

nilu



Status and data availability from IMP 2022/2024

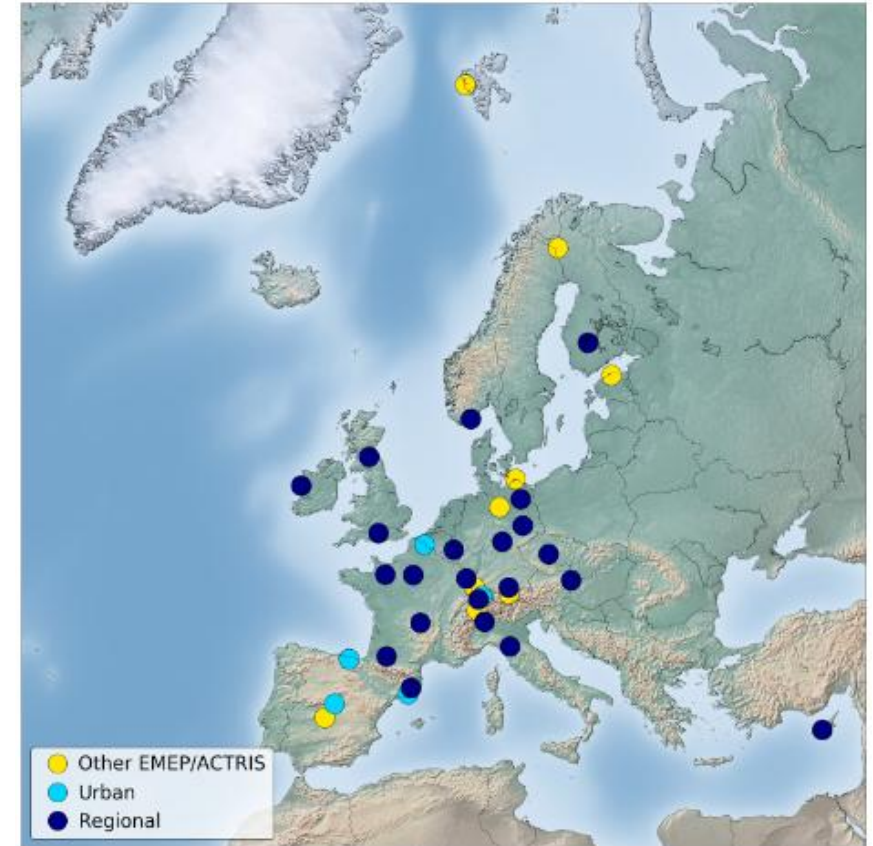
Wenche Aas, Crist Amelynck, Benjamin Bergmans, Anja Claude, James Dernie, René Dubus, Yao Ge, Heidi Hellén, Lukas Kesper, Dieter Klemp, Jean-luc Jaffrezo, Thuy Vu Nguyen, Jean-Philippe Putaud, Stefan Reimann, Pontus Roldin, Therese Salameh, David Simpson, Sverre Solberg¹, Svetlana Tsyro, Ågot Watne, Robert Wegener, Ana Yanez, Karl Espen Yttri and more to add



Foto: Anja Claude (DWD) from Hohenpeißenberg.

Overview of measurements

- 30 sites, of these 17 sites measured all VOC groups (NMHCs, Aromatics, O-VOCs, monoterpenes) while 23 sites analyzed organic tracers.
- More than **120 VOC species** and 47 tracers
- A draft paper is in progress to be submitted in May 2025
 - Aim to describe the effect this heatwave had on the VOC, ozone and PM levels



Data selection (several methods measure same compounds)

- **Non-Methane Hydrocarbons (NMHC):**

- C2–C6 range: Data from canisters and GC/FID monitors were used. Monitor data were prioritized
- C7–C12 Range: Data from Tenax tubes and GC/FID monitors were used. Monitor data were prioritized
- Isoprene: Data from canisters and GC/FID + PTR-MS monitors were used. Monitor data were prioritized

- **Aromatic hydrocarbons.**

Data were collected from canisters, Tenax tubes and monitors. Monitor data was prioritized. Benzene and toluene data from canisters were prioritized before Tenax tubes, while Tenax tubes for the other aromatic compounds.

- **Terpenes:**

Monoterpenes were collected from Tenax tubes and PTR-MS. Tenax tube data were prioritized
Sesquiterpenes data were exclusively taken from Tenax tubes.

- **Oxygenated VOCs:**

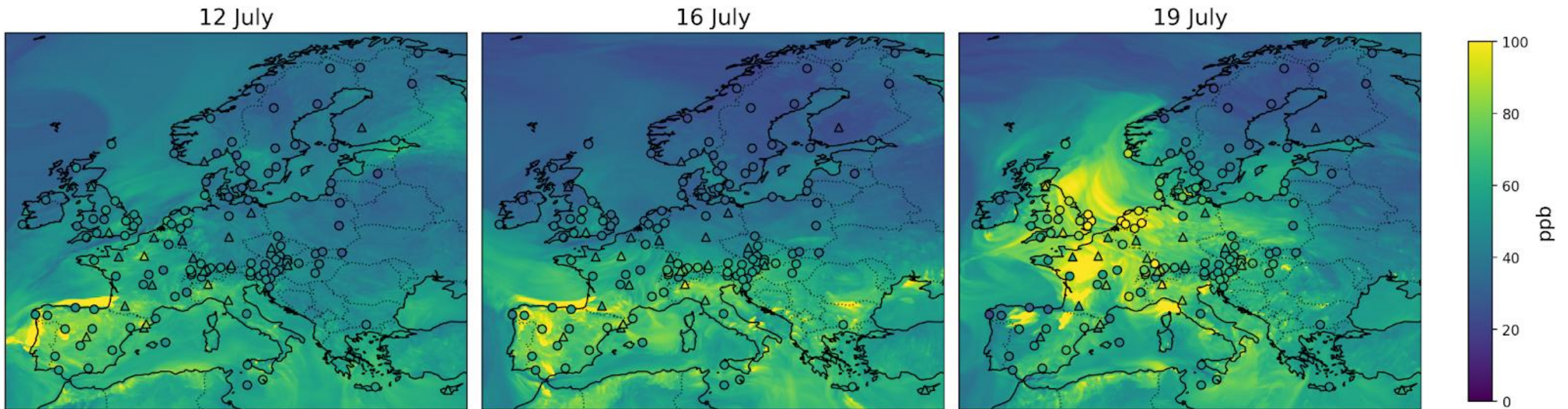
Data were collected from DNPH cartridges, GC/FID and PTR-MS. DNPH data were prioritized.

- **Chemical speciation of aerosols and tracer analysis.**

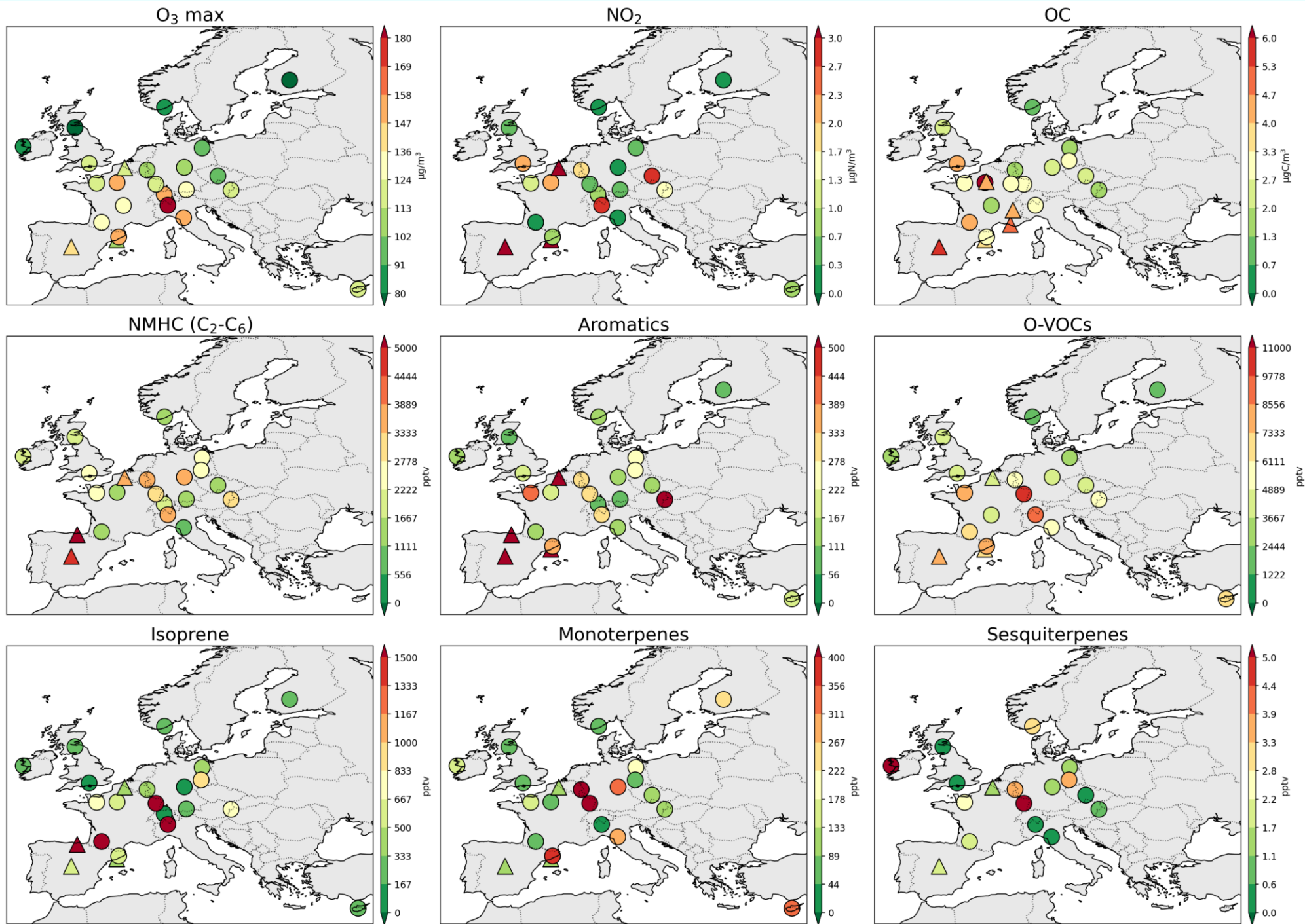
- The tracer analyses were all done at the same laboratory.
- The PM mass and EC/OC were also measured as part of the regular EMEP monitoring. These data are prioritized

Ozone developing during the heat wave in 2022 (daily max)

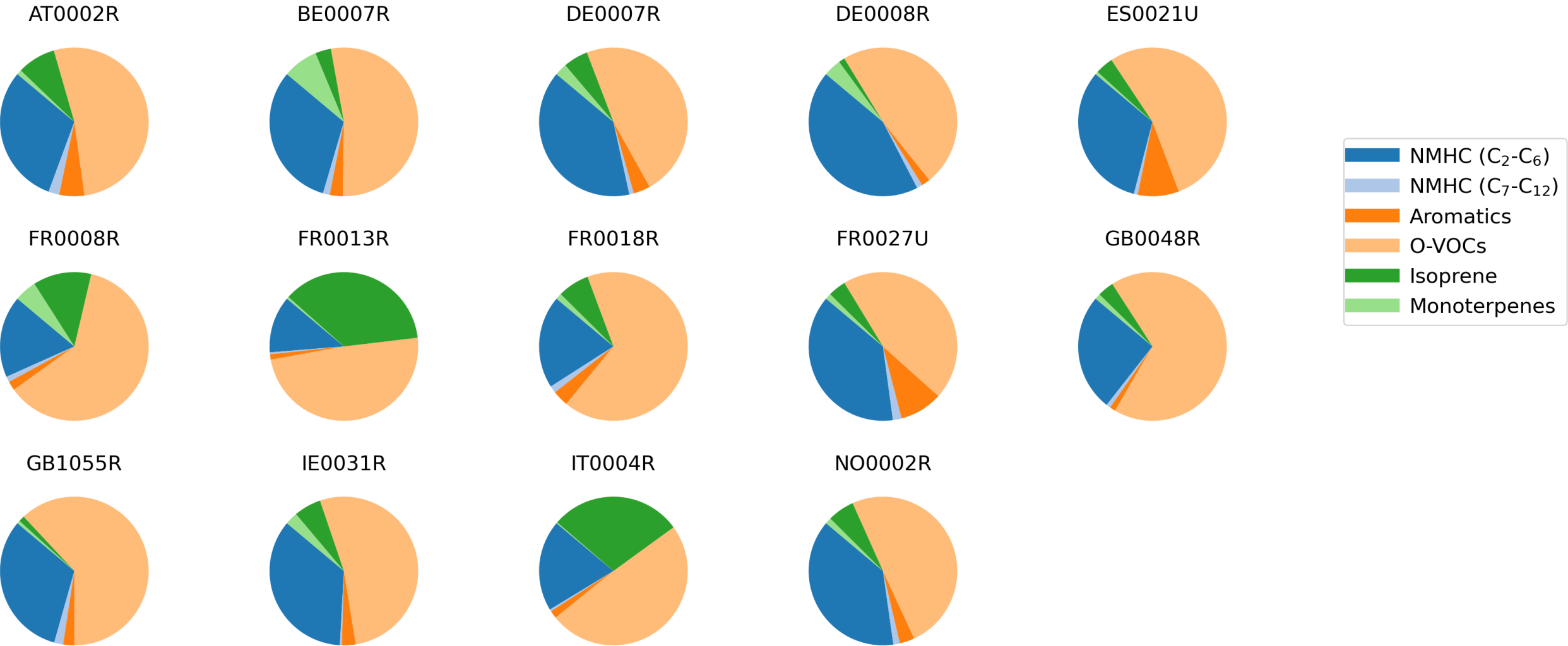
- Quite good correlation between modelled and observed ozone concentrations during the week (EMEP)
- an average bias for ozone daily maxima with 8%
- slightly higher overestimation (11%) at low concentration sites (below 50 ppb)
- slightly underestimating (-3%) at high concentration (above 80ppb)



Average
conc.
12-19 July
2022
sum comp.
group



Relative contribution of different VOCs

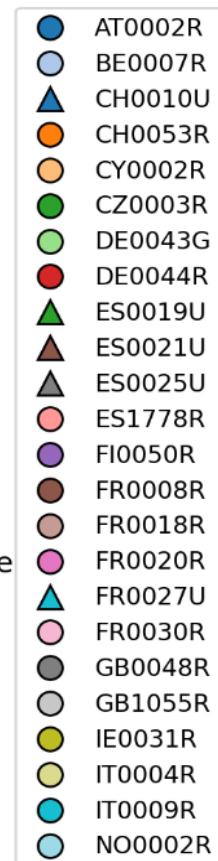
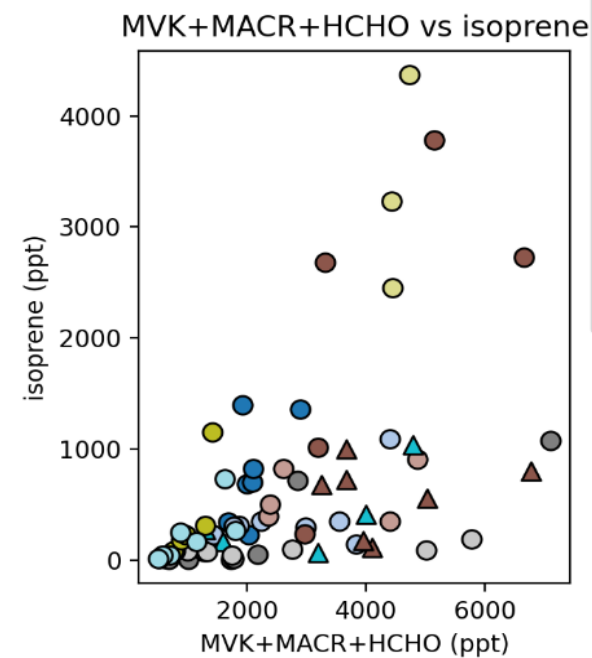
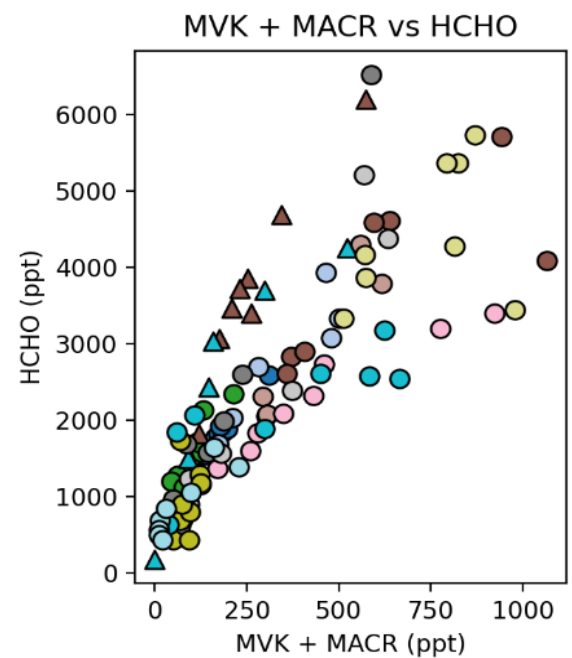
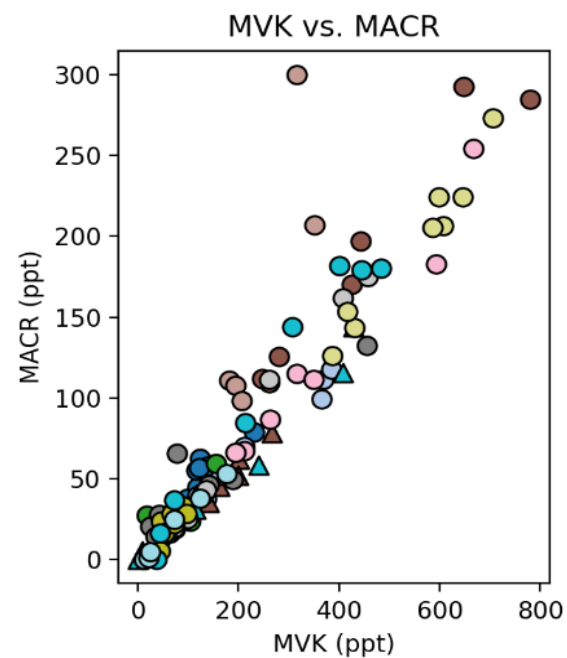
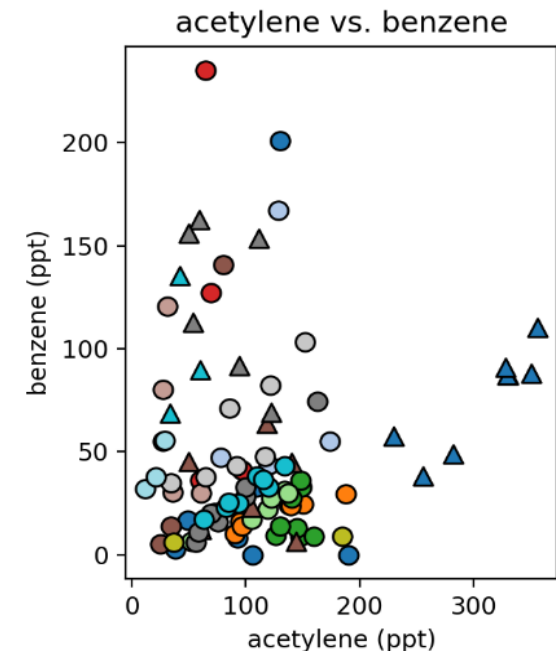
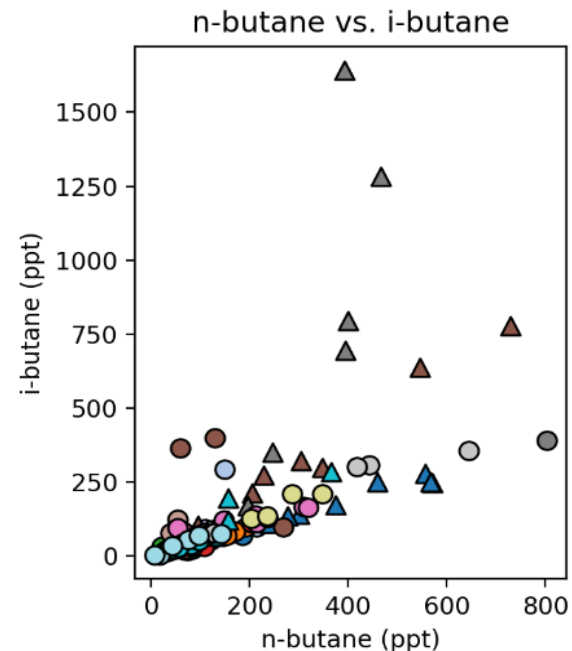
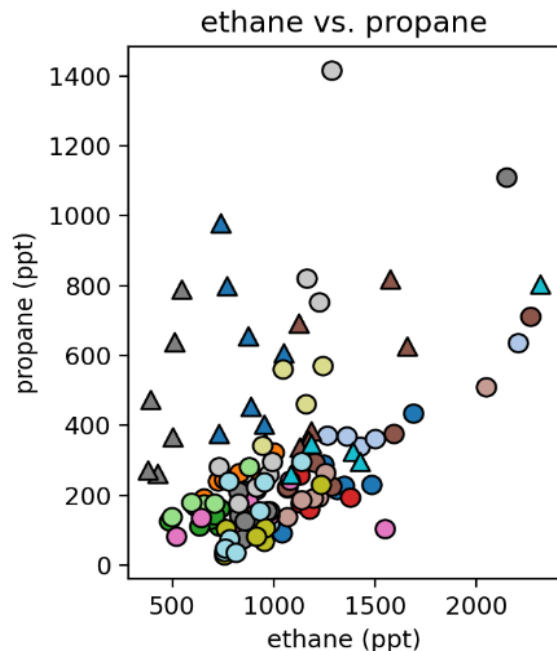


Speciation of VOC groups

(not all VOCs included at all sites)



Selected VOC ratios



Potential for ozone and SOA formation

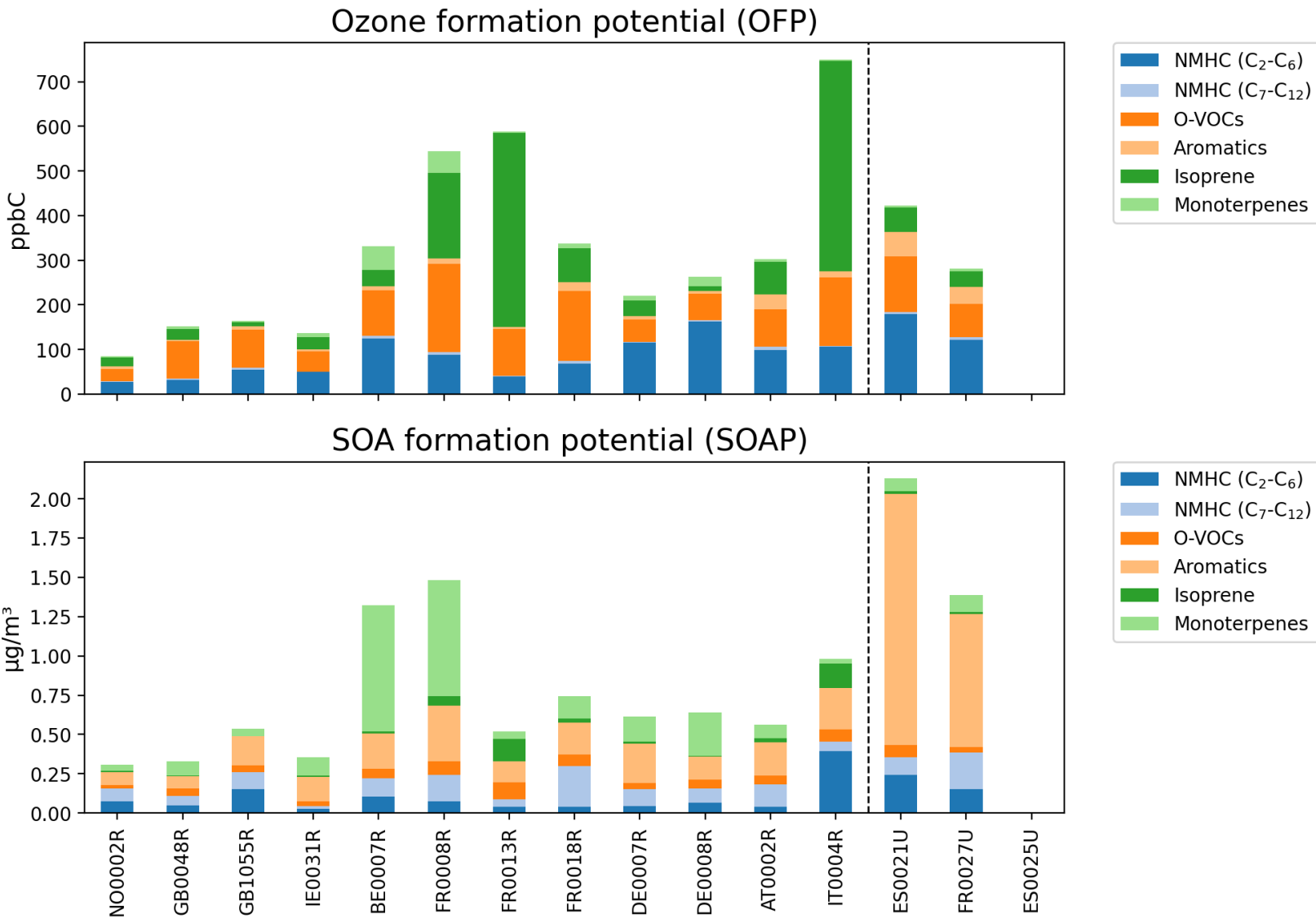
Contribution to OFP:

- isoprene: $33 \pm 2\%$
- O-VOCs: $30 \pm 1\%$
- NMHCs: $29 \pm 1\%$

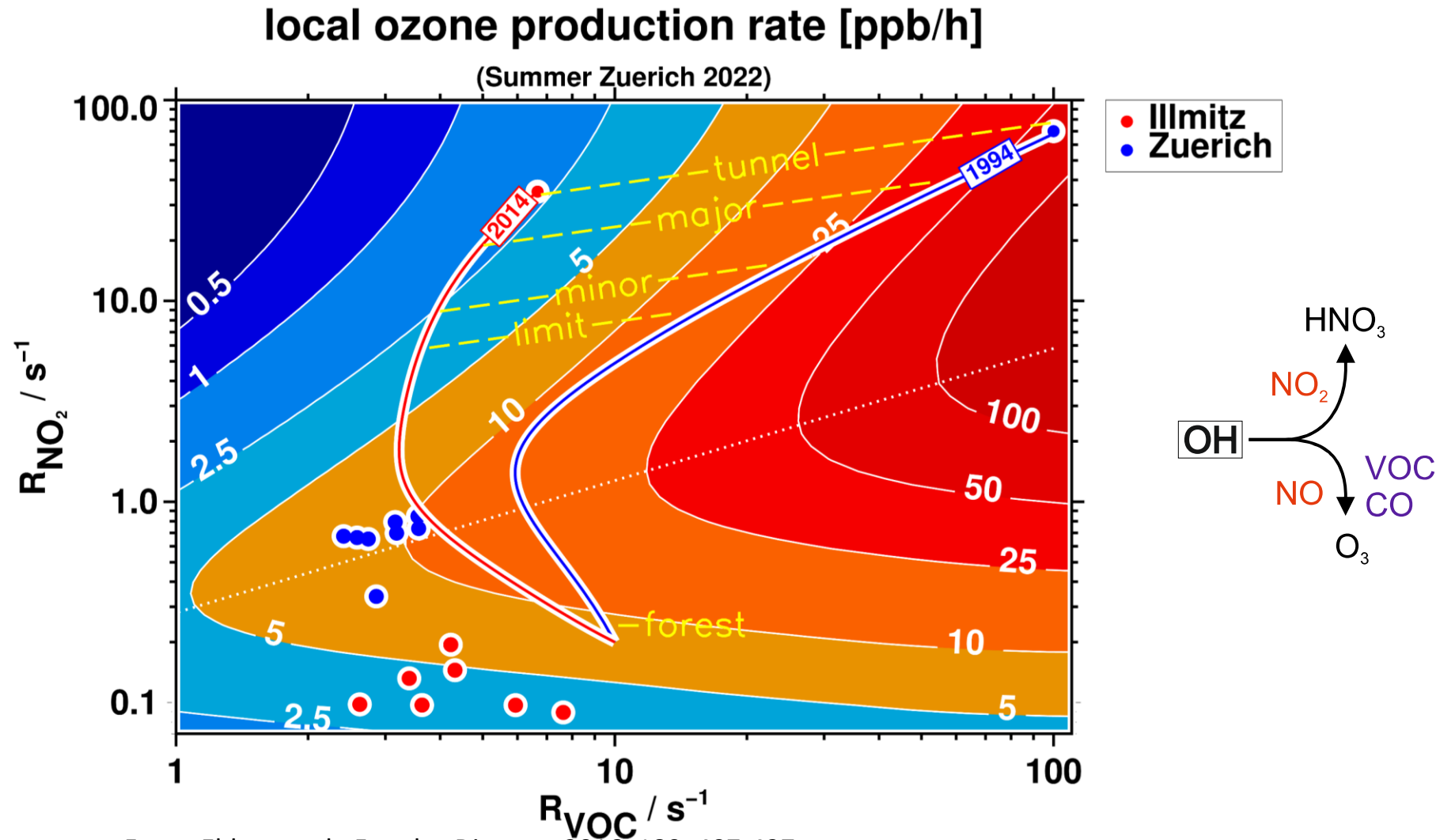
Contribution to SOAP:

- Aromatics: $30 \pm 1\%$
- monoterpenes: $27 \pm 2\%$
- All NMHCs ca 30%

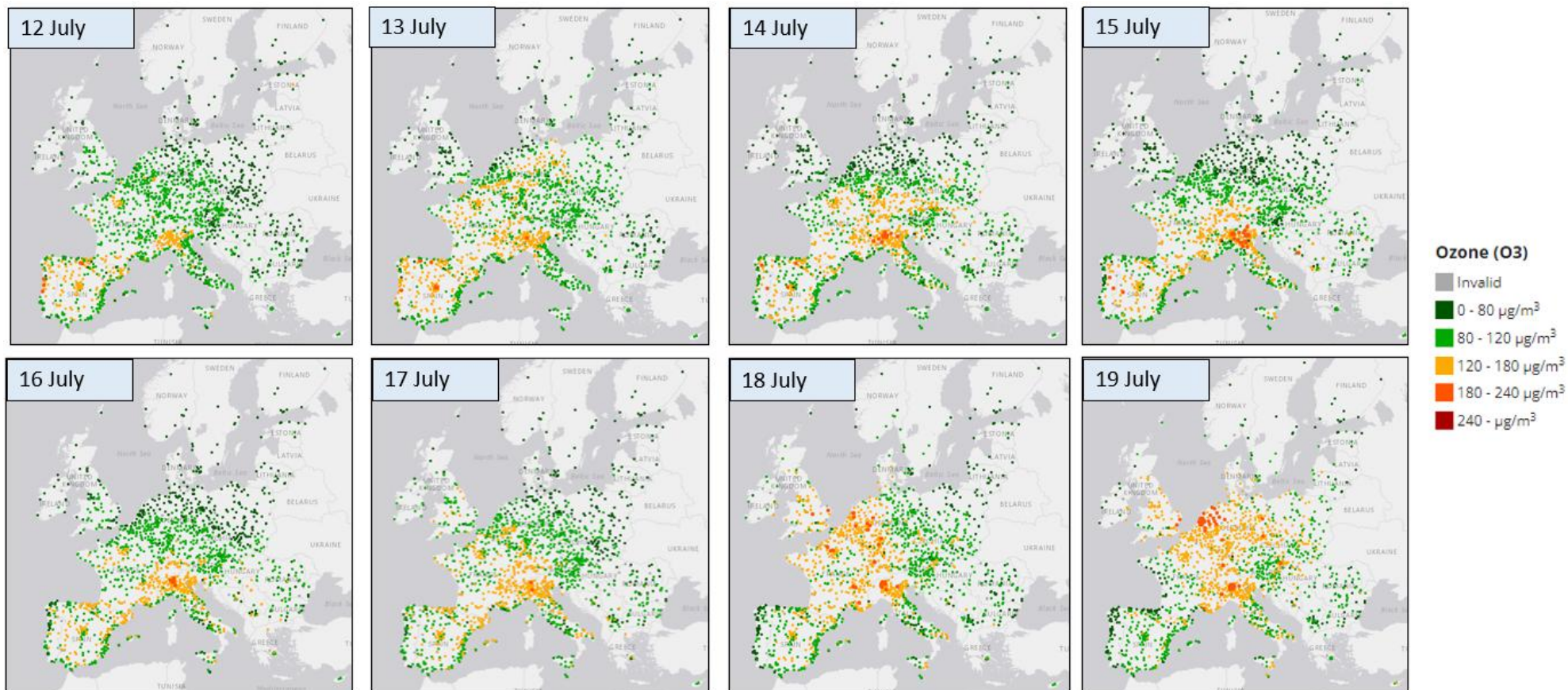
Very crude estimates that does not consider NOx, pH, humidity etc. May not be published



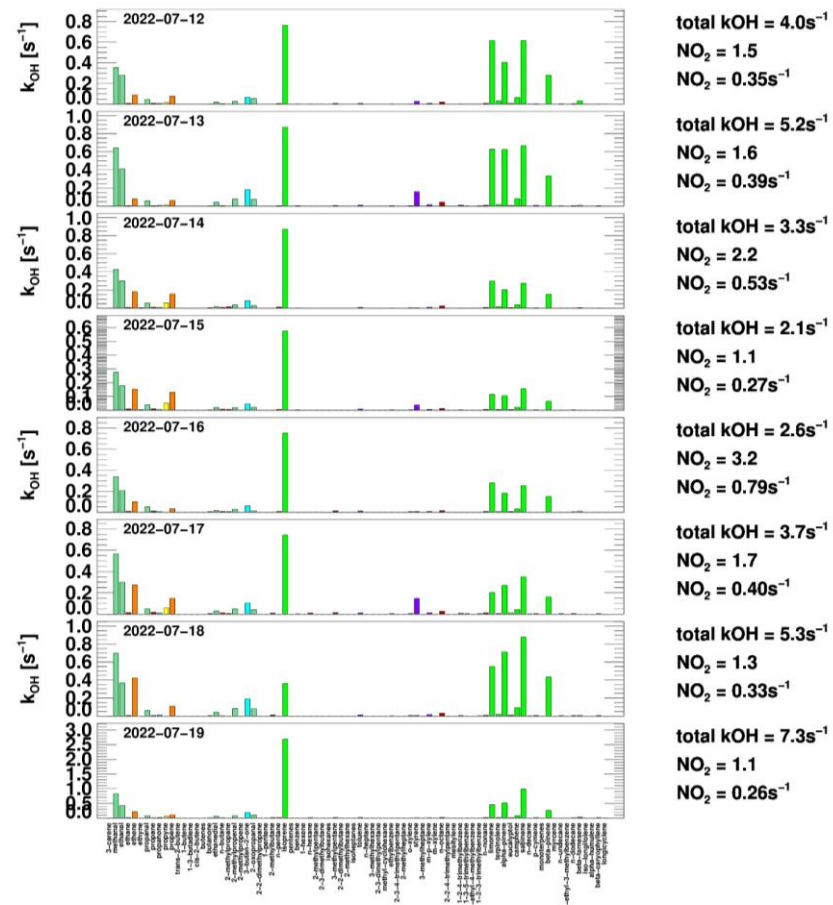
Local ozone production rate



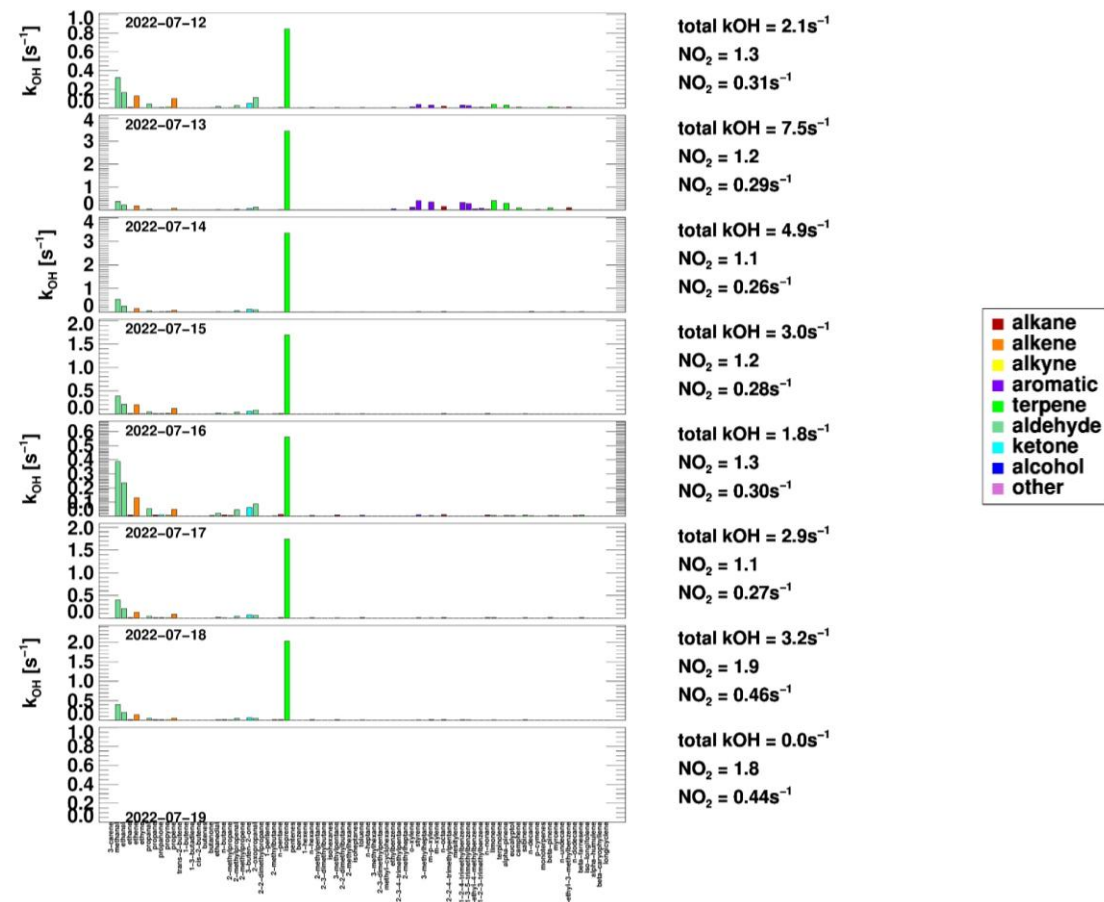
From: Ehlers et al., Faraday Discuss., 2016, 189, 407-437



BE0007R

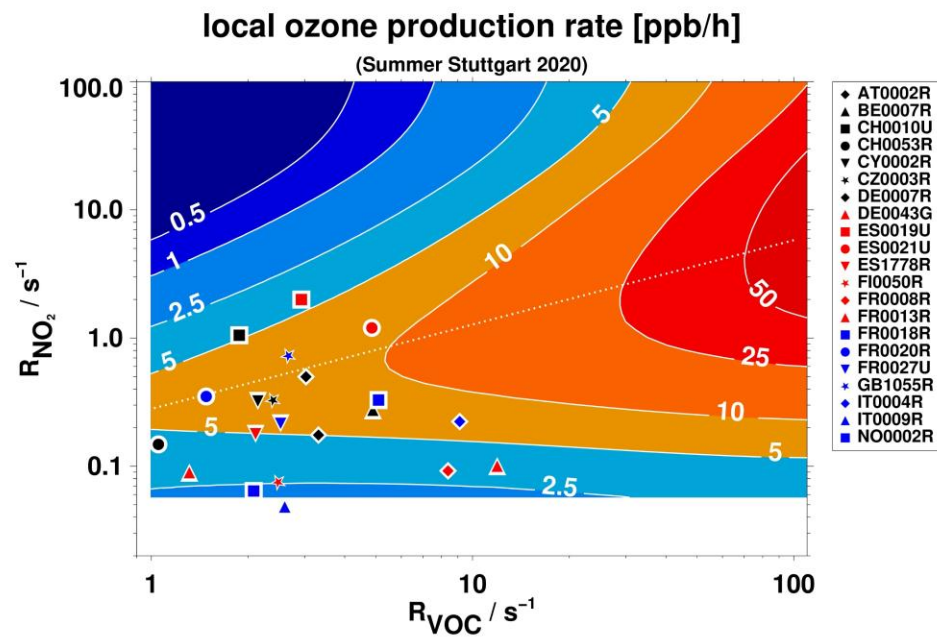


AT0002R

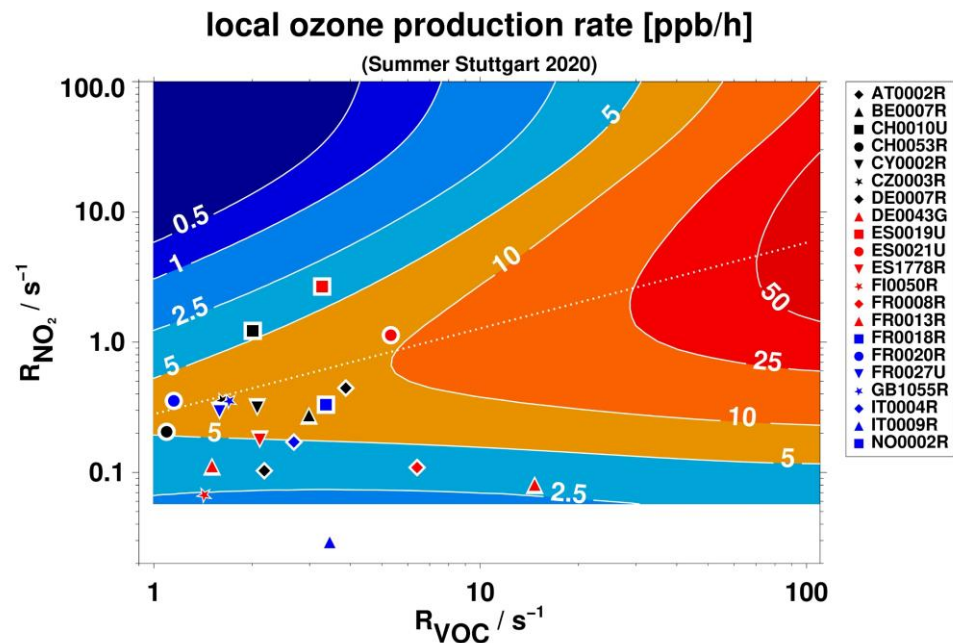


Local ozone production rate

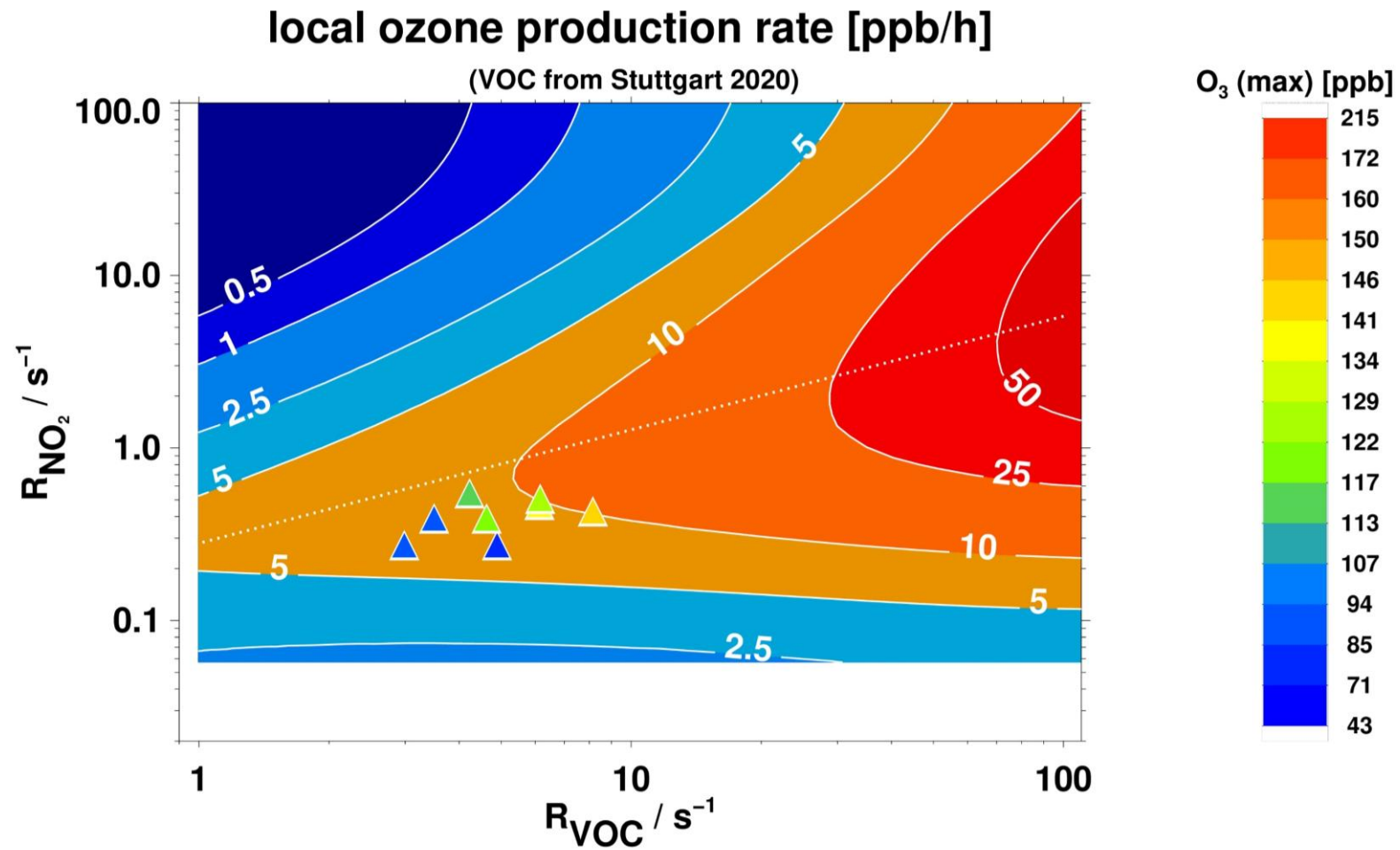
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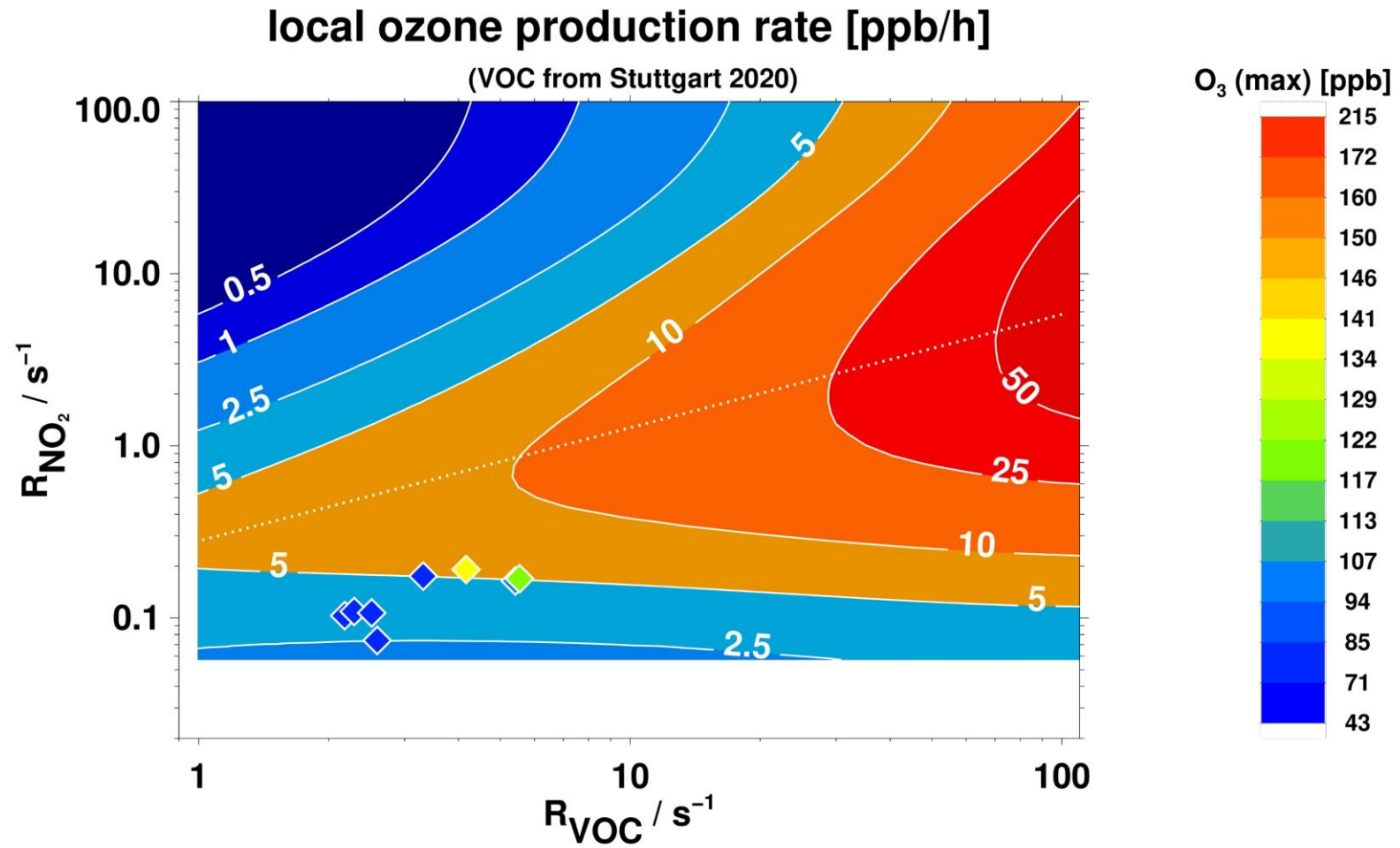
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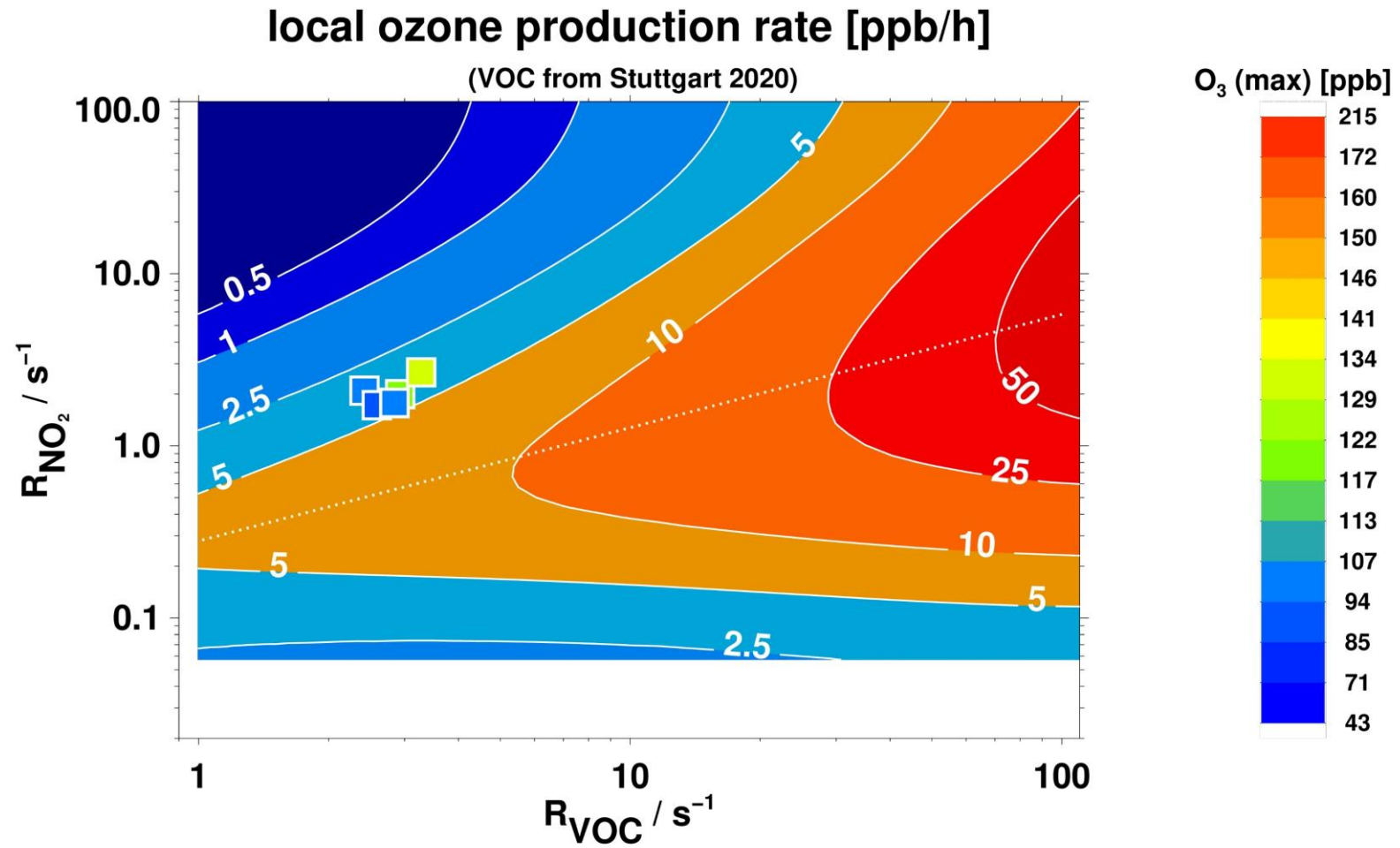
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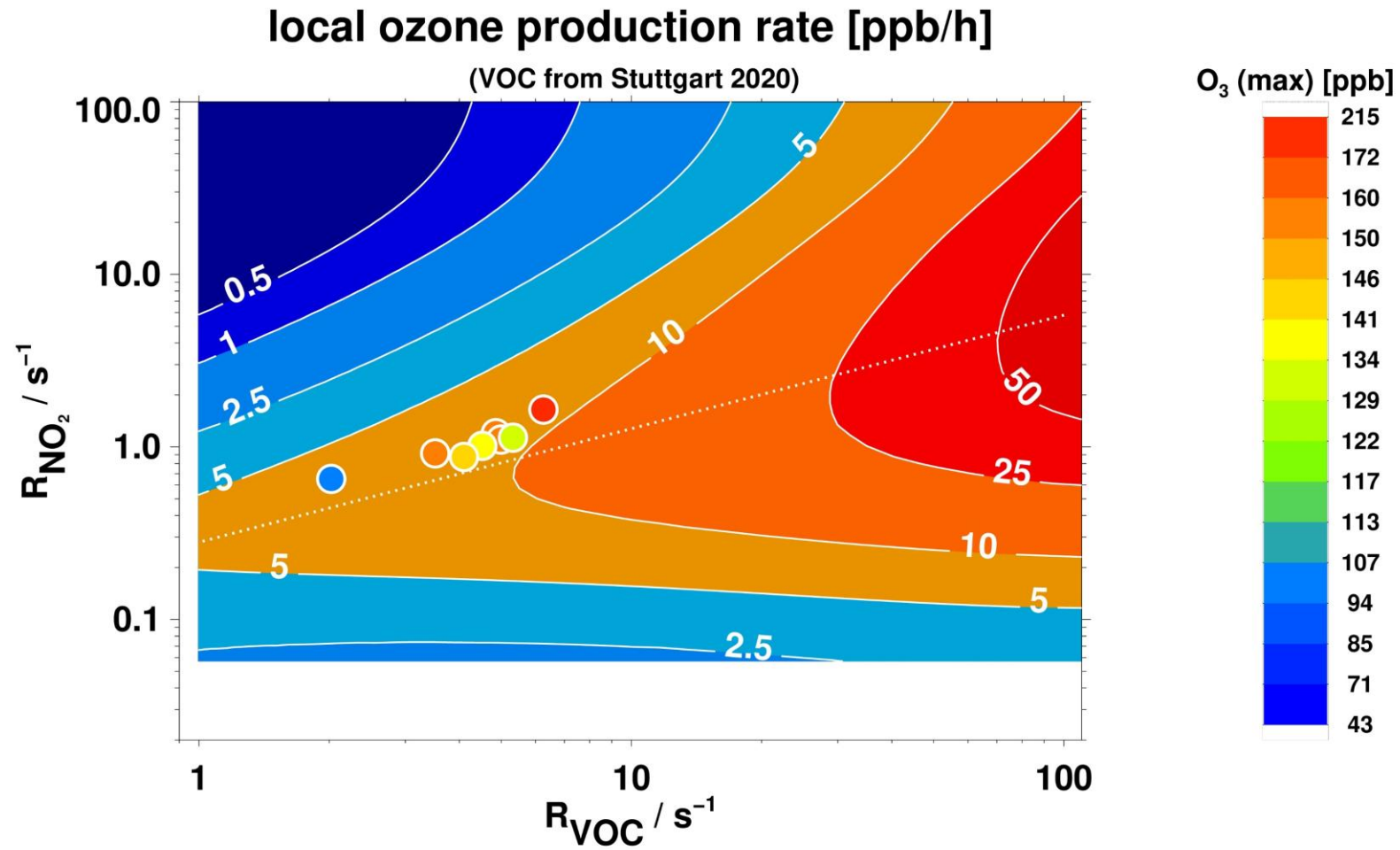
DE0007R



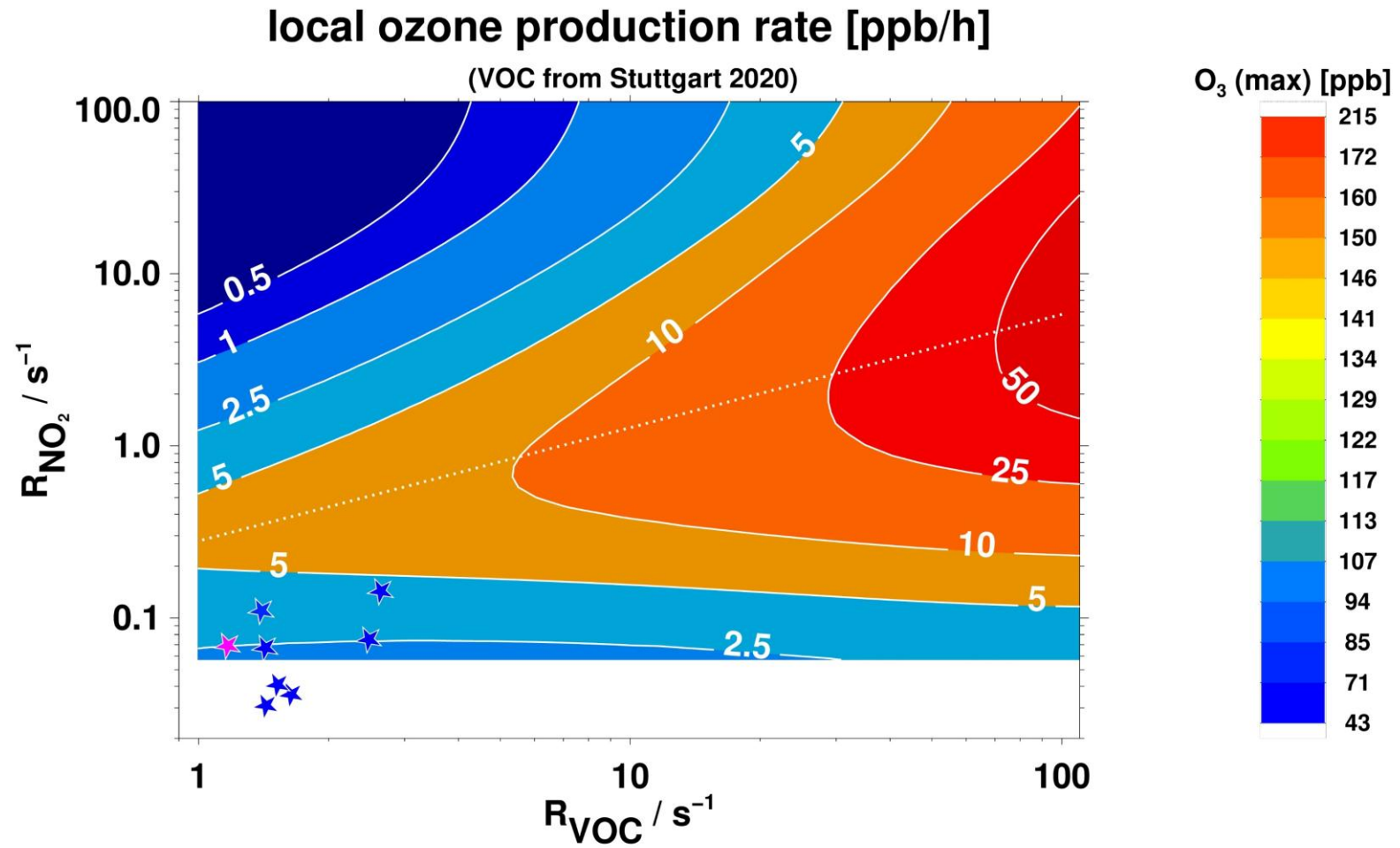
ES0019U



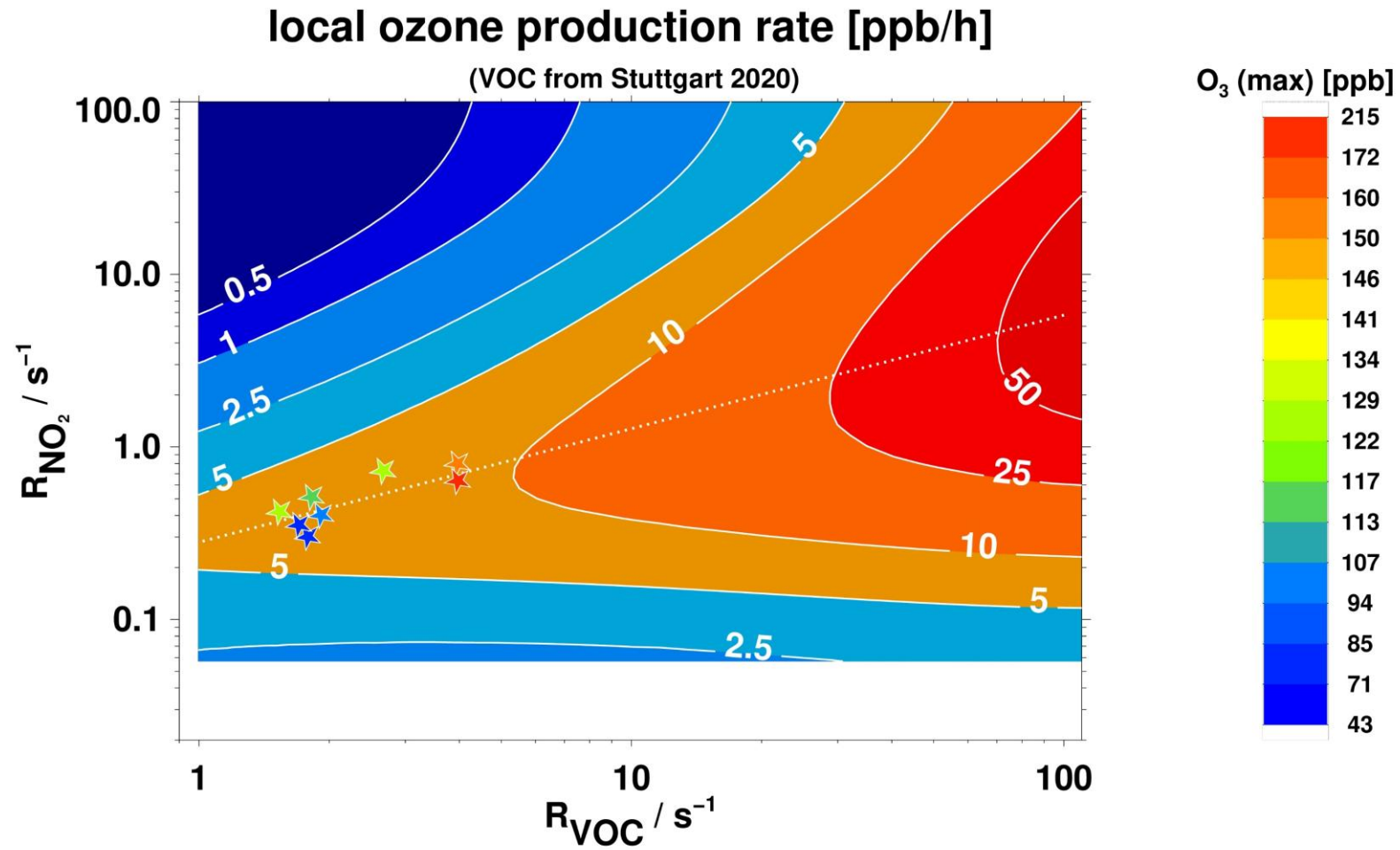
ES0021U



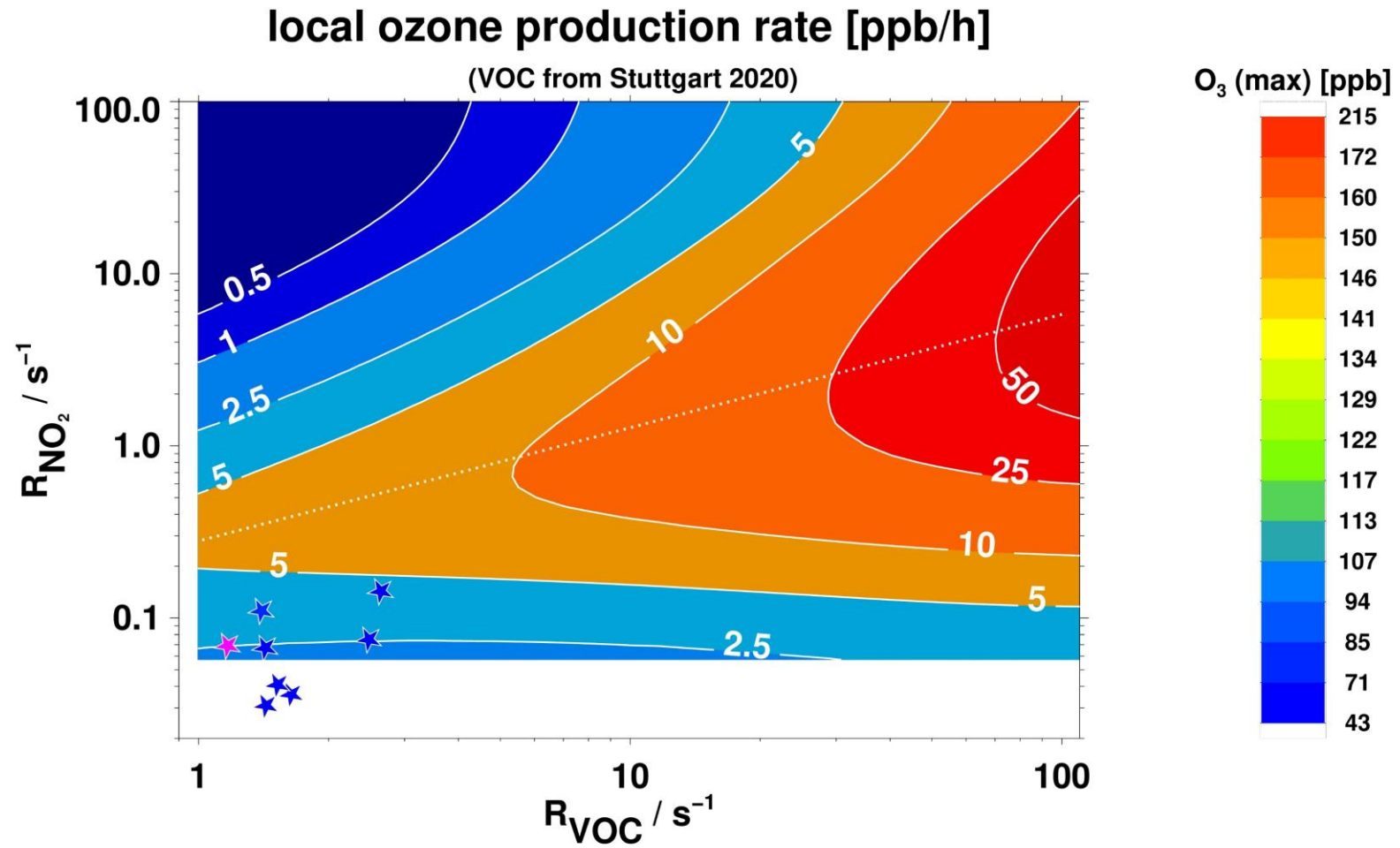
FI0050R



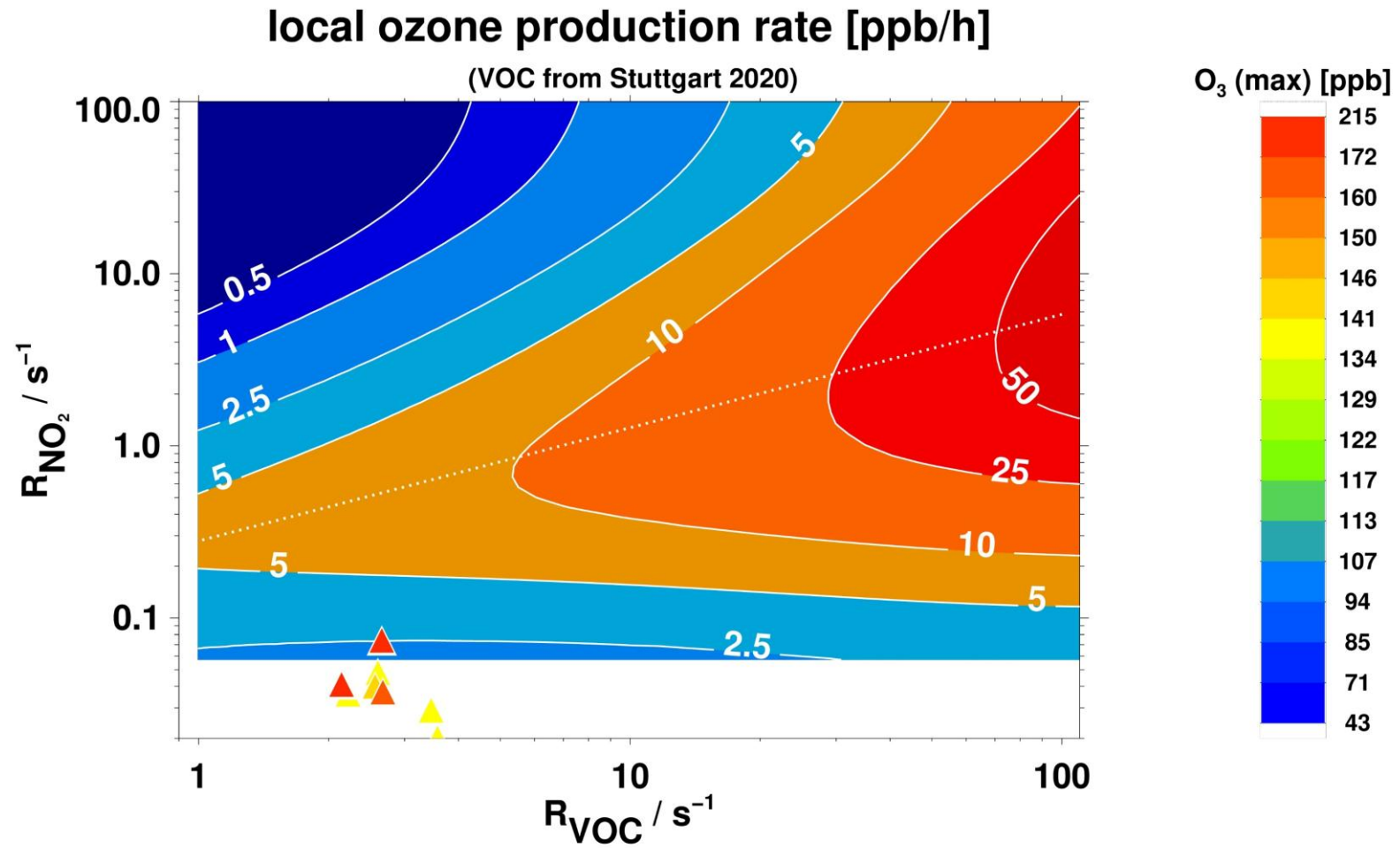
GB1055R



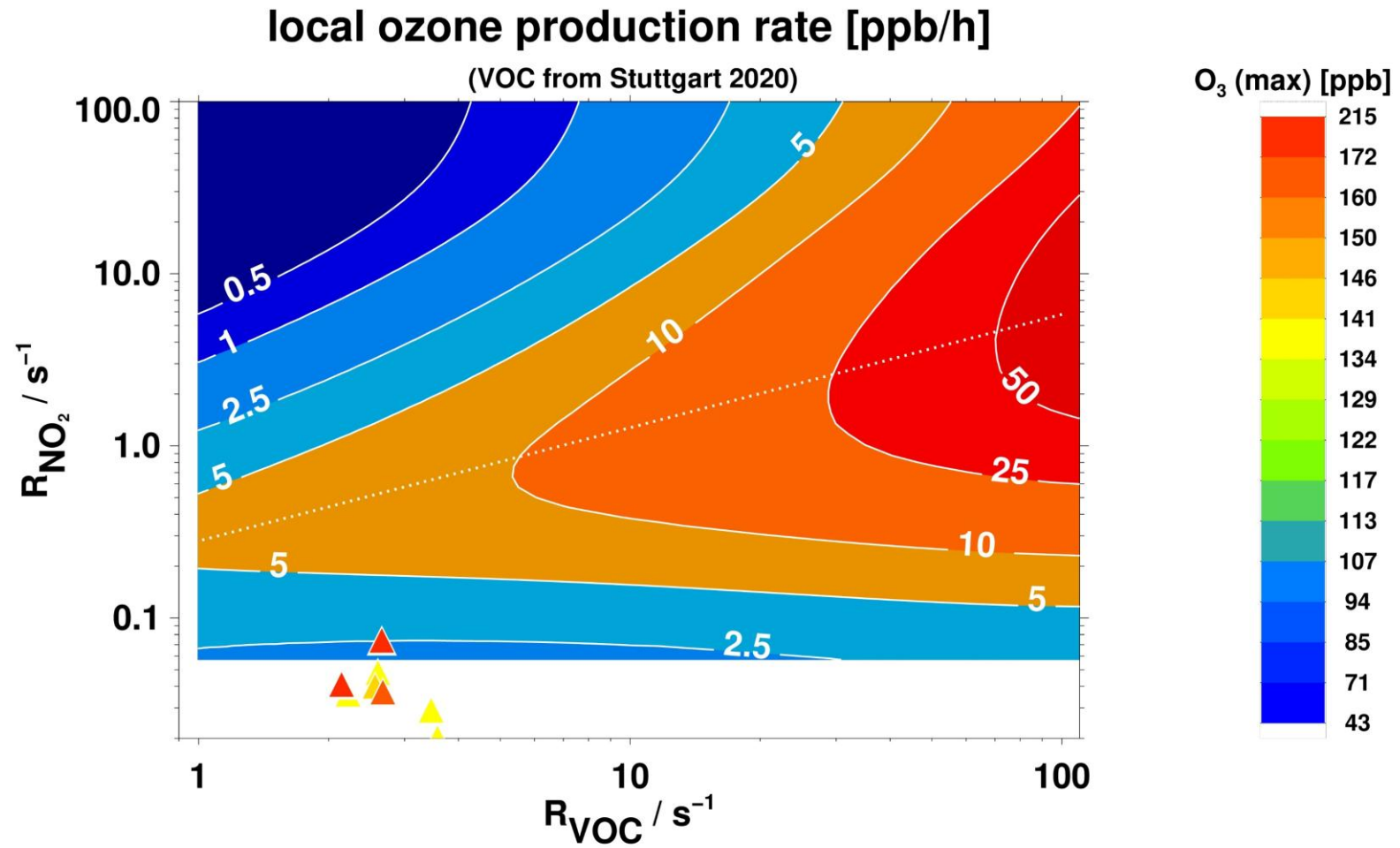
FI0050R



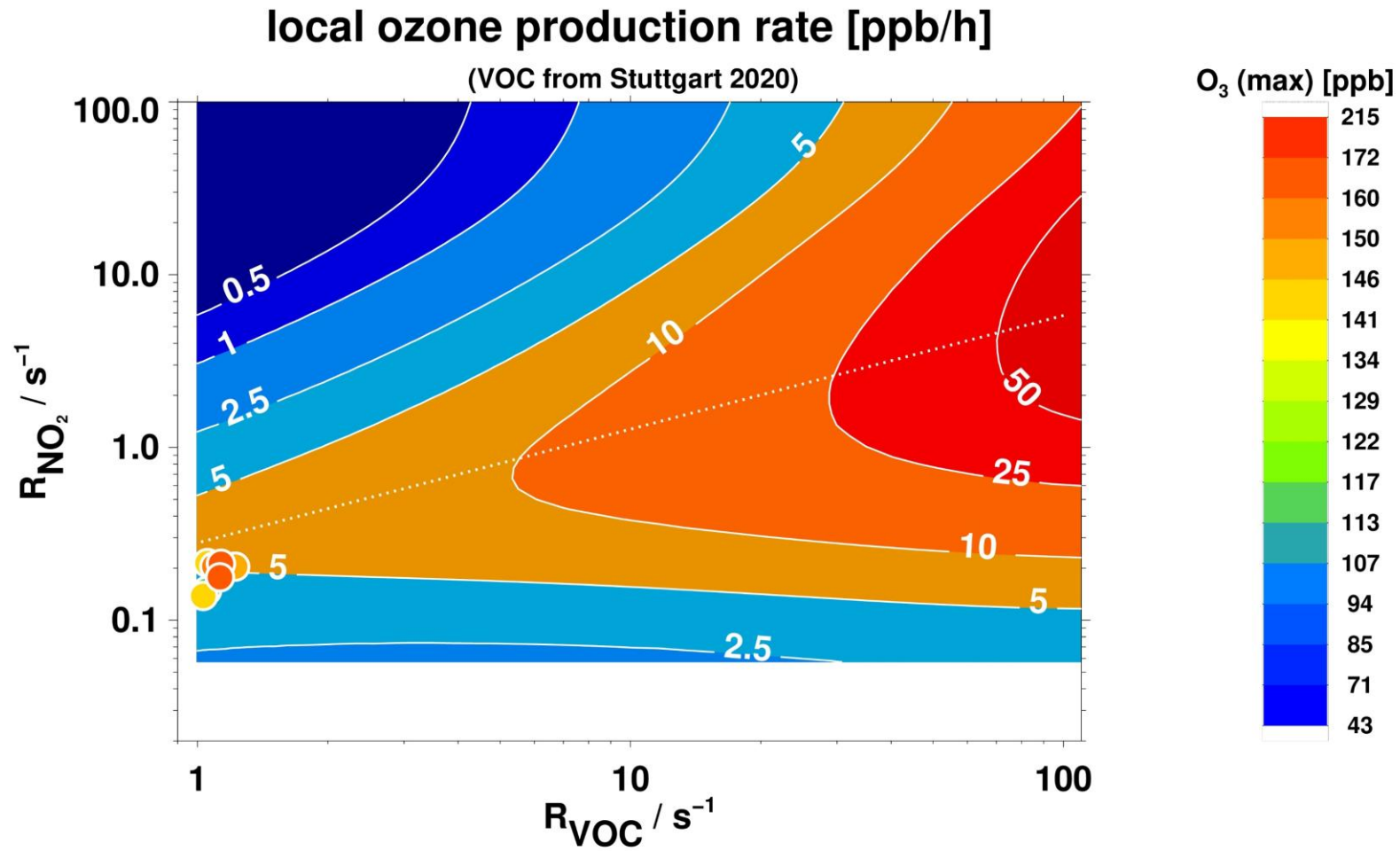
IT0009R



IT0009R



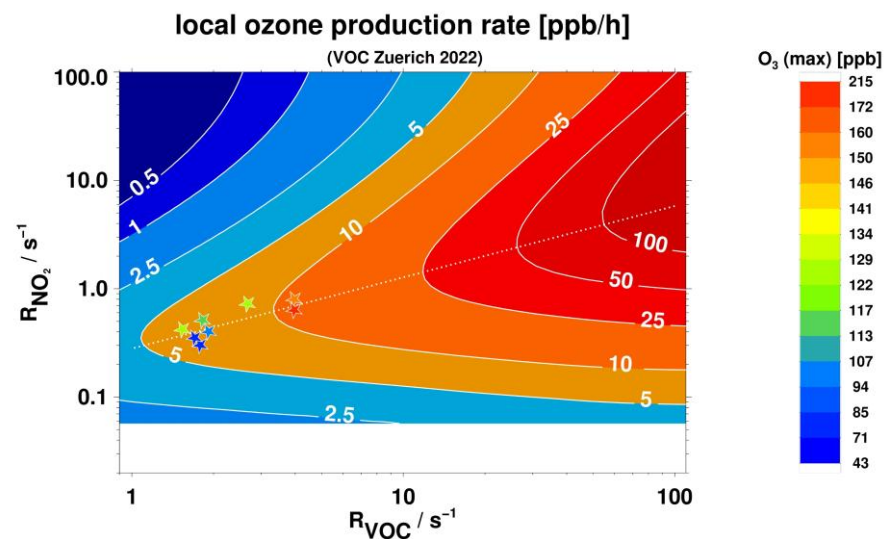
CH0053R



- **Results**

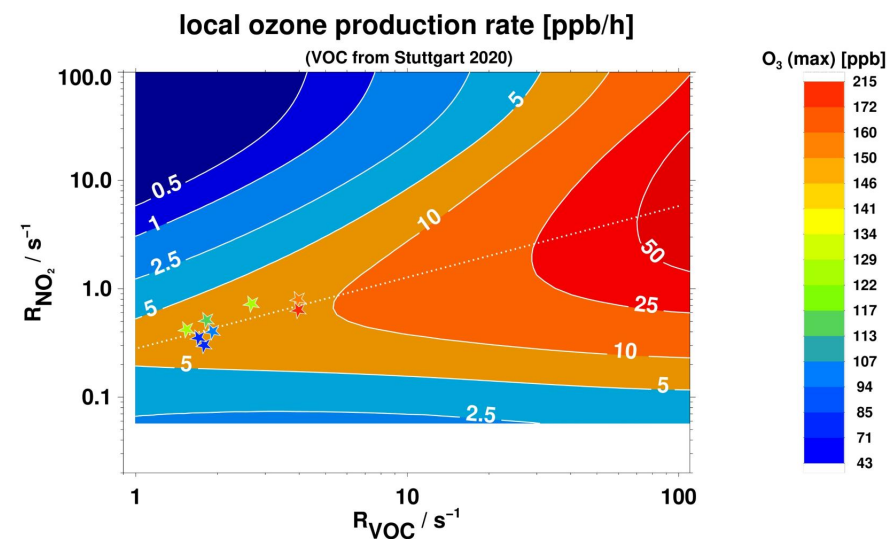
- At one site, maximum ozone values measured rises with simulated ozone production
- Differences between the sites due to
 - Ozone is transported from somewhere else (and not produced on the site)
 - The meteorological conditions might not favor ozone production at this site
 - Missing VOC data
 - Or the VOC composition may play a larger role ?

GB1055R



Low OVOC share

GB1055R



High OVOC share

... More simulation needed...

“EUROVOC: EUROpe-wide intensive campaign on Volatile Organic Compounds”

2nd pan European intensive measurement period (IMP) on VOCs organized by the TFMM-EMEP/ACTRIS/RIURBANS

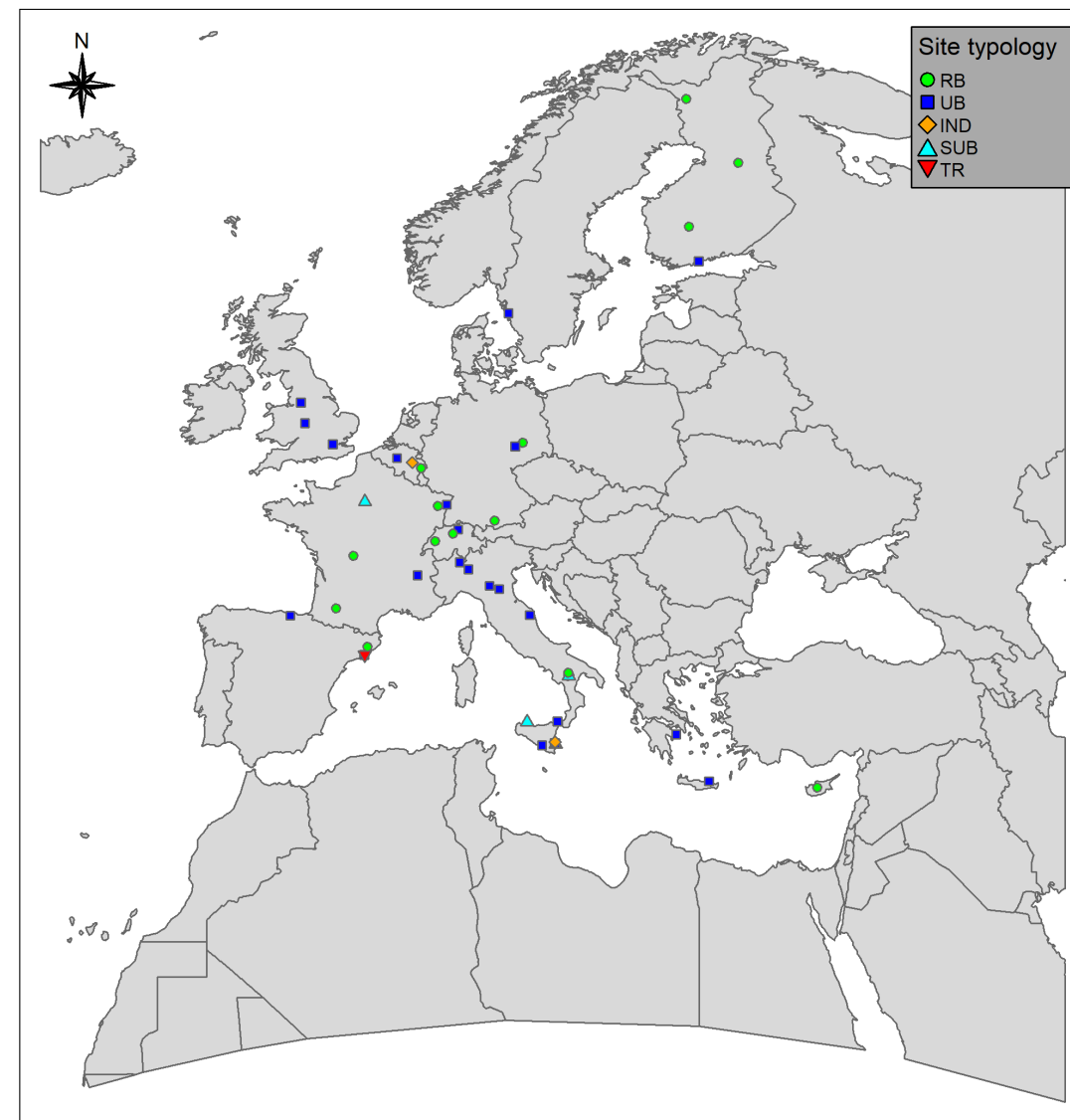
To gain deeper insights into VOC emissions, including their temporal development and speciation, by deploying high-resolution measurements at sites near emission sources (e.g., urban, industrial, traffic, harbour, and forest areas)

Period: 1 month - September 2024

46 urban and rural sites across Europe (ACTRIS NF, EMEP, GAW, Local Air Quality Monitoring Networks, ACTRIS/ICOS sites): **16** regional background and **30** urban and suburban, mainly background

Collaboration with instrument manufacturers

Contact: Wenche Waas, Thérèse Salameh



“EUROVOC: EUROpe-wide intensive campaign on Volatile Organic Compounds”

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Data submission status: data from 32 sites received or directly submitted to EBAS (for ACTRIS sites)

Online measurement at all the sites with additional offline measurements, including 14 sites with PTR-MS

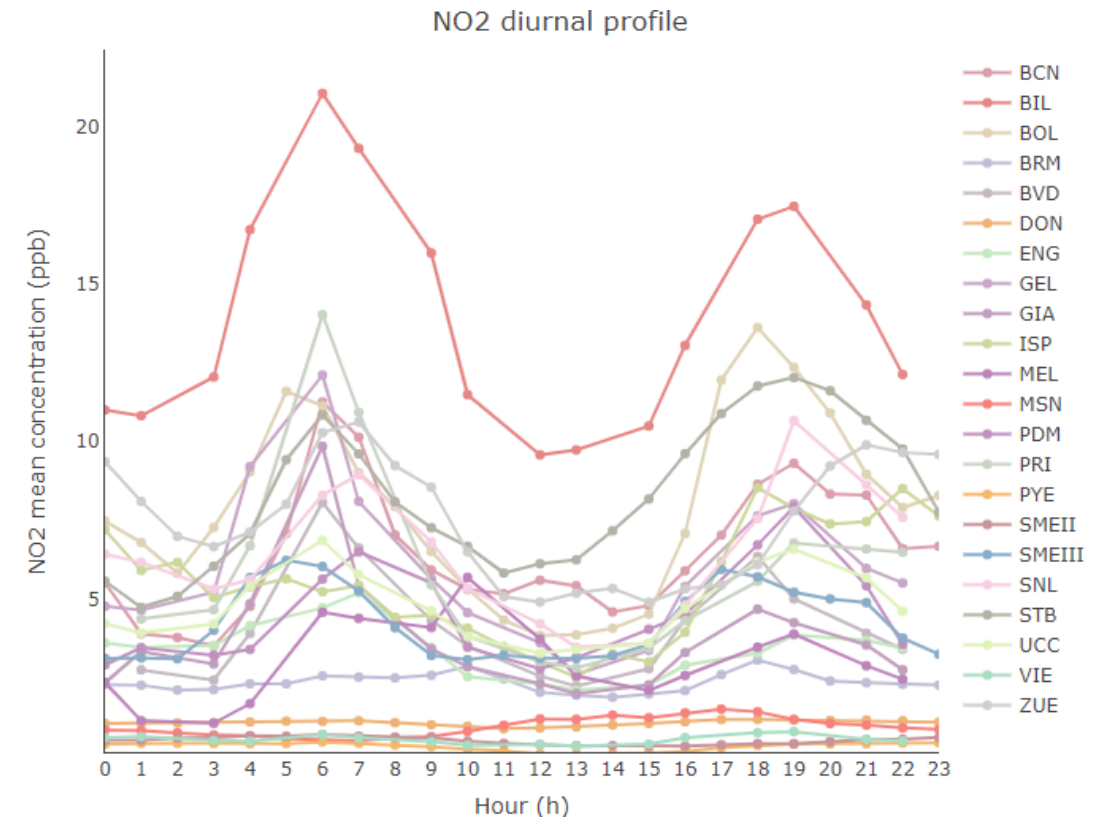
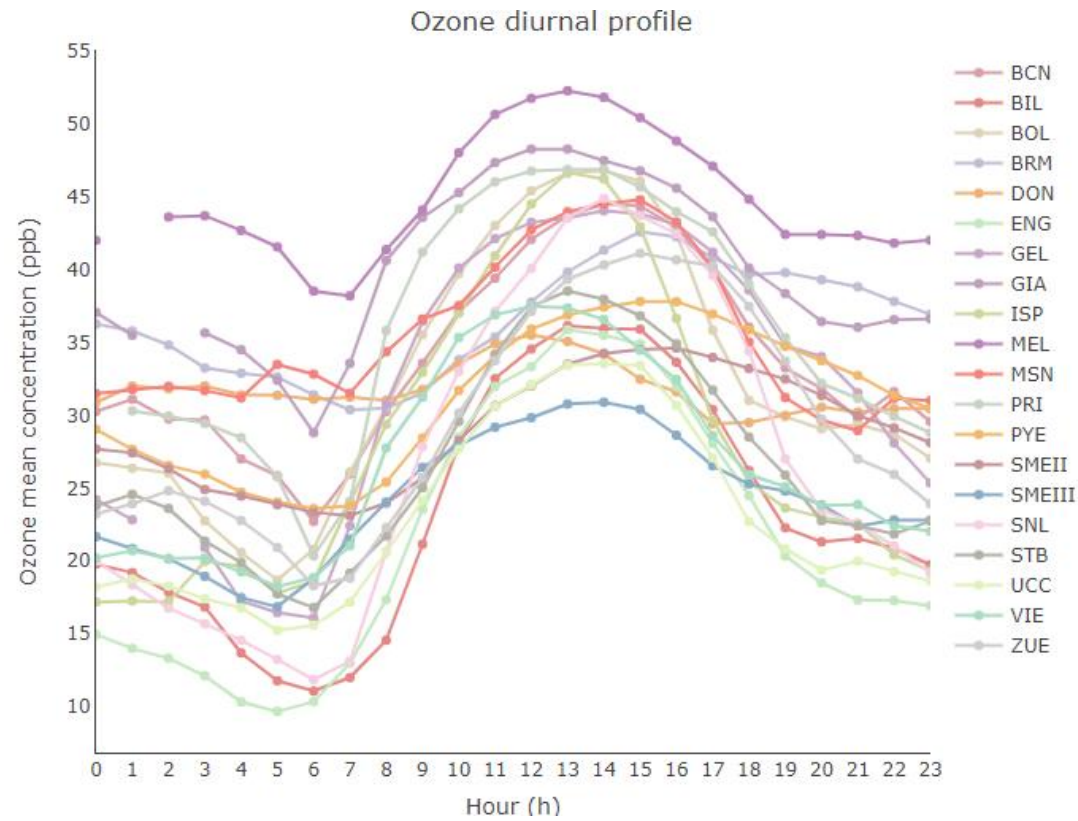
From the received data: 14 sites measured OVOC and 1 site measured terpenes

O₃ and NO_x also measured at the majority of the sites and more compounds at some sites : PM, CO, CO₂, CH₄...

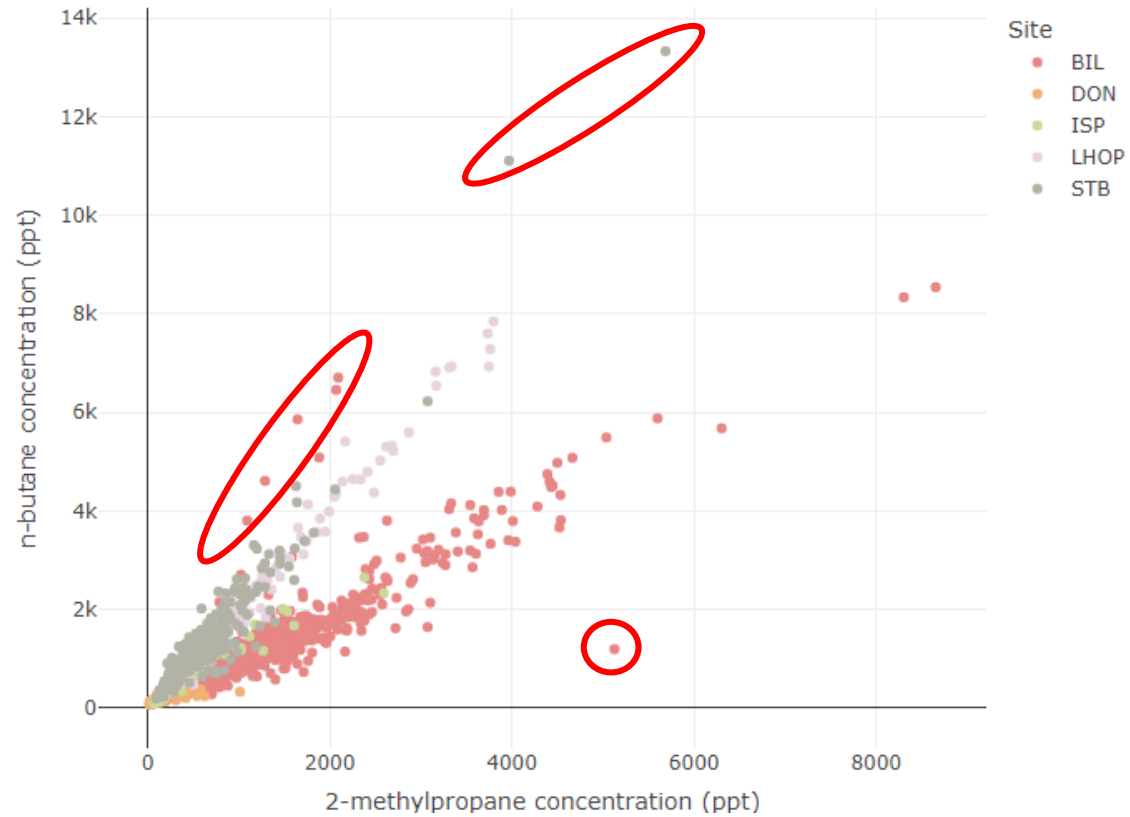


Figure : Overview of participant sites (Photos: ACTRIS NF (Hohenpeissenberg - Allemagne), AASQA (Atmo Grand Est – France), EMEP/ICOS/ACTRIS NF (Vielsalm & Space Pole sites - Belgique)

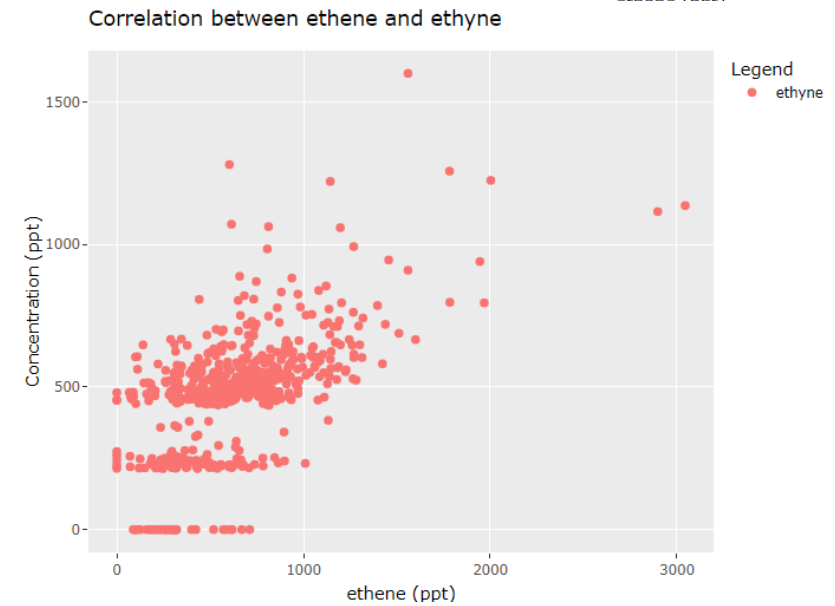
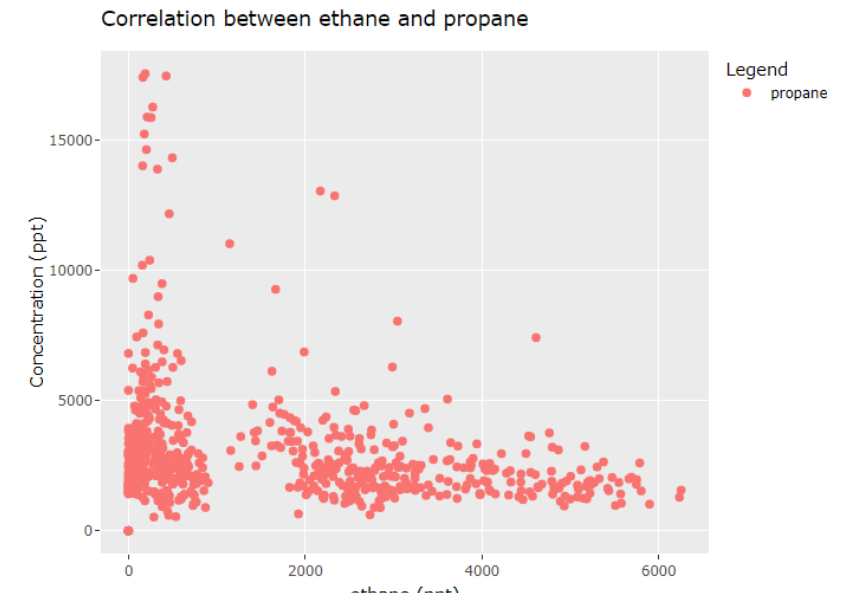
Preliminary results: Ozone & NO₂ diurnal profiles observed at many sites



VOC QA/QC assessment

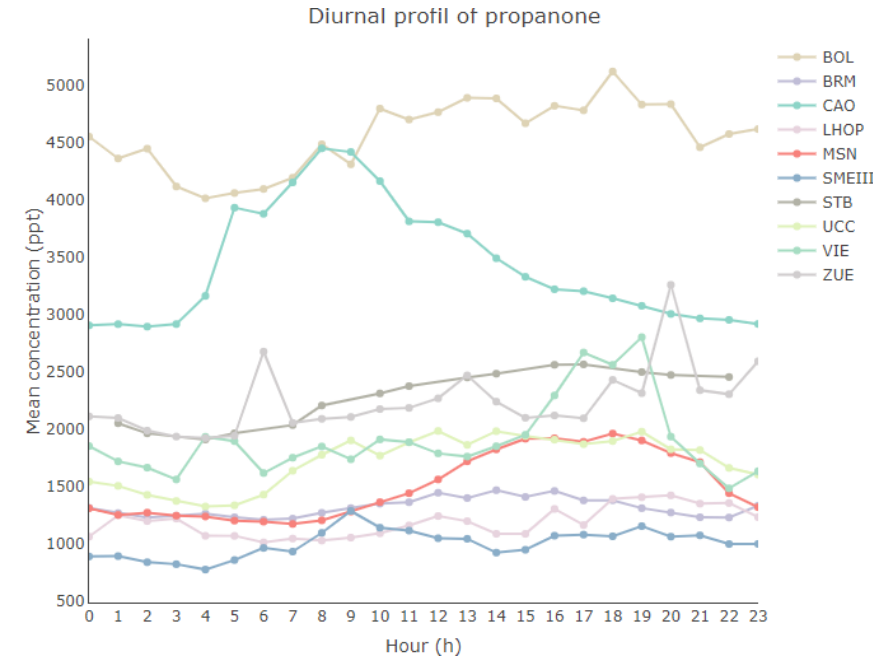
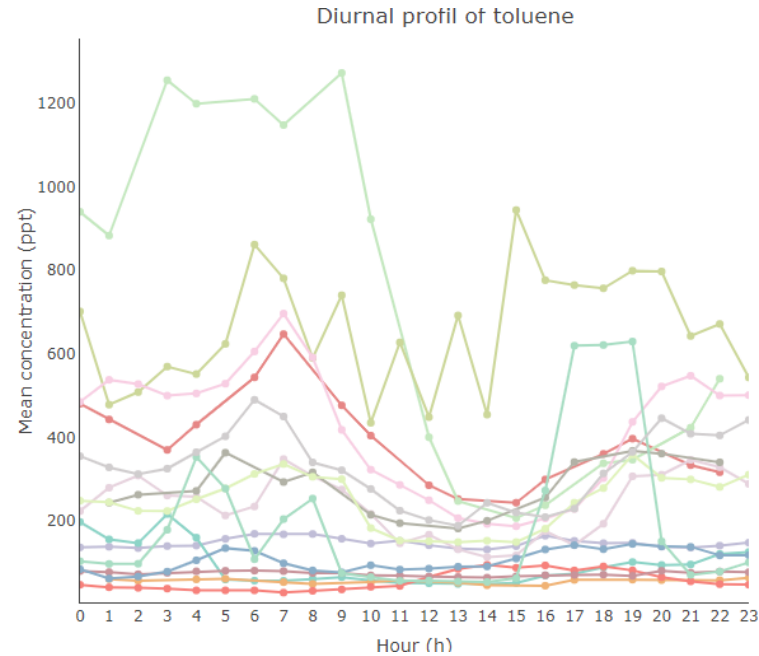
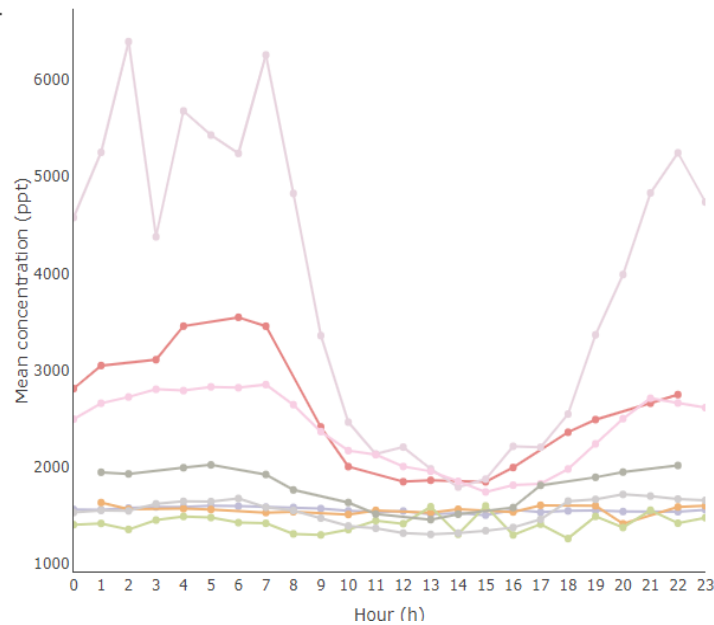


QA/QC done for all received data: in general good quality of the data



... But data from some sites have to be strongly investigated before their submission in EBAS

Diurnal variability of VOC to be checked after final validation



Perspectives:

- Data QA/QC evaluation => submission to EBAS
- PhD of Félix Moreau at IMT Nord Europe – Jan. 2025:
« DéCOV : Déterminants de la variabilité spatio-temporelle dans l'air ambiant extérieur des Composés Organiques Volatiles : impact sur l'ozone et l'aérosol organique secondaire ».
- PhD of XX?? at IMT Nord Europe – Oct. 2025:
“Observation-based evaluation of the factors influencing ozone formation across Europe”



IMT Nord Europe
École Mines-Télécom
IMT-Université de Lille



THANK YOU