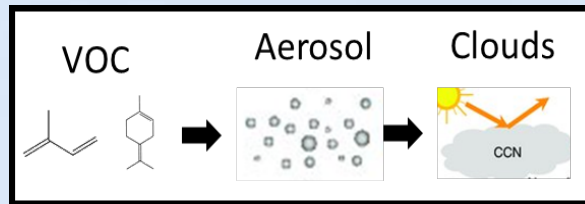


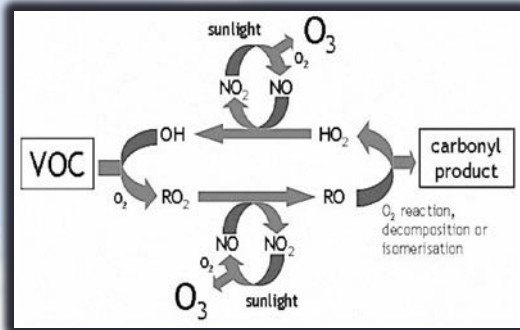
DYNAMICS OF VOLATILE ORGANIC COMPOUNDS IN A WESTERN MEDITERRANEAN OAK FOREST



A.M. Yáñez-Serrano, A. Bach, D. Bartolomé-Català, Vasileios Matthaios, R. Seco, J. Llusia, I. Filella and J. Peñuelas



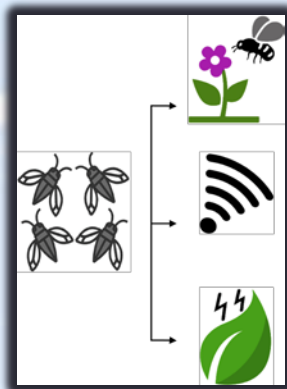
Aerosols & Clouds



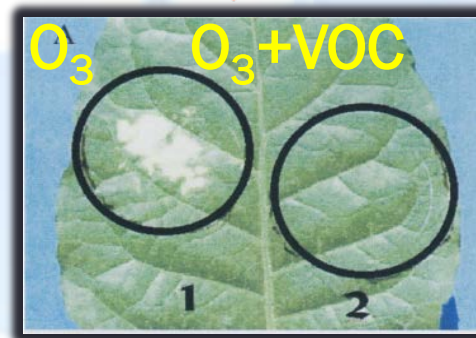
Atmospheric Reactivity



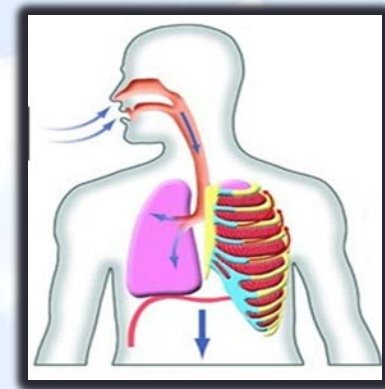
Photochemical pollution



Ecosystem signalling

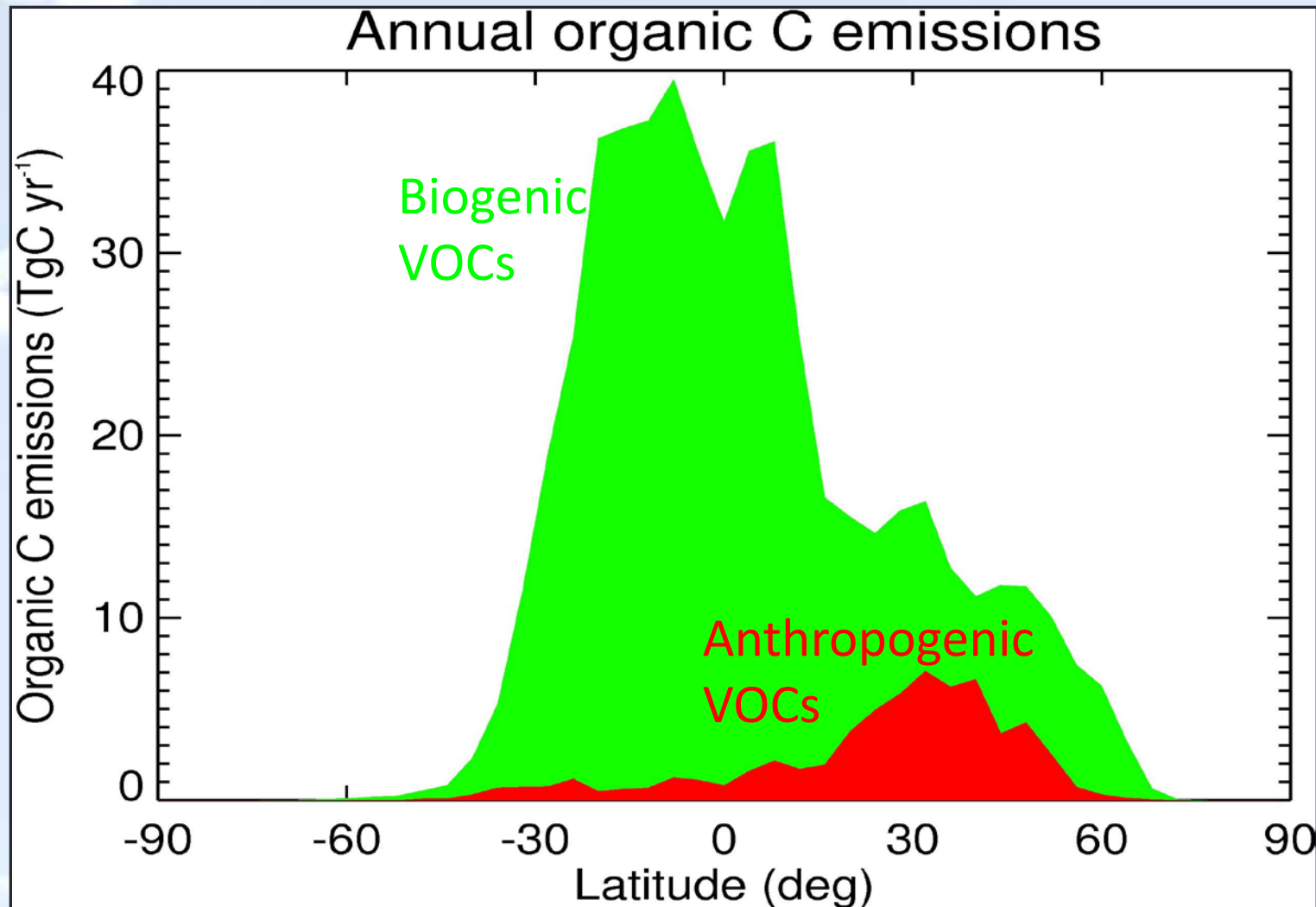


Plant defence



Health effects

Biogenic vs. Anthropogenic VOCs



Objectives - Montseny Natural Park

VOC characterization

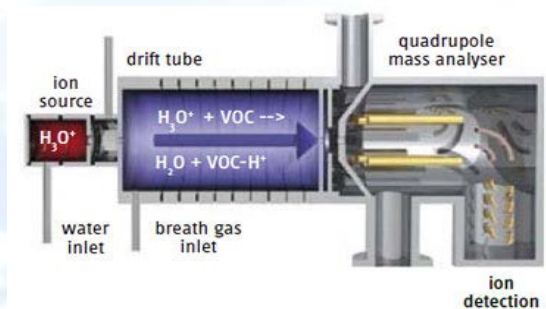
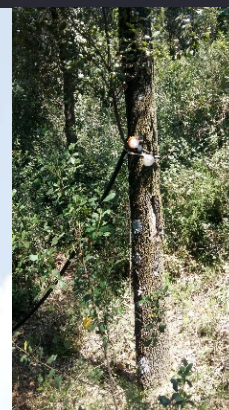
- To study the interaction of anthropogenic and biogenic VOCs
 - impact on atmospheric chemistry and ecological roles.

- Mediterranean forests ecosystems have
 - high BVOC emissions
 - high solar radiation
 - influence of anthropogenic sources enhance photochemistry favouring the production of ozone and aerosols

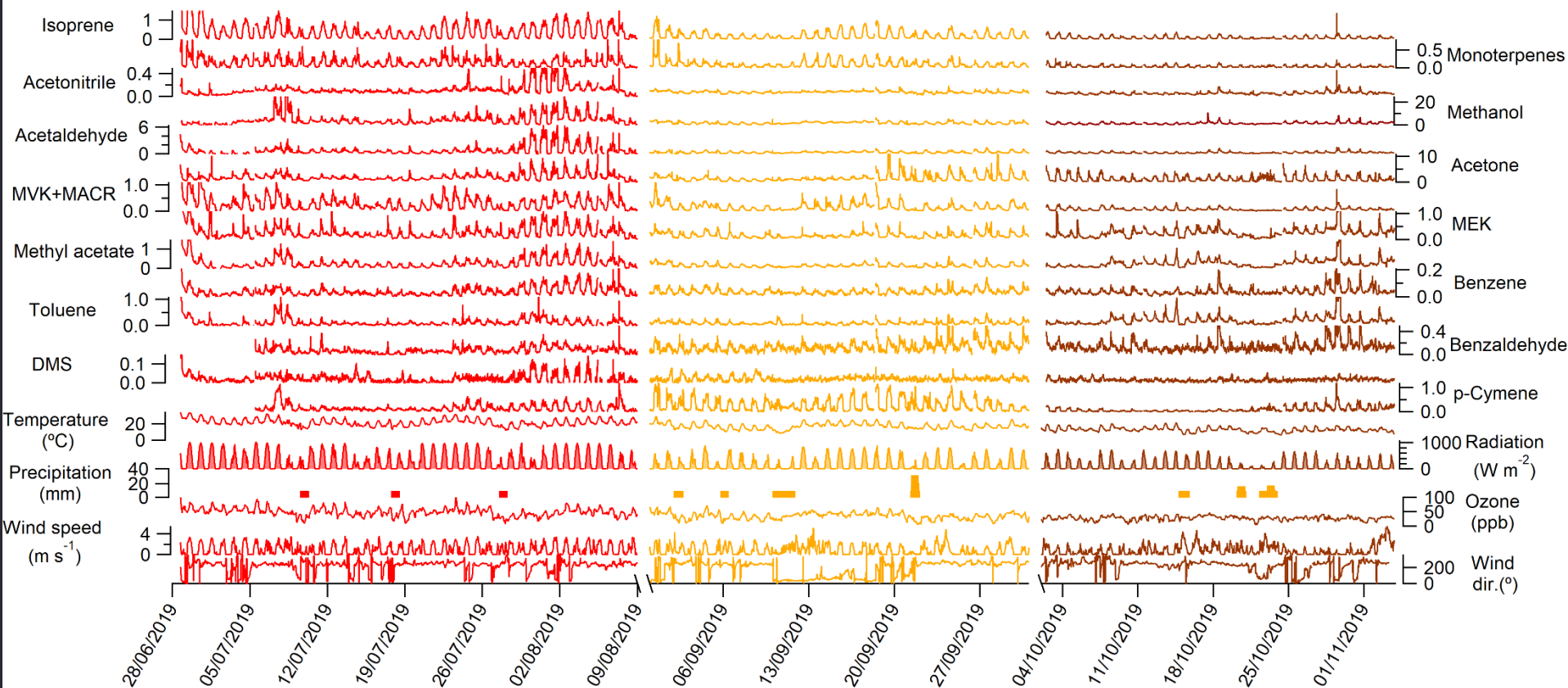


Methodology

- Measuring period: June 2019 – Nov 2019
- Inlet height: 1.5m
- Canopy top: 6m
- Other Atmospheric variables obtained from nearby (up to 12km away) measuring stations.
- Measuring method: PTR-MS
 - Proton transfer reaction mass spectrometry (PTR-MS) is a soft chemical ionization technique capable of measuring online trace gases down to the ppt range.

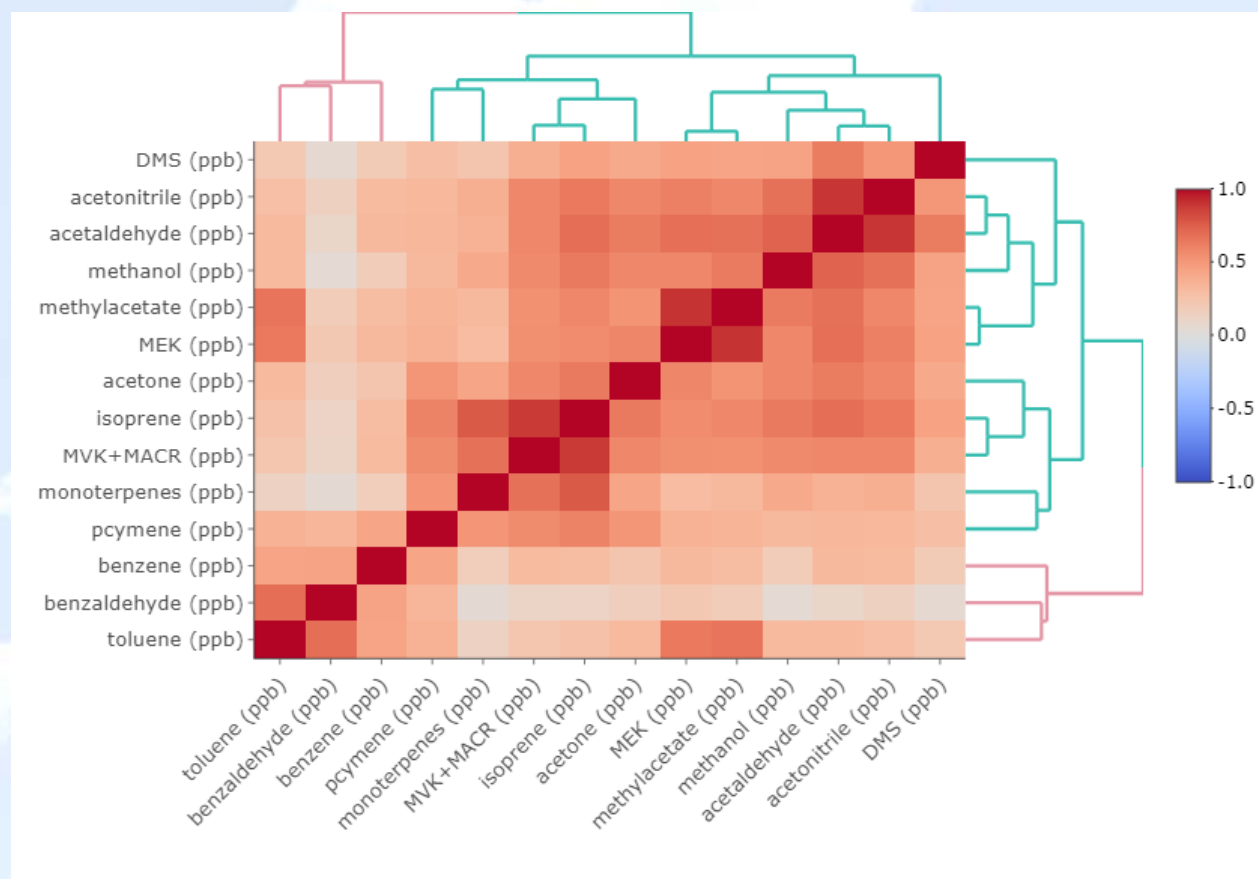


All data



Heatmap

- Use of heatmap with dendrogram to group the different VOCs
- Biogenic
- Oxygenated
- Aromatics



Positive matrix factorization

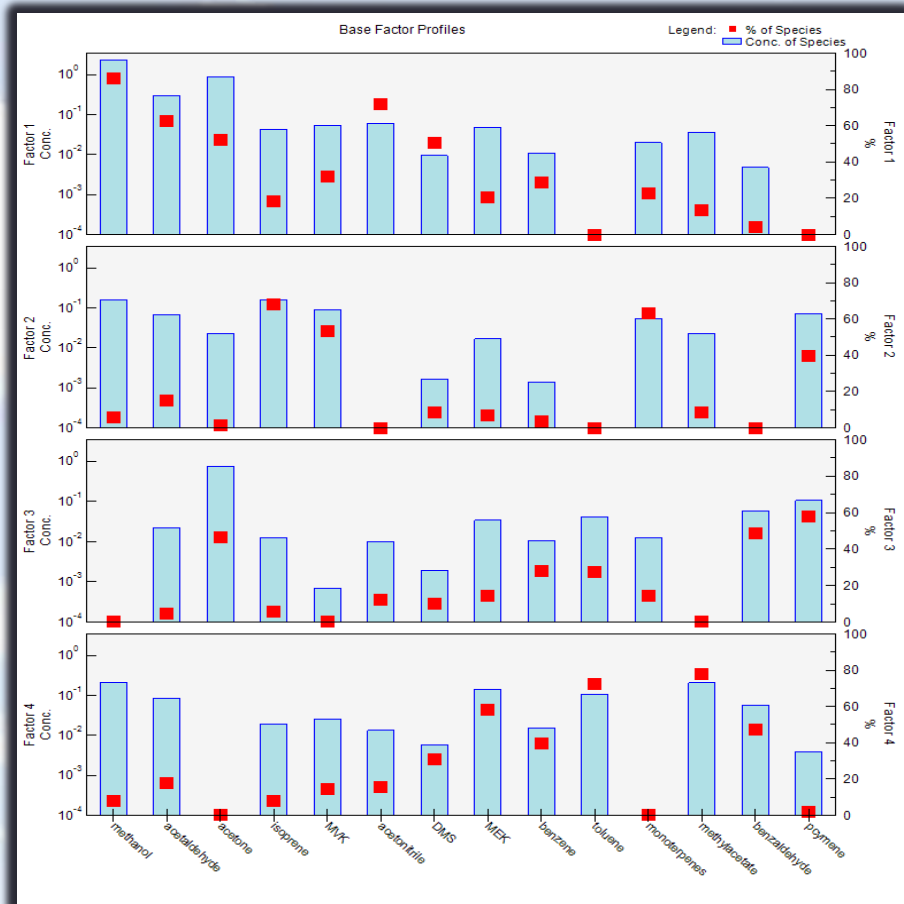
- With positive matrix factorisation analysis we identified four emission profiles that were attributed to:

Factor 1
Photochemistry

Factor 2
Biogenic

Factor 3
Mixed source

Factor 4
Traffic emission

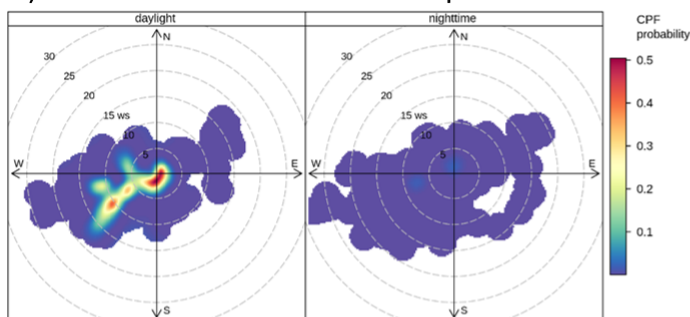


Different VOCs

Bivariate polar plots

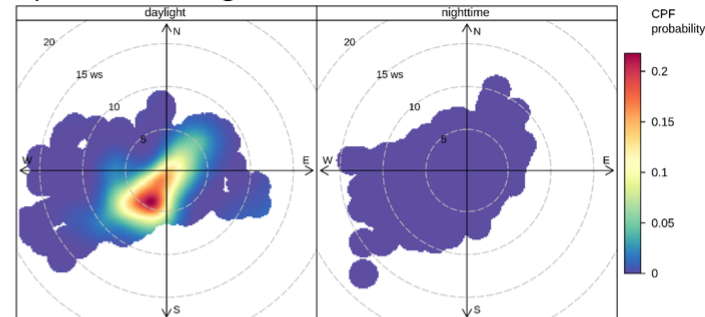
- Factor 3 and 4 had distant sources, wind direction and speed show air masses come from elsewhere and infiltrate the canopy.

a) Factor 1: Photochemical VOC production



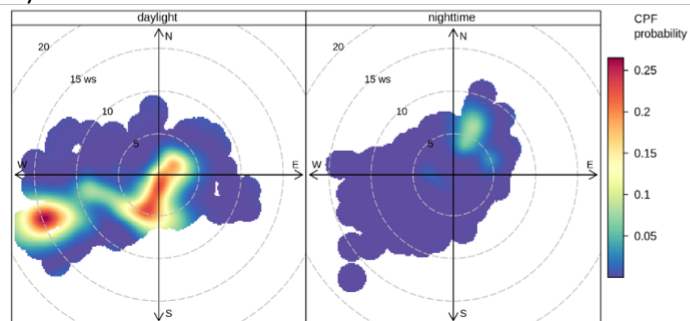
CPF at the 90th percentile (≈ 0.95)

b) Factor 2: Biogenic VOC emissions



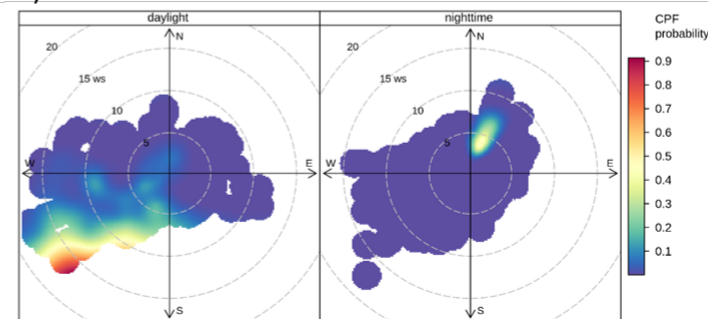
CPF at the 90th percentile (≈ 4)

c) Factor 3: Mixed VOC emission



CPF at the 90th percentile (≈ 1.6)

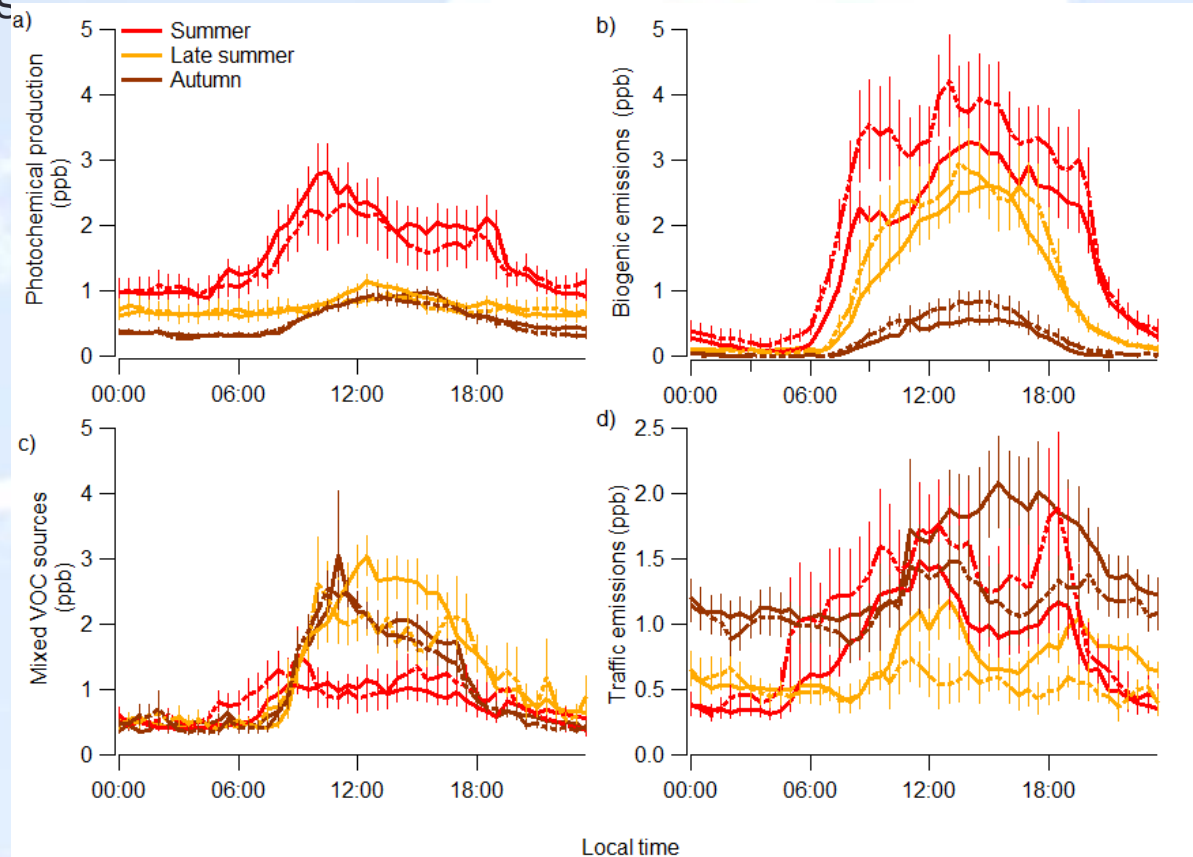
d) Factor 4: Traffic emissions



CPF at the 90th percentile (≈ 2.3)

Diel cycles of the different factors

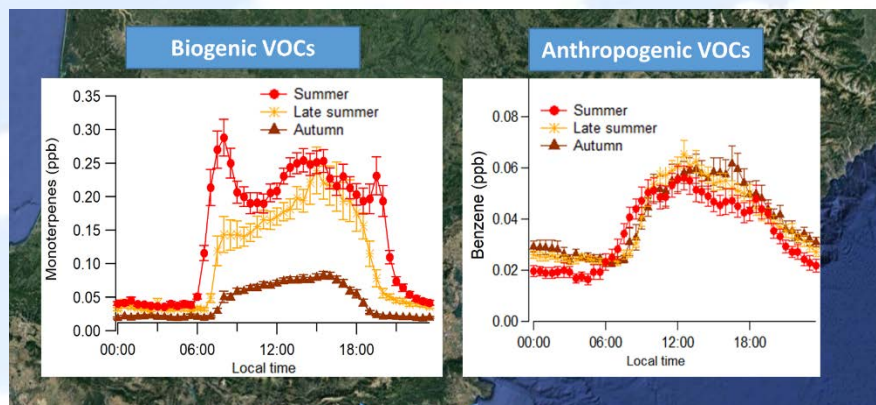
- Differences between weekdays (dash lines) and weekends (thick line) for traffic emissions



traffic emissions show peaks with 2hr-lag rush hour from Barcelona city and surrounding area

Conclusion & scope to this workshop

- Biogenic VOC emissions dominated early in the morning,
- but polluted air masses arrived at the site later in the day due to sea breeze and interacted with the forest air – altering photochemistry
- We show how the atmospheres of forested ecosystems could be substantially affected by anthropogenic VOC sources which infiltrate the canopy.
- In terms of air quality the interaction between biogenic and anthropogenic sources is key at a regional scale





THANK YOU!