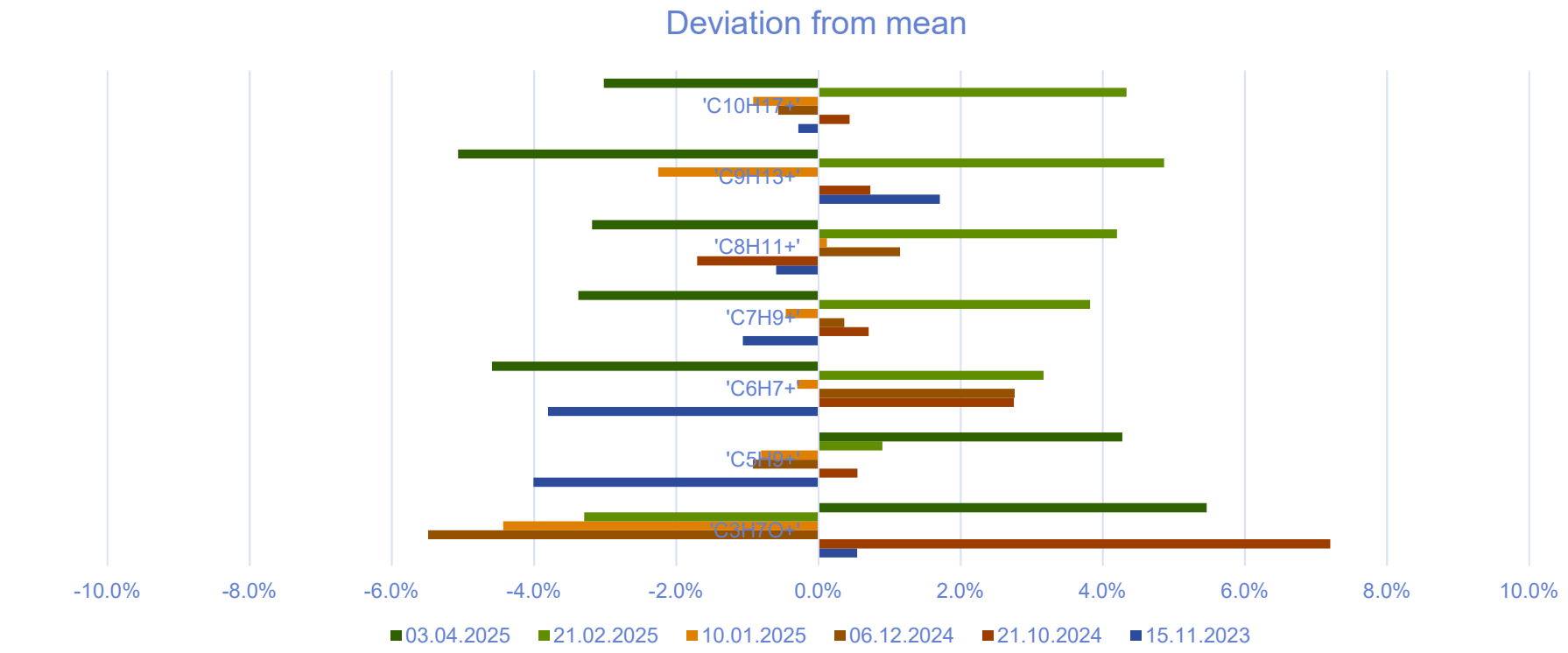
- Sensitivity around 5000 cps/ppb for Xylene
- Resolution around 5000 m/dm for Xylene
- Uncertainty >5%

Stability of background and calibration



Target Standard (diluted NPL 100)




Deviation from mean
'C10H17+'
'C9H13+'
'C8H11+'
'C7H9+'
'C6H7+'
'C5H9+'
'C3H7O+'
-10.0%
-8.0%
-6.0%
-4.0%
-2.0%
0.0%
2.0%
4.0%
6.0%
8.0%
10.0%
03.04.2025
21.02.2025
10.01.2025
06.12.2024
21.10.2024
15.11.2023

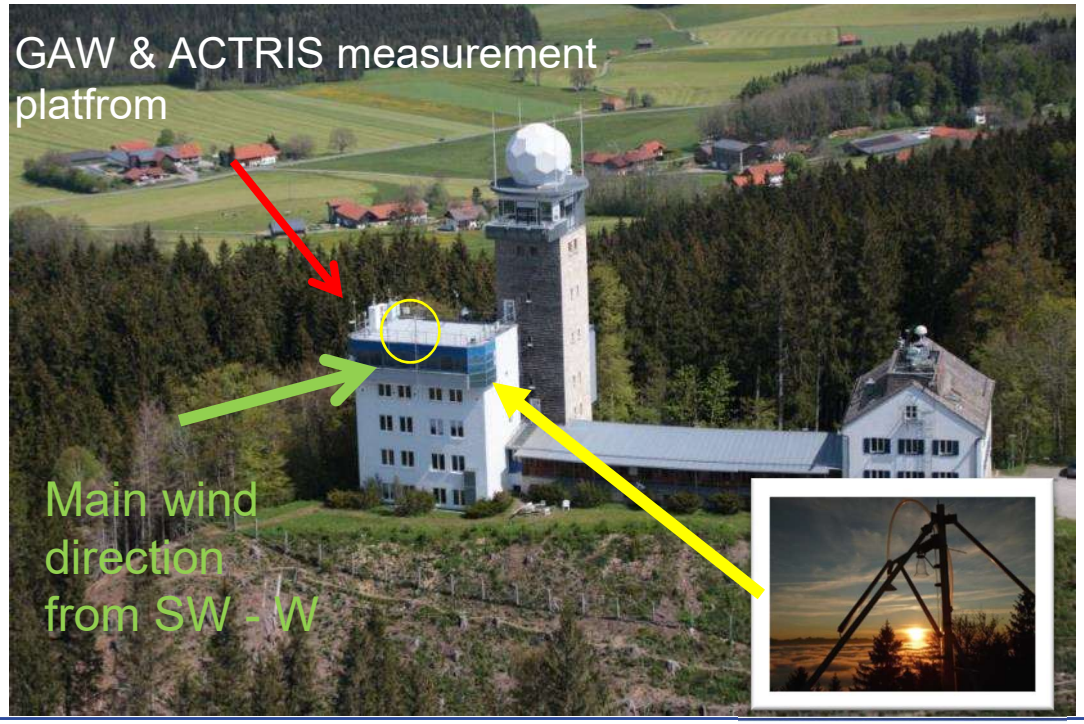
Lessons learned

- VOCUS PTR is running stable for longterm without excessive maintanence
- Automatization with VOCUSExplore works well
- In clean environments MCP lasts much longer then one year
- Calibration and zero every 9 hours is enough (even less would be possible)
- In general good correlation with GCMS data (with open questions)

Problems

- Large amount of data makes data treatment and QA/QC difficult
- Pump failure (only happend once)
  - Change of ballast exhaust filter
- Clogging of the capillary
  - Monitoring of pressure control valve position
- Tailing of calibration
  - (partly?)fixed by additional pumping at the inlet and zero air after calibration

NMHC meaurements / GC-FID @ Hohenpeißenberg



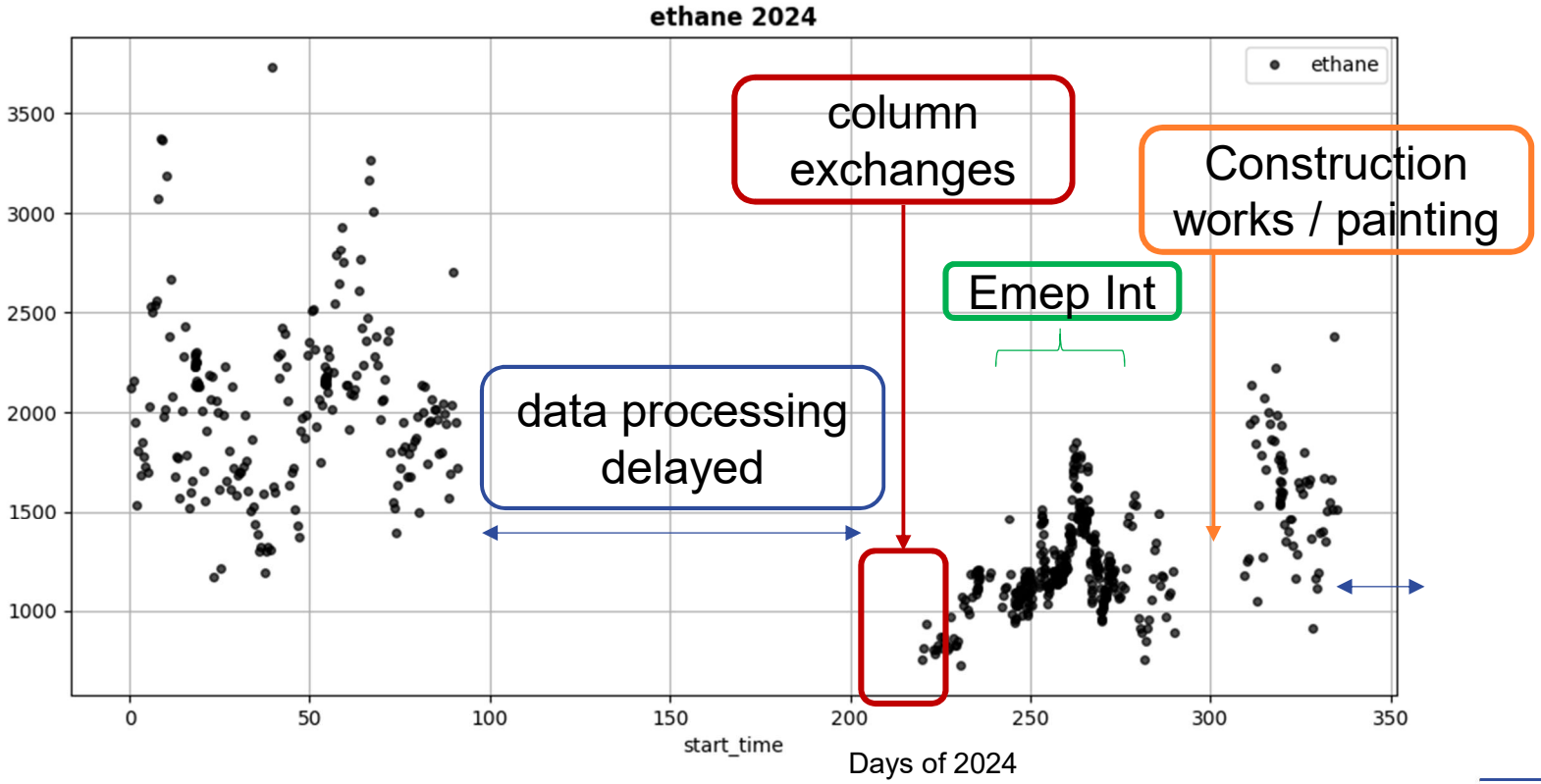
GC-FID C_2-C_8 since 1998 (updated in 2007)

Glass inlet line (not heated) on top of the lab (375 L/min, about 8 m length, 4 cm i.d.)

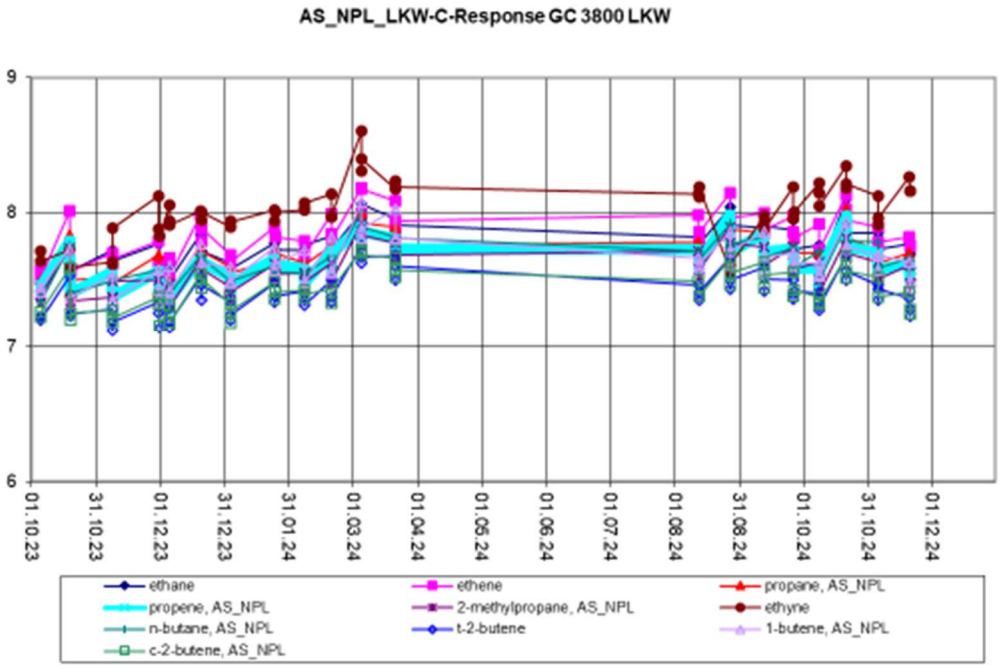
Routine measuremens: 2/day

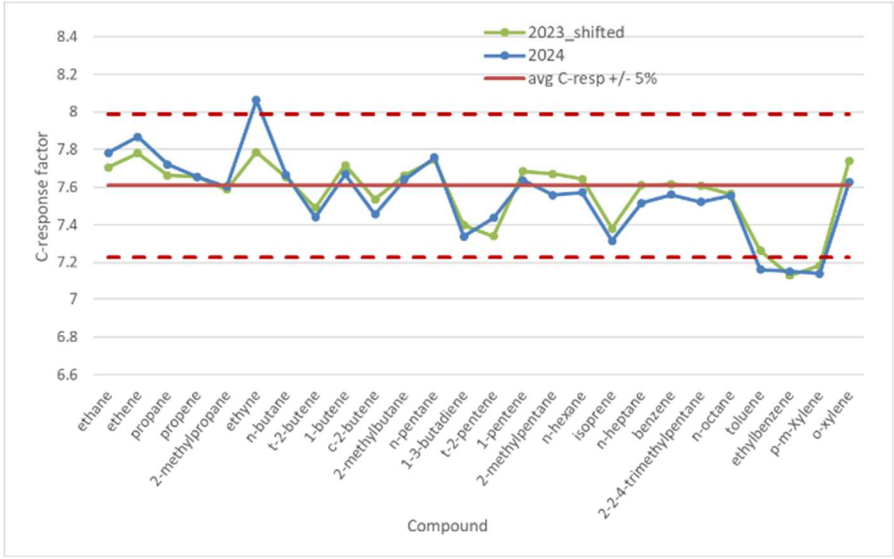
Daily cylces: ~1/month

Issues HPB – GC/FID 2024



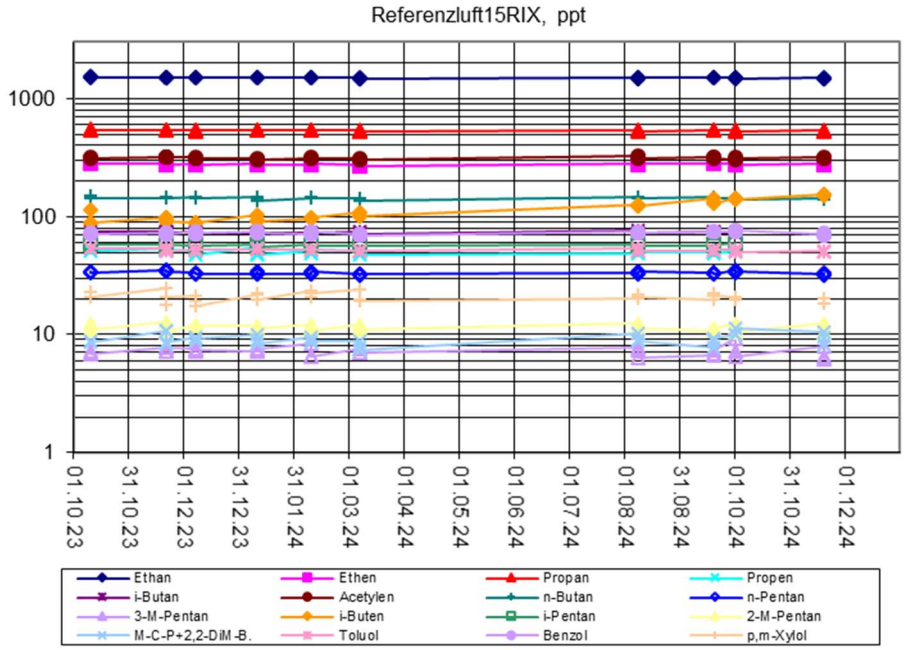
Calibration Performance 2024





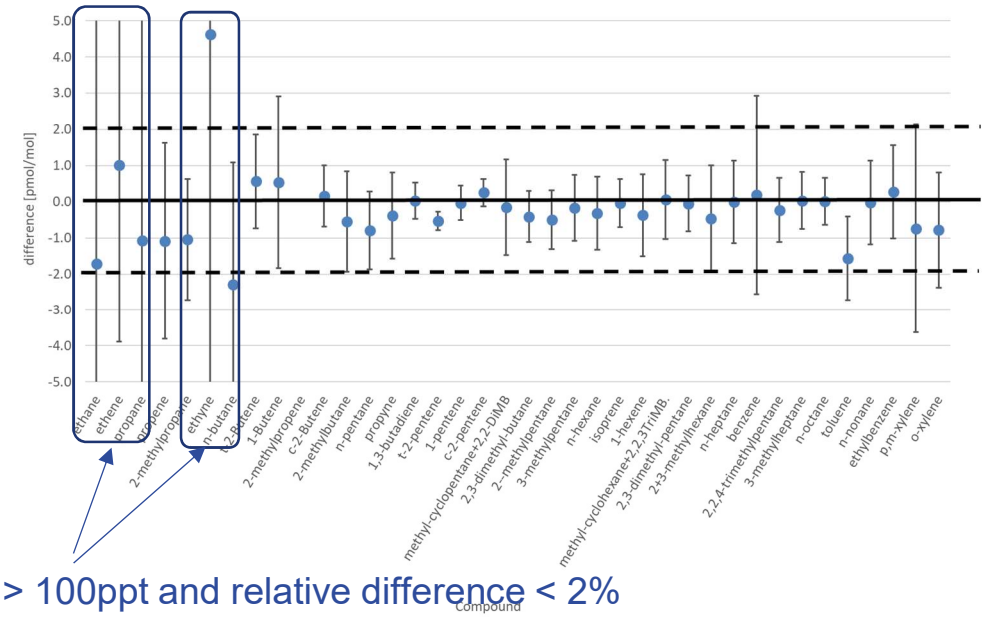
Shift of average C-response by + 5.6%

Target gas performance – whole air



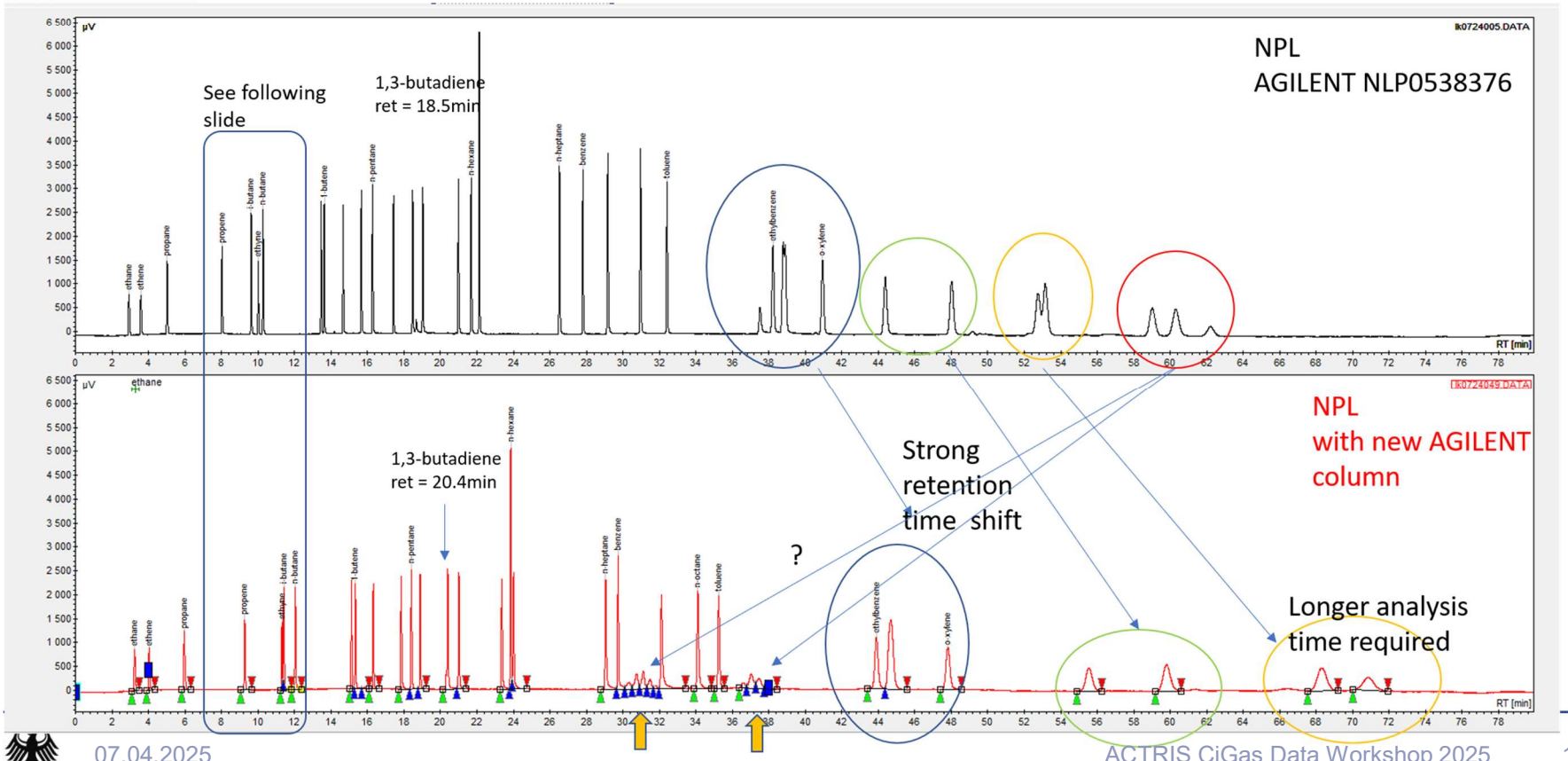
i-butene drifting in cylinder

Absolute difference 2024 -2023



> 100ppt and relative difference < 2%

Column exchange – Al_2O_3

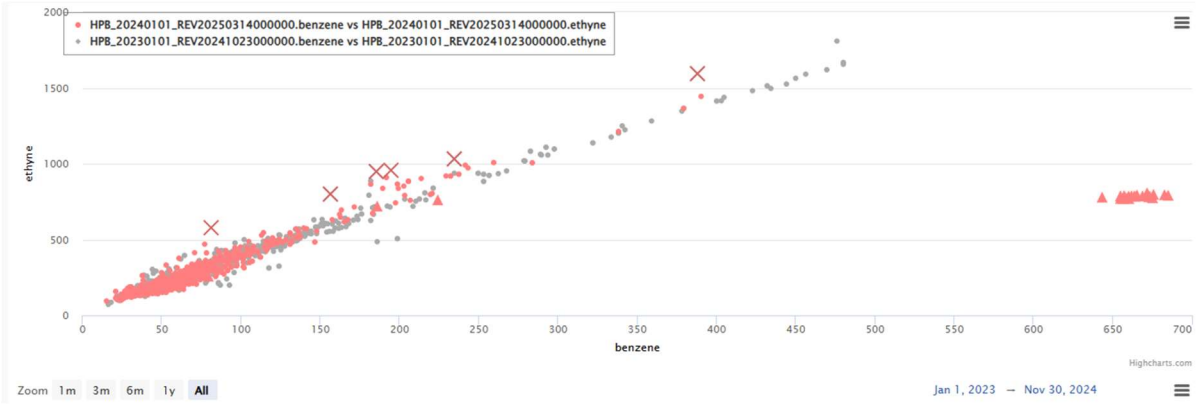


Ext. QA/QC: thank you for the feedback

Data from level 0 were transferred to QA Tool? Lev 2 submission file does not show any flags

Ethyne outliers

Submitted with 111

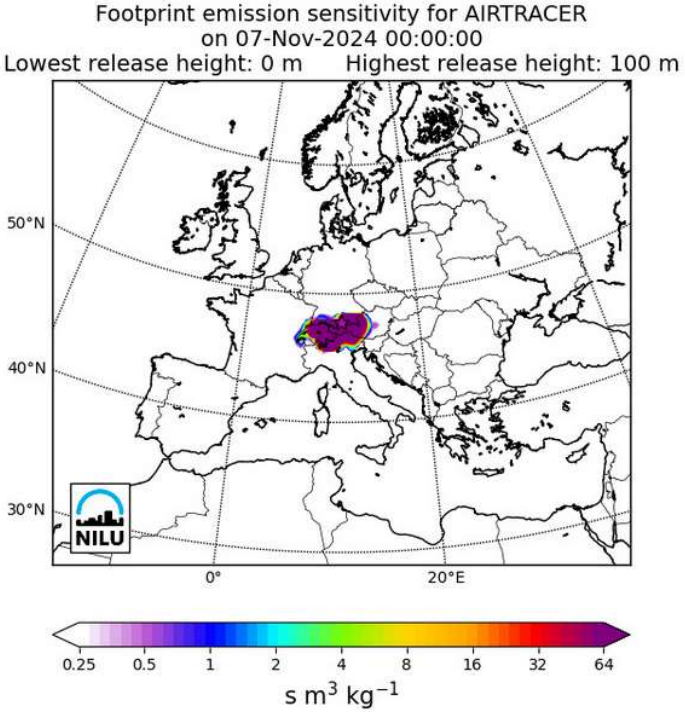


often nighttime values →no local (@ obervatory) source expected
Chromatography was not suspicious; benzene value confirmed with parallel GC

Ext. QA/QC:

Several outliers observed in the beginning of November 2024

→Specific meteorological situation beginning of November: inversion and stagnating air masses, station in freezing fog, which often associated with low air quality.



Summary 2024

Calibration Perfomance: typical characteristics for individual responces factors did not signifcantly change since between 23 and 24.

Target gas: performance stable, changes 2024-2023 mostly <+-2% or within 2ppt,

→ instrument performance ok.

Data evaulation still in progress – complete set will be provided until May 31st

bBOVCs under data processing

New NMHC system is still under development to replace Varian system

Contact

Project Scientist PTRMS

Dr. Felix Klein (Felix.Klein@dwd.de)

Senior Scientist GC/VOC measurements

Dr. Anja Claude (Anja.Claude@dwd.de)

Division head tracegas group

Dr. Dagmar Kubistin (Dagmar.Kubistin@dwd.de)

GEFÖRDERT VOM

Thank you!