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PANAME – Project synergy of atmospheric research in the Paris region

Martial Haeffelin, Simone Kotthaus, Sophie Bastin, Sophie Bouffies-Cloch , Chris Cantrell, Andreas Christen, Jean-Charles Dupont, Gilles Foret, Val rie Gros, Aude Lemonsu, et al.

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PANAME

Project synergy of atmospheric research in the Paris region

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EGU23 - CL2.8
25th April 2023

PANAME

An initiative to promote collaborations and develop multi-project synergies on urban environment research in Paris.

Paris region urbaN Atmospheric observations and models for
Multidisciplinary rEsearch

<https://paname.aeris-data.fr>

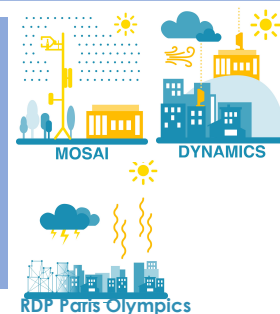
Cities and Air Quality

- Anthropogenic and biogenic emissions
- Ultrafine particles
- Hydric stress □ tree emissions



Cities and Meteorology

- Urban ABL dynamics
- Local circulations
- Urban heat island effects
- Effects on thunderstorms



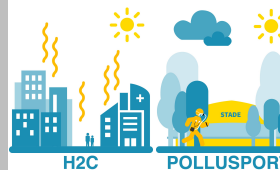
Cities and Climate

- GHG emissions and concentrations
- Effect of urban transformation



Impacts

- Interdisciplinary studies
- Impact on human health
- Impact on human activities

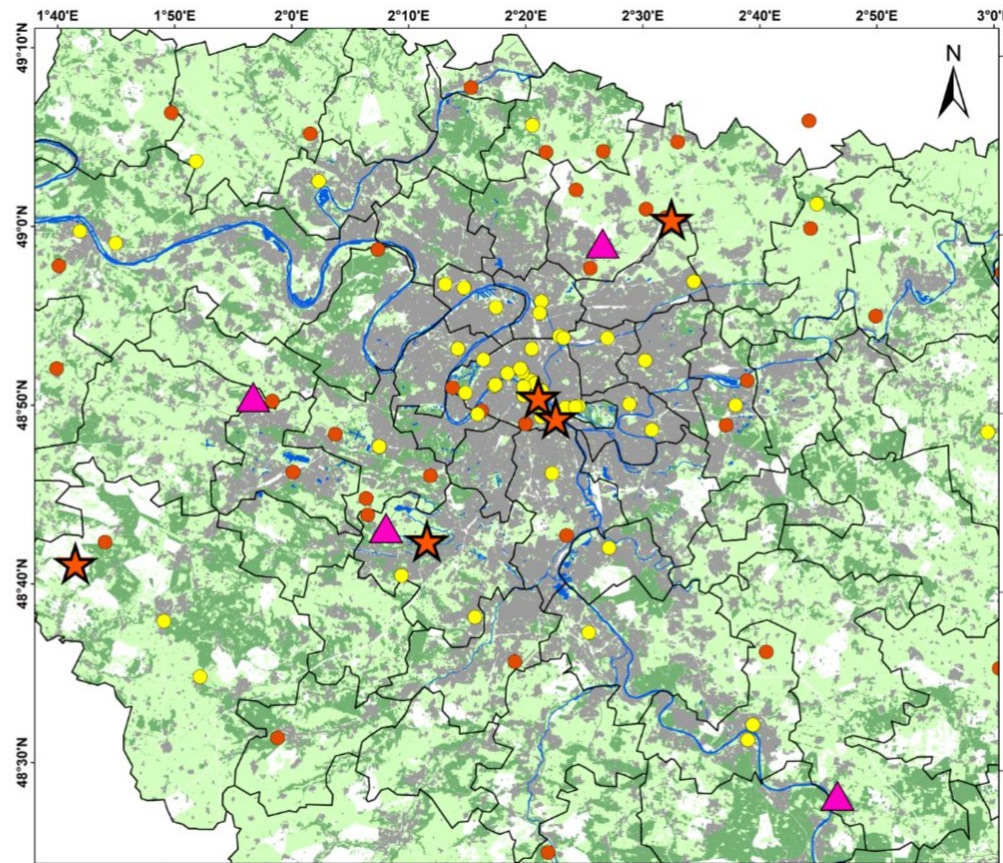
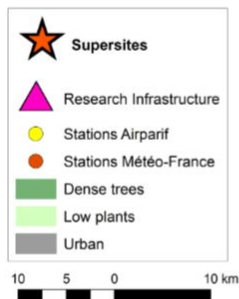


Measurement network design



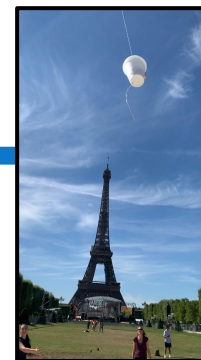
New observations:

- process studies
- model evaluation

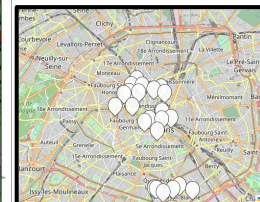


Before 2022:

- no meteo or flux station in urban setting
- limited vertical measurements



radiosoundings



high-density meteo network



atmospheric remote sensing



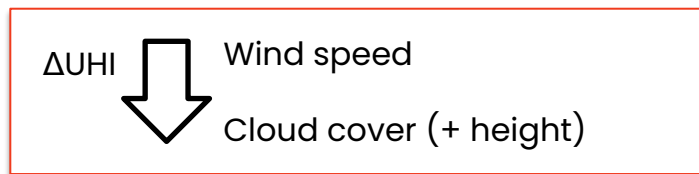
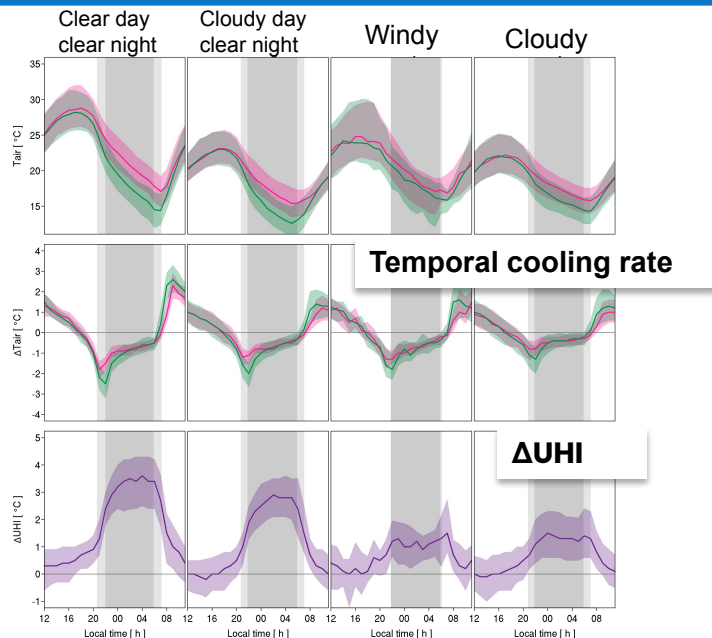
Urban biogenic emissions



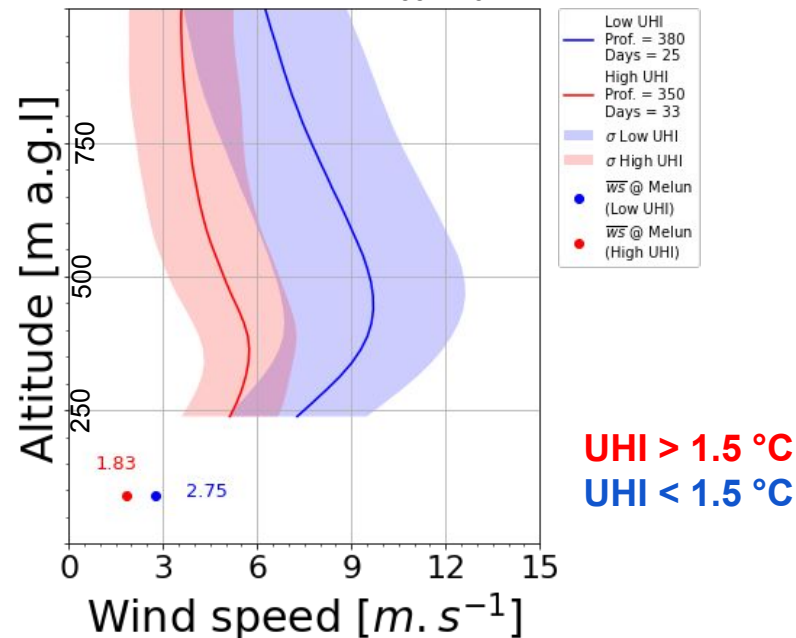
Forest atmospheric chemistry



Atmospheric boundary layer – DYNAMICS



- Frequent (70%) nighttime low-level jet
- Impact on Urban Heat Island (UHI)
JJA 2022

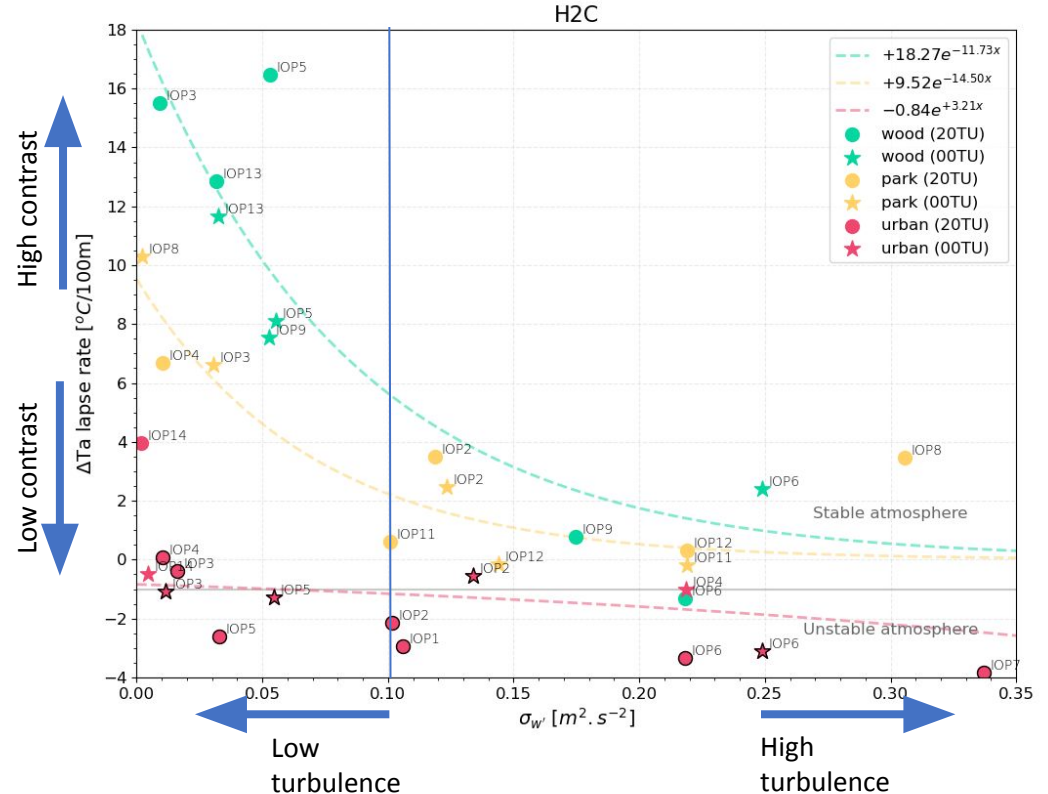


Vaisala Doppler wind lidar @QUALAIR-SU; Paris Region PhD @LMD: Jonnathan Cespedes

Cooling by urban green spaces - H2C



Evening cooling and turbulence



LOW turbulence conditions:

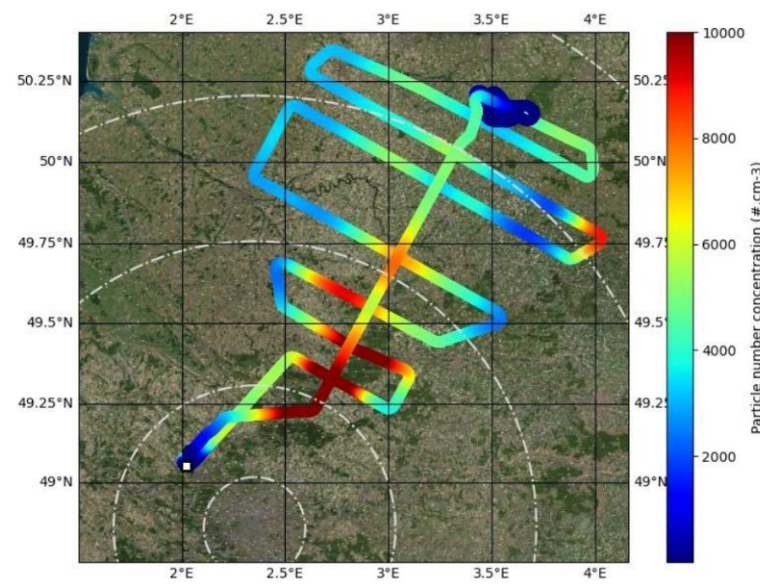
- STRONG temperature contrasts between Wood-City and Park-City
- Cooling of vegetation is STRONG in woods and parks, but not in city.

STRONG turbulence conditions:

- Weak temperature contrasts between Wood-City and Parks-City
- Cooling effect of vegetation is mixed vertically and horizontally

- Impacts of chemistry of mixed urban and biogenic emissions on
 - Oxidants levels
 - Speciation of reactive nitrogen
 - Organic carbon oxidation pathways
 - Aerosol composition & properties
- Consequences for air quality, biosphere health & representation in models
- <https://across.aeris-data.fr>

Particle Number Concentration (11-478 nm)
ACROSS-Aircraft Observations – CNRM (C. Denjean)



Demonstration of plume evolution
due to dilution and chemistry
downwind of Paris in particle number

AS5.9 Urban to rural atmospheric observations and models for multidisciplinary research

Posters: Wed. 26 April, posters up all day, presenters at 14:00-15:45 CEST (Hall X5)

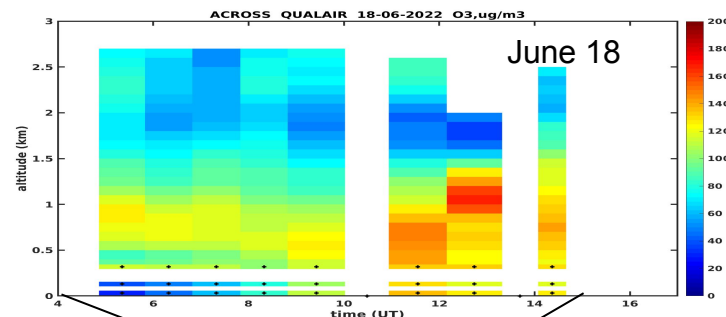
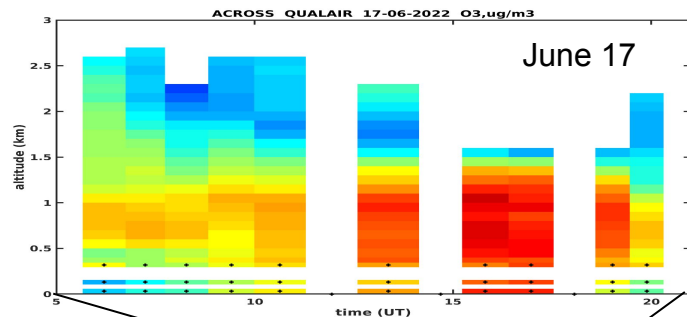
Oral: Wed. 26 April, 16:15-18:00 CEST (Room M2)

Contact Chris Cantrell, LISA-IPSL

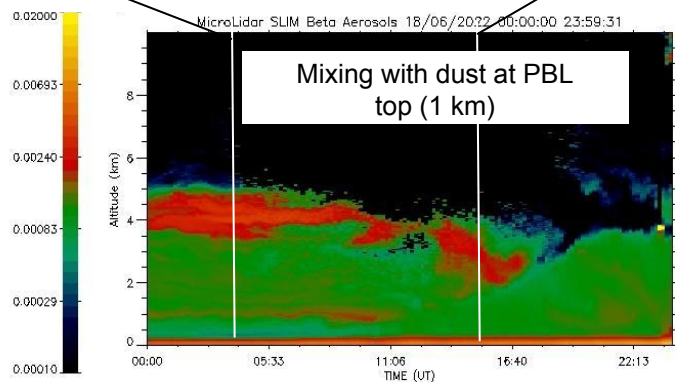
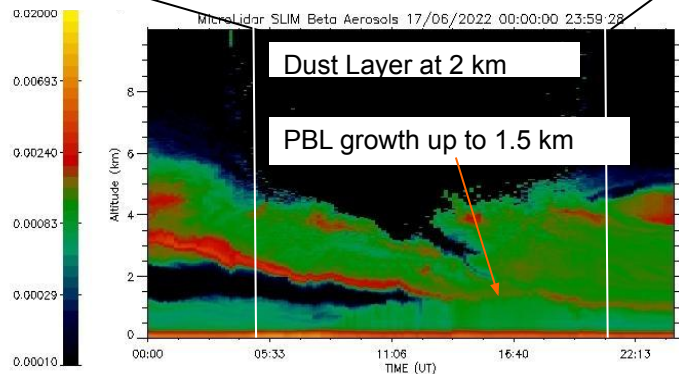
Ozone profile variability - ACROSS

Ozone pollution peak in Paris and advection of dust plume above the ABL

Ozone profiles



Aerosol profiles



High ozone in residual layer (>140 $\mu\text{g}/\text{m}^3$) → daytime ozone peak exceed 180 $\mu\text{g}/\text{m}^3$

Lower ozone in transported dust layer & dust → reduced photolysis and ozone

Biogenic VOC emissions – sTREEt



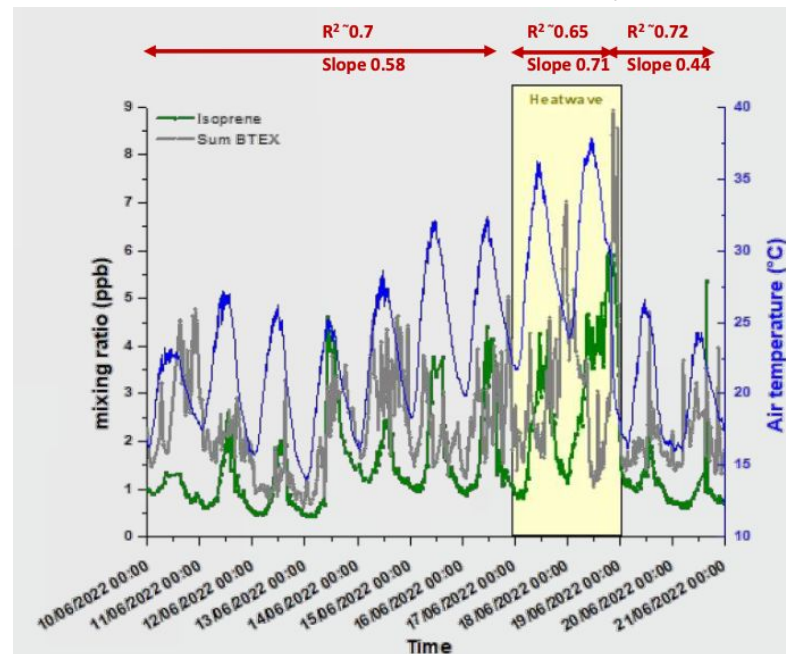
What is the impact of urban stress on biogenic VOC emissions of city trees and its consequence on air quality?

In central Paris, significant traffic-related source to ambient isoprene and monoterpene (typical biogenic markers)

But increase biogenic source during heat wave

PANAME allows to study biogenic VOCs at multiple sites (urban, suburban, forest, ...)

Isoprene and Benzene/Toluene mixing ratio in Paris Garden located near heavy traffic



PANAME data portal by



PANAME DATA PORTAL: Content

1. Objectives and projects

- Scientific issues
- Scientific questions
- Projects contributing to PANAME

2. Measurement networks and campaigns

- Urban, suburban, rural super sites
- Research infrastructures (ACTRIS, ICOS)
- Distributed operational networks
- Satellite data

3. Modelling activities

- Weather prediction
- Chemistry-transport
- Climate models
- Campaign deployment planning

4. Data access

- Data catalog
- Data visualization

<https://paname.aeris-data.fr>

PANAME DATA PORTAL: Catalog

- Each **Data Product** is described in a specific **Data Sheet**
- Each data product has a **DOI**
- Access to data and metadata via an **API** to facilitate interoperability
- Use of **controlled vocabularies**. (<https://skosmos.aeris-data.fr/>)
 - AERIS
 - CF standard names
 - Parameters
 - Instruments
 - Platforms
 - Projects
 - Data policies
 - Reference Thesaurus
 - GCMD (NASA)
 - WIGOS

PANAME DATA PORTAL: Visualizations

Many data visualizations are available:

Improvements and future developments

- Graphical tools improvements
- Serve PANAME Jupyter notebooks on a Jupyter Hub
- Cross-referencing of data from various sources
- Use of citizen science data

Thank you for your attention

<https://paname.aeris-data.fr>

Contact martial.haeffelin@ipsl.fr