



MI-TRAP
Transport • Health • Data



Final Science Meeting

Innovative methods for air quality monitoring and modelling at transport hotspots

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**Funded by
the European Union**

Project targets & deliverables

- 1 Focus is on **transport** sources in **urban areas** (Traffic, Shipping, Aircraft)
- 2 Air Quality **metrics** focus is on **emerging pollutants** Ultrafine Particles (UFP), Black Carbon (BC) including **standard** metrics (NO_2 , $\text{PM}_{2.5}$) and **specific** metrics and **tracers** (solid particles, CO_2)
- 3 Employ **novel techniques** to mitigate transport emissions at **hotspots** and assist decision making
 - **High Time resolution,**
 - **Near Real Time** Data Acquisition,
 - Flexible **Compact - Cost effective** monitoring
 - **Quality Assured** Methods

Project targets & deliverables

4

Several Industrial partners provide **instrumentation** for the project **tailor-made** solutions

 **Catalytic Instruments**
hot technologies • clean solutions

 **NANO DUST**

 **BRUKER**

 **ivm**

 **HAZE**
INSTRUMENTS

5

Monitoring concept: The **High Resolution (HR)** & **Cost Effective (CE)** Stations

HR: (Ambient and Solid UFP Number Conc. & UFP Size distribution, PM_{2.5}, CO₂, NO₂, BC, NRT Chemical speciation including Metals (Xact) for Source apportionment

CE: Compact instruments for the above for flexible deployment (excl. chemical species)

6

Focus on **heath** impacts through Inhalation dosimetry & epidemiology

7

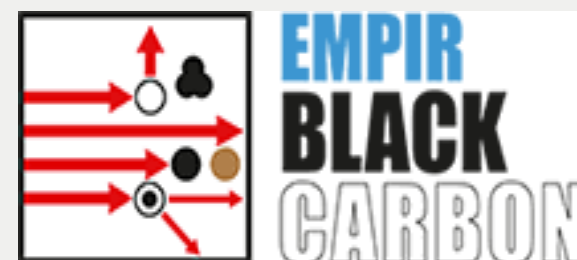
Include the implementation of **Nature based solutions** for mitigation of air pollution levels at hotspots



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● Quality assurance of existing methods

CEN Standardized methods are updated and members of this consortium are active there
(**WG35 EC/OC, WG32** Particle number/surface)



Monitoring of emerging pollutants (particles & gases) is currently **well established** in Research Infrastructures **ACTRIS, ICOS**, and networks like **GAW**

And demonstrated their capacity in Green Deal Projects



Any methods for tailor made output to respond to needs for High time Resolution and NRT Output was tested in specific workshops



QA/QC: For UFP number conc. & Size distribution

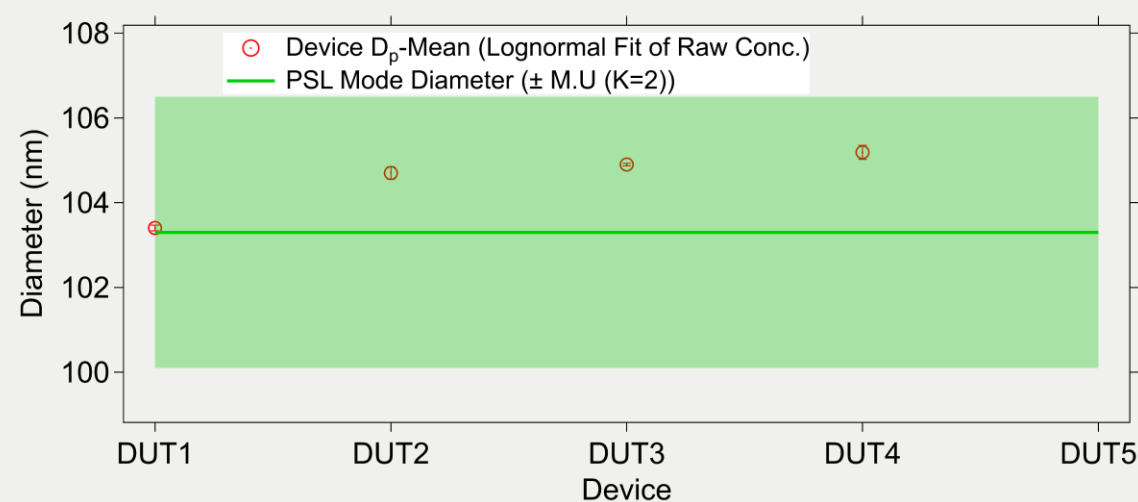
MPSS Calibration Workshop at PTB (NMI) & ICPF (ACTRIS CF Facility):

Physikalisch-Technische Bundesanstalt (NMI, Germany & WP1 leader)

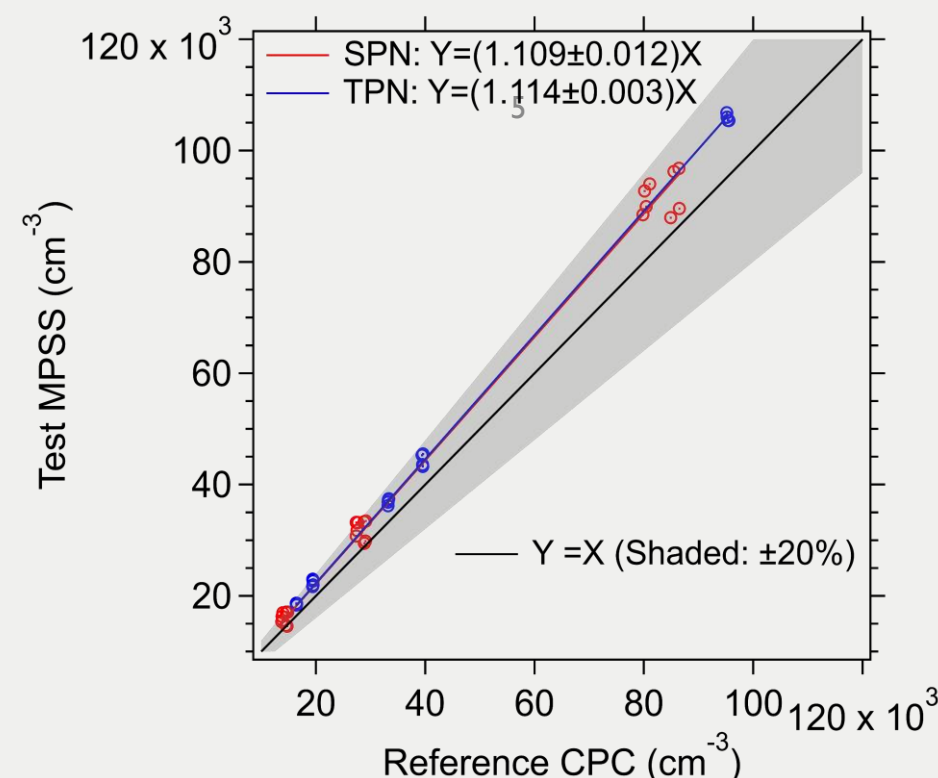
Institute of Chemical Process Fundamentals (Prague, Czech Rep)

- ❖ **Scan time: 1 – min** : Dynamic aerosol distributions/ short life event at traffic sites.
- ❖ **Scan Range: 15-250 nm** : PNSD with GMDs below 50-60 nm at traffic sites in europe (Trechera et al., 2023) + very low PN at higher diameters + an overlap with OPS

The size measured by all MPSS within M.U. (3.2nm) as well as within the 3% limit (CEN criteria) of PSL



Solid PN vs Total PN



Summary of system performance

Device(Institute): DMA & CPC models, Polarity	Slope (DUT vs Ref CPC) (DP-Mean: ≈ 30 nm)	Slope (DUT vs Ref CPC) (DP-Mean: ≈ 50 nm)	Slope (DUT vs Ref CPC) (DP-Mean: ≈ 80 nm)	Mean Deviation
Reference MPSS HV+ : (Hauke M&3756)	1.05	1.03	1.03	3.5%
DUT1 (PTB-new TSI): 3083 & 3756, HV-	0.80	0.81	0.82	19%
DUT2 (TUC-new TSI): 3081 & 3775, HV-	0.76	0.80	0.84	20%
DUT3 (ICPF-New TSI) 3081& 3752, HV-	0.85	0.90	0.93	12%
DUT4 (DTI-New TSI) : 3081& 3776, HV-	0.69	0.70	0.71	30%
DUT5 (NCSRD-Old TSI): 3080 & 3772, HV-	0.94	1.06	1.20	10%

Extending the RI-URBANS NRT Source apportionment

The AXA method (Manousakas et al., 2025, AMT)

AXA set up

ACSM (Q/ToF)



Non-refractory PM
(OM, SO₄, NH₄, NO₃, Cl)

Xact

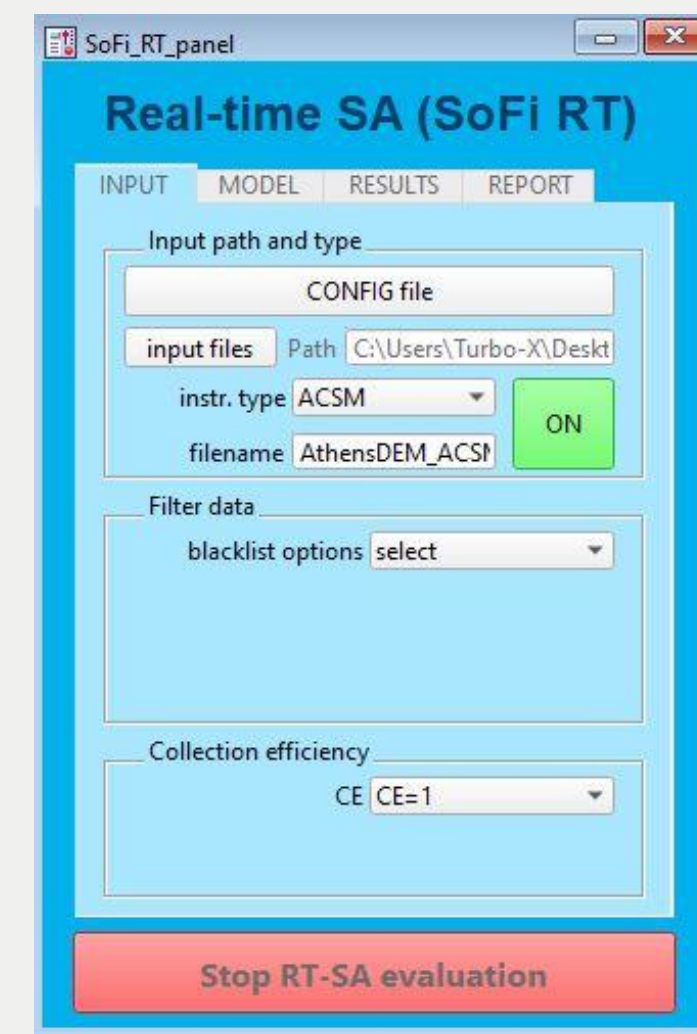


Elemental
composition

Aethalometer



Equivalent Black Carbon
(fossil fuel/biomass burning)



Configuration file:

- a-values constraints
- Bootstrap with defined blocks
- Rolling window
- CMB runs

Extending the RI-URBANS NRT Source apportionment

The AXA method (Manousakas et al., 2025, AMT)

2. Real Time SA
ATHENS Traffic site

AXA set up

ACSM (Q/ToF)



Non-refractory PM
(OM, SO₄, NH₄, NO₃, Cl)

Xact

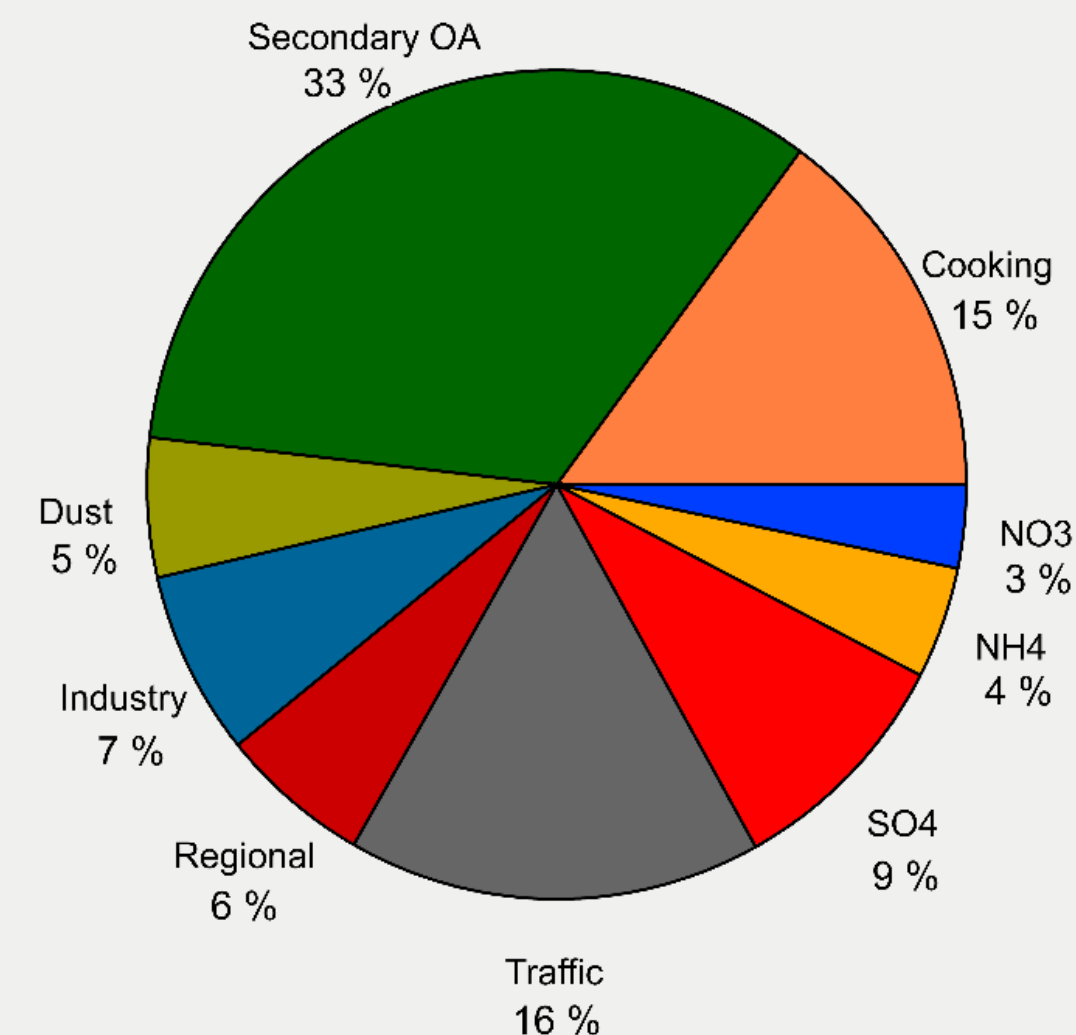


Elemental
composition

Aethalometer



Equivalent Black Carbon
(fossil fuel/biomass burning)



Consolidated pie chart of
source contributions

City Pilots Campaigns 2025-2026



Athens
GR.



Rotterdam
NL.



Milan
IT.



Lisbon
PT.



Copenhagen
Aarhus
DK.



Prague
CZ.



Florence
IT.



Lille
Dunkirk
FR.

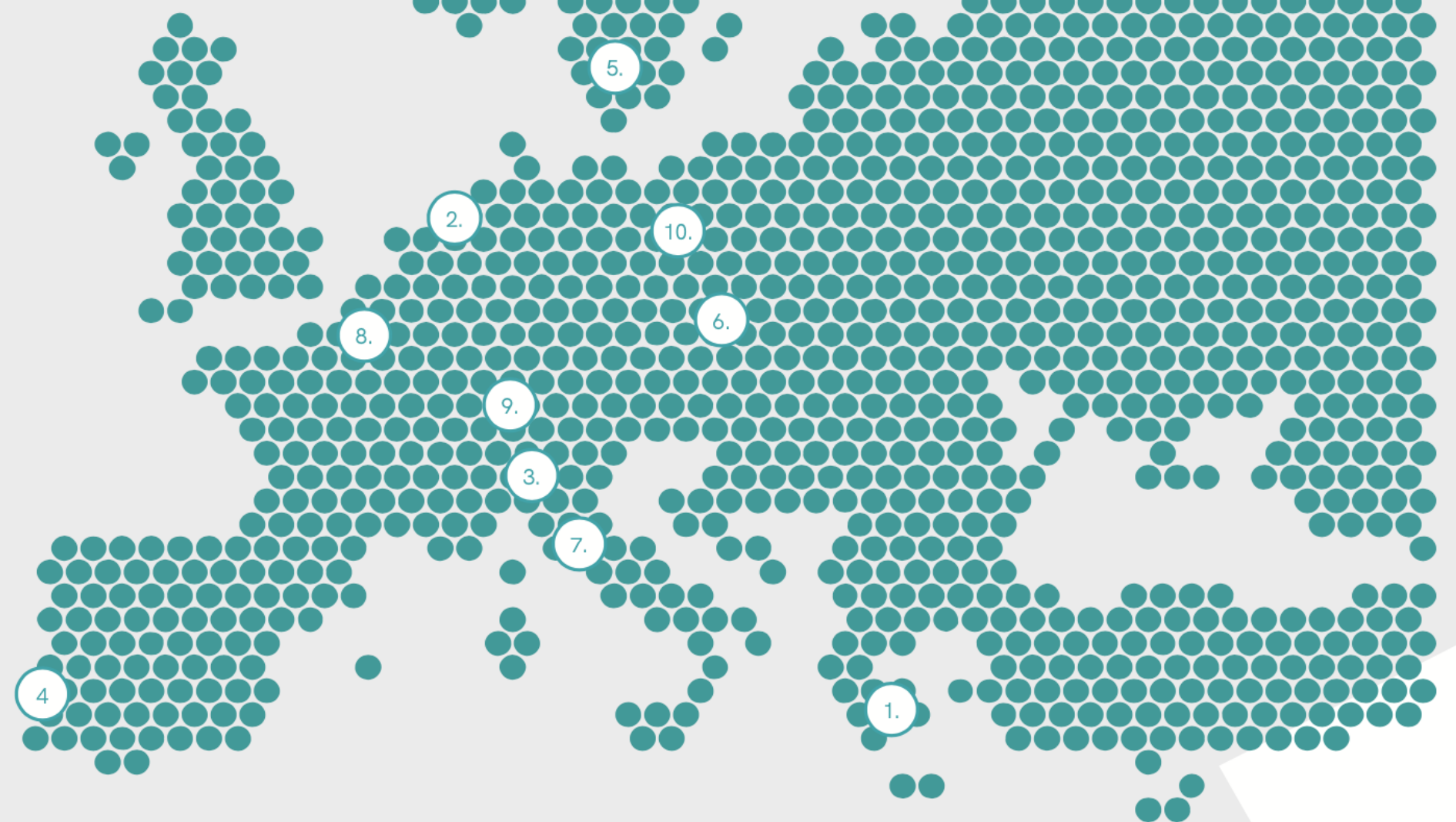


Zurich
CH.



Berlin
DE.

We leverage advanced monitoring capabilities, analytical tools, and strategically positioned monitoring stations near emission hotspots in 10 selected city pilots. These stations help us trace pollutants, evaluate the efficacy of legislation, and assess health impacts in real-time.



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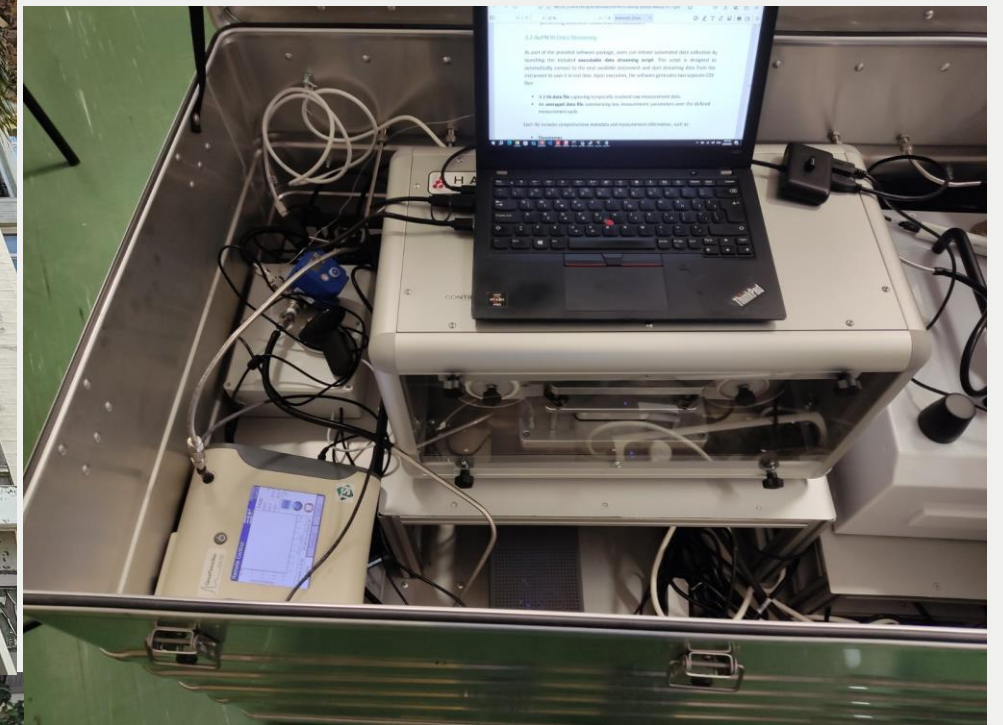
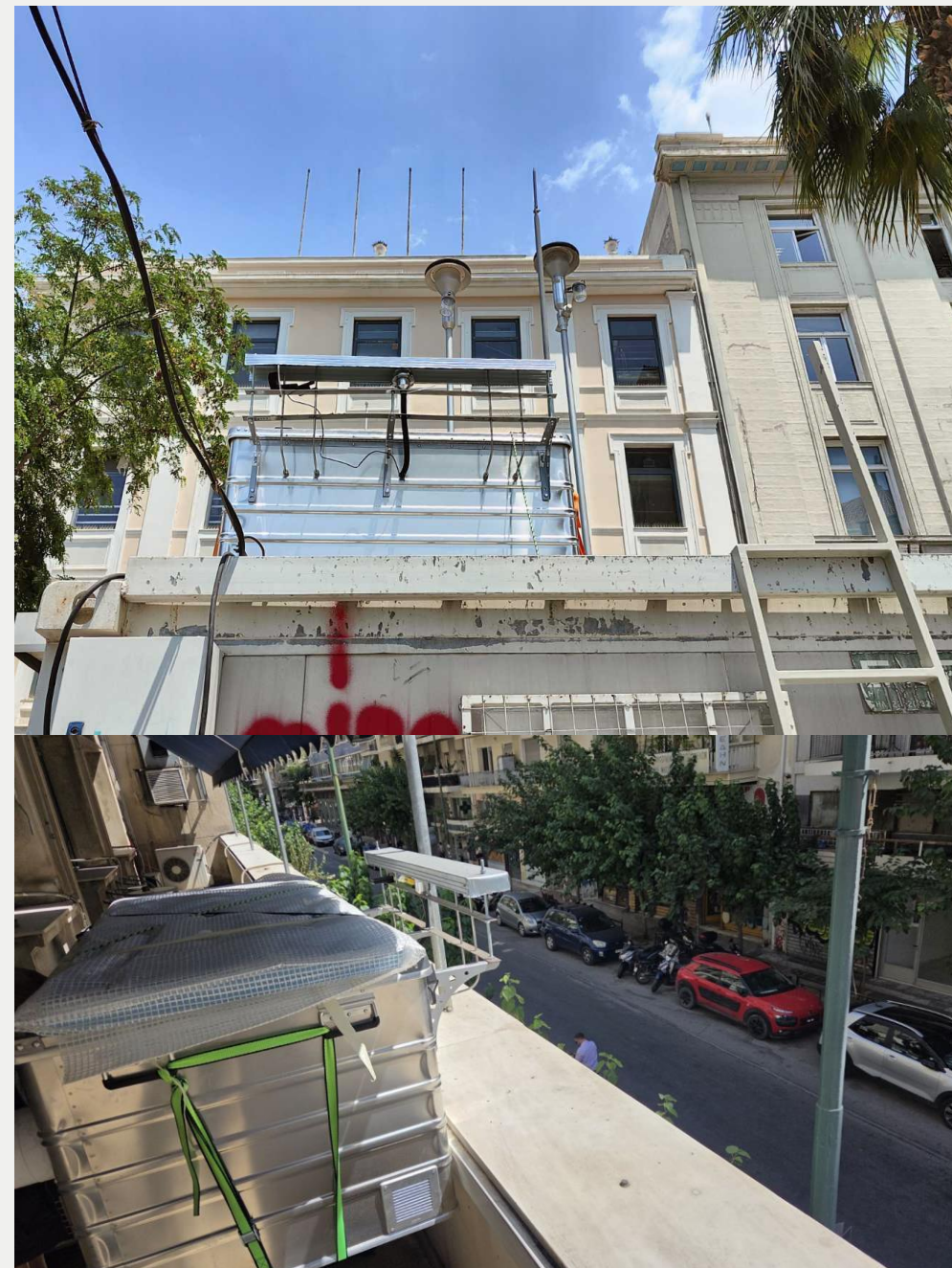
Three months One HR & 2 Cost Effective Stations

Preliminary Results from Athens

HR station – Patission
Street Canyon

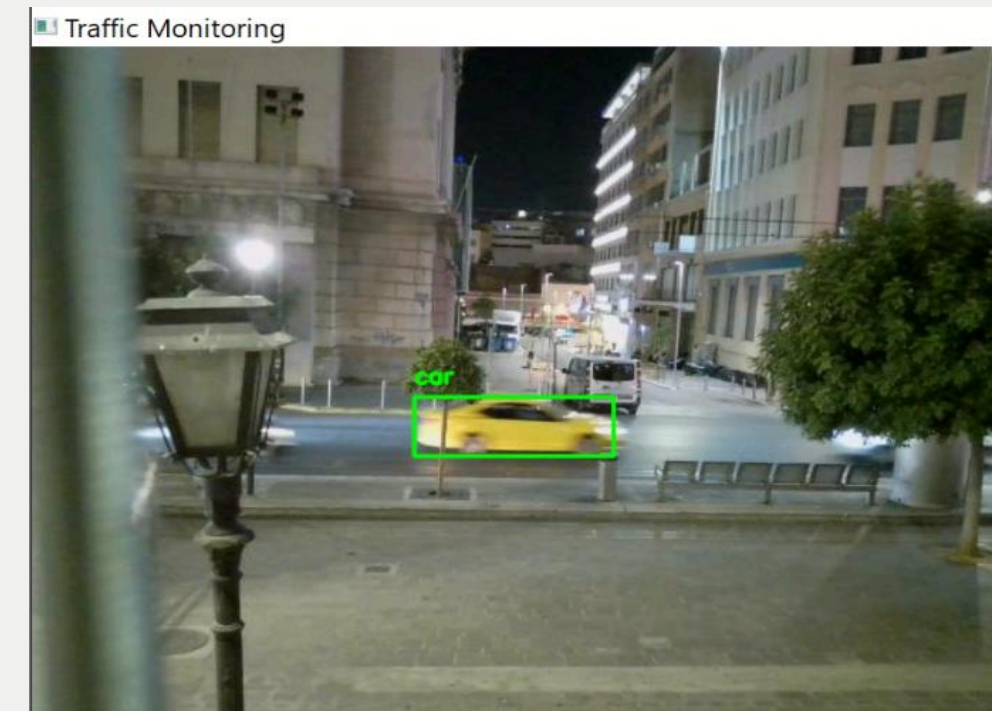


CE station – Aristotelous &
Piraeus Harbour



Traffic Monitoring System

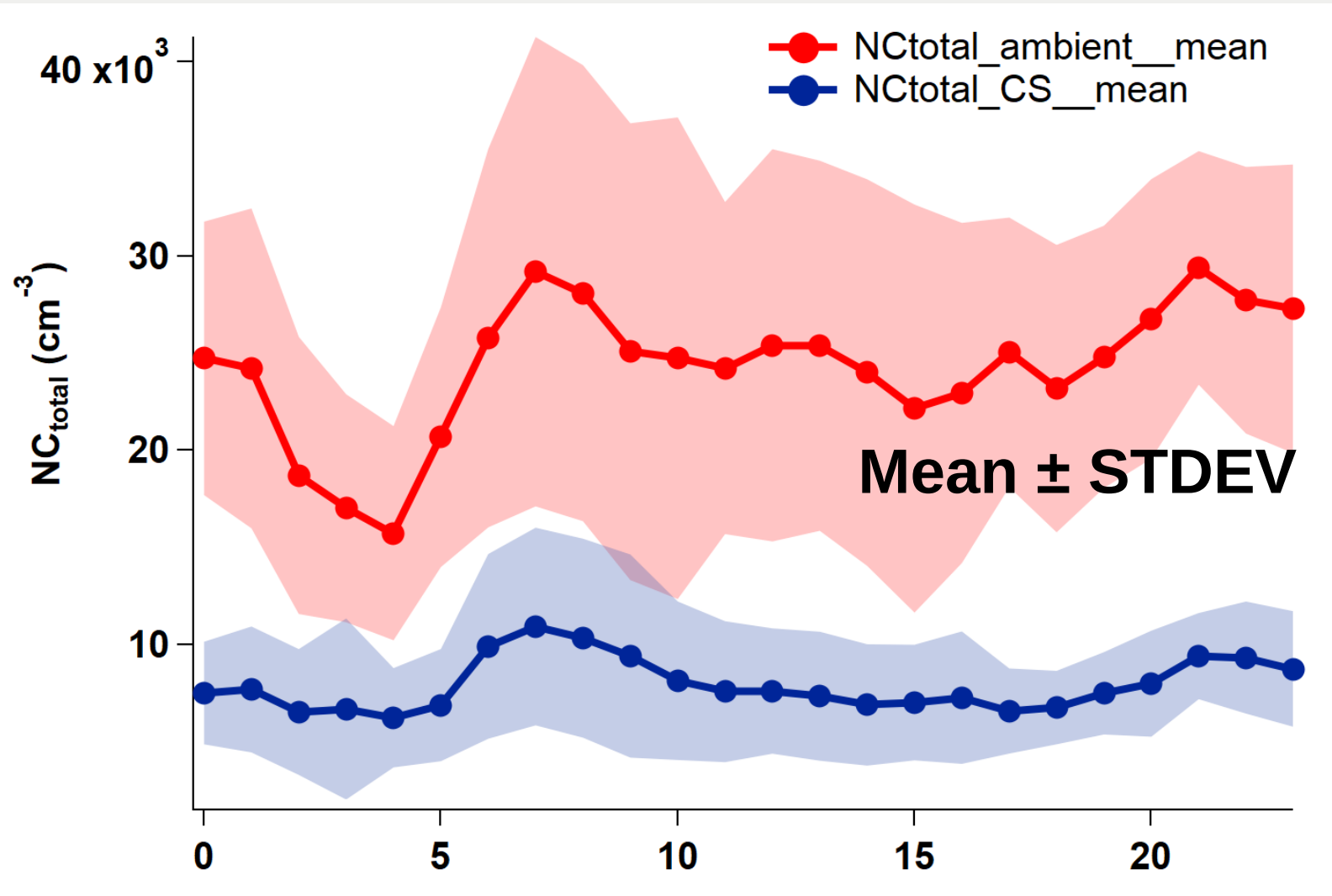
- Developed within the MI-TRAP project for near real-time (NRT) monitoring of road traffic
- Operates on standard PC or laptop devices, using a connected camera for acquiring images
- Uses a deep learning object detection algorithm to detect passing vehicles and classify them into broad categories (e.g., cars, LDVs, HDVs)
- Images shown are solely for illustrative purposes



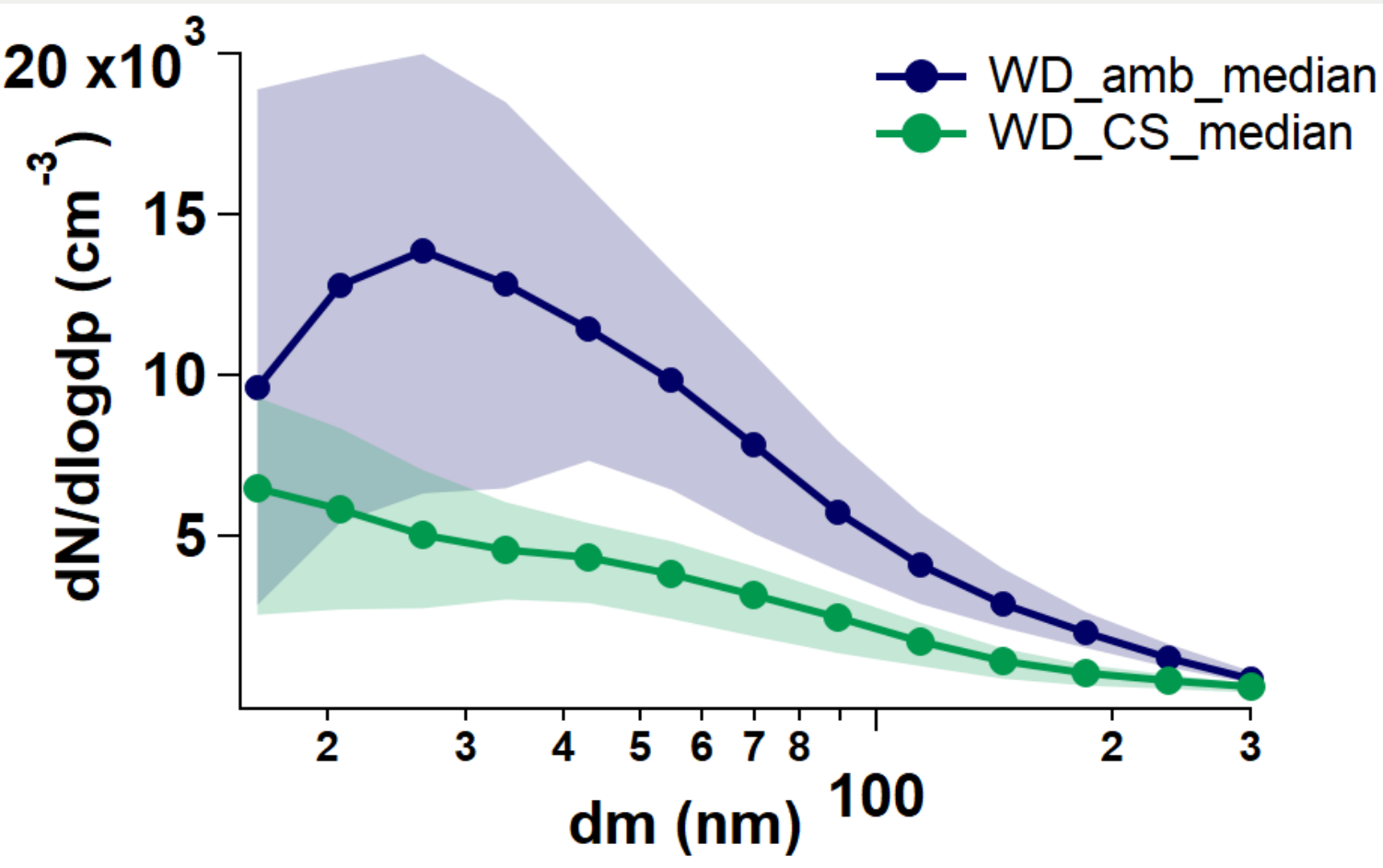
Preliminary Results from Athens

Diurnal Variability of Solid and Ambient Particle Conc.

Solid/AMBIENT	
Traffic PN	37%
Non Traffic PN	31%

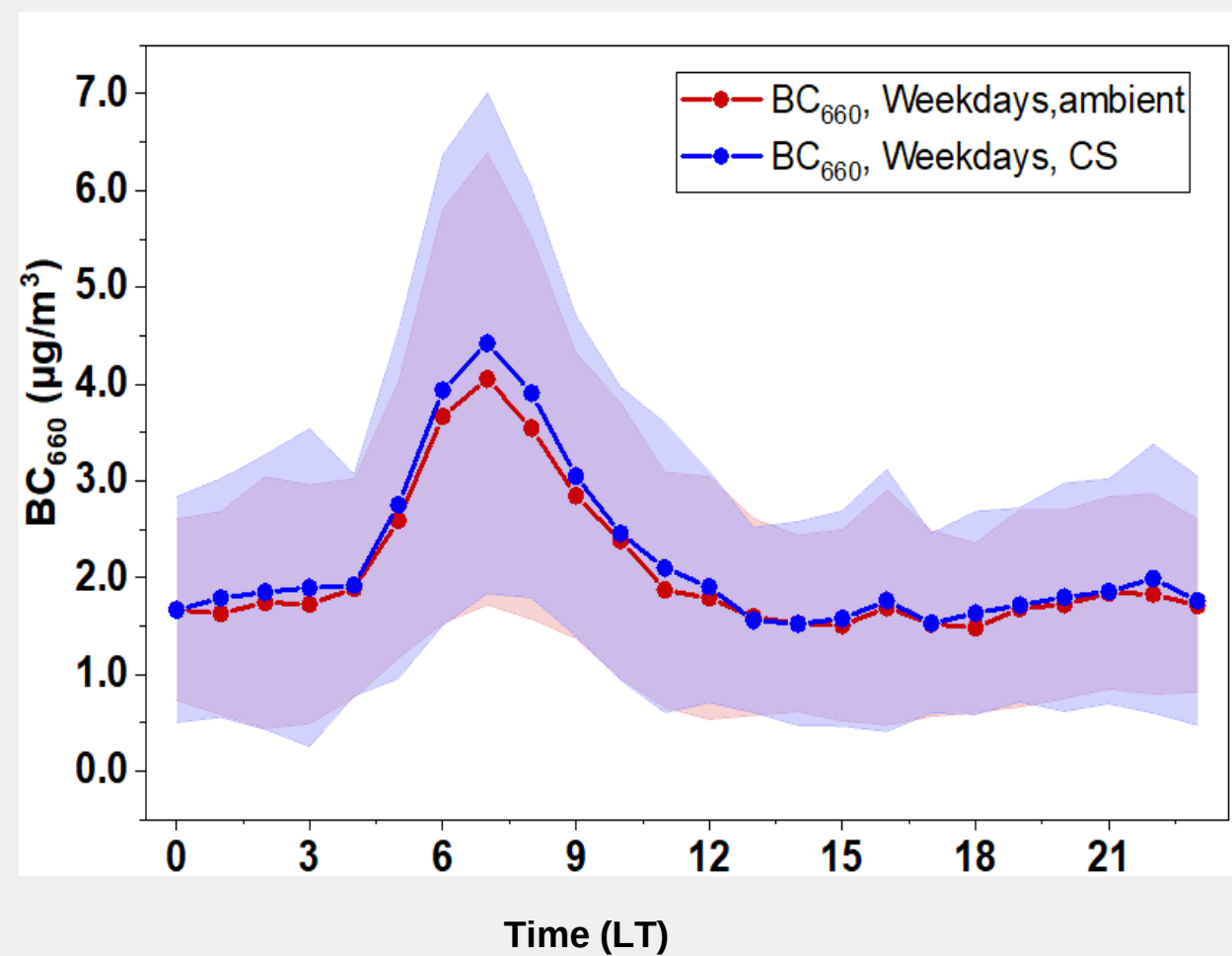


Size Distribution of Solid and Ambient Particle Conc.

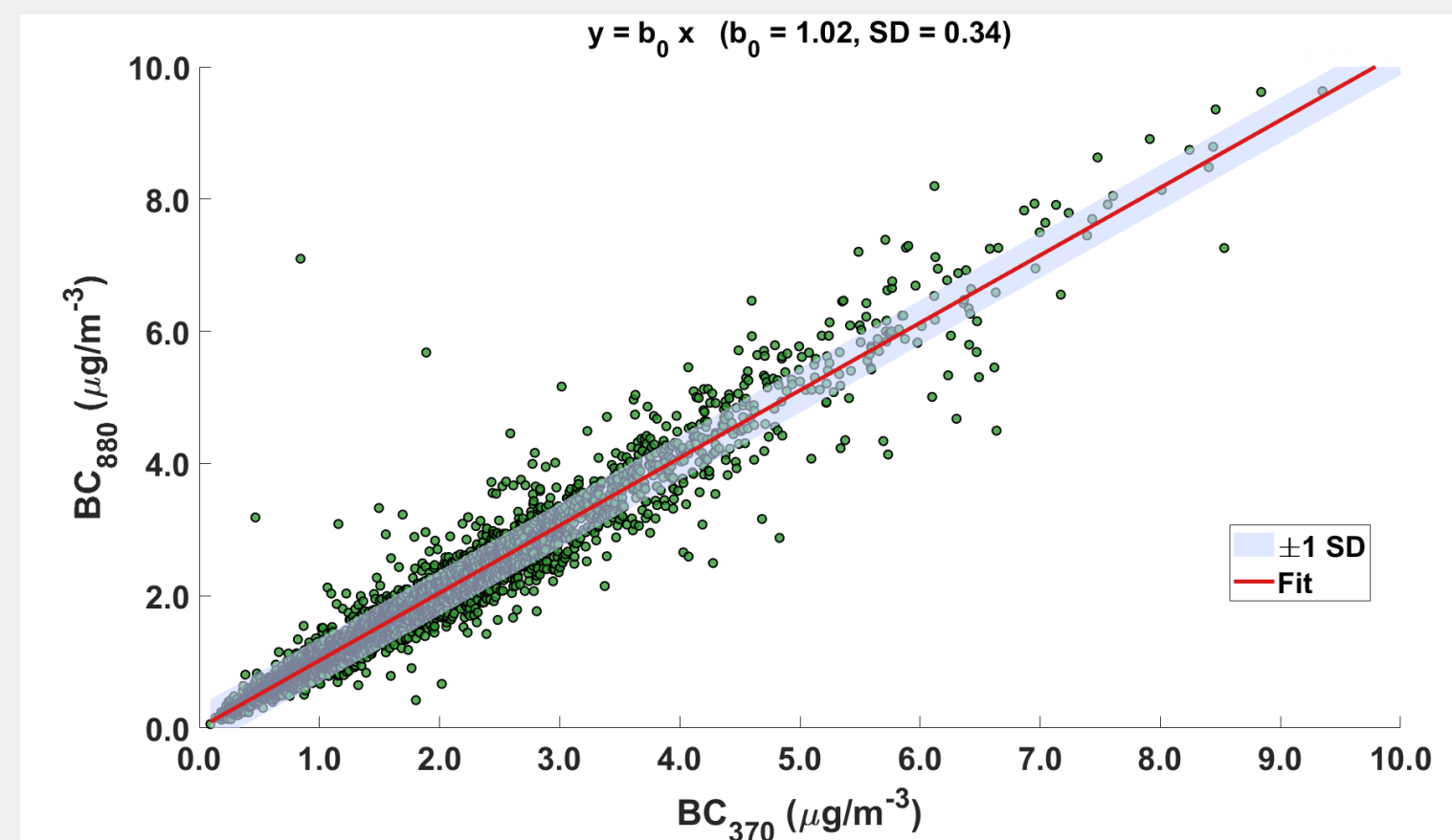


Preliminary Results from Athens

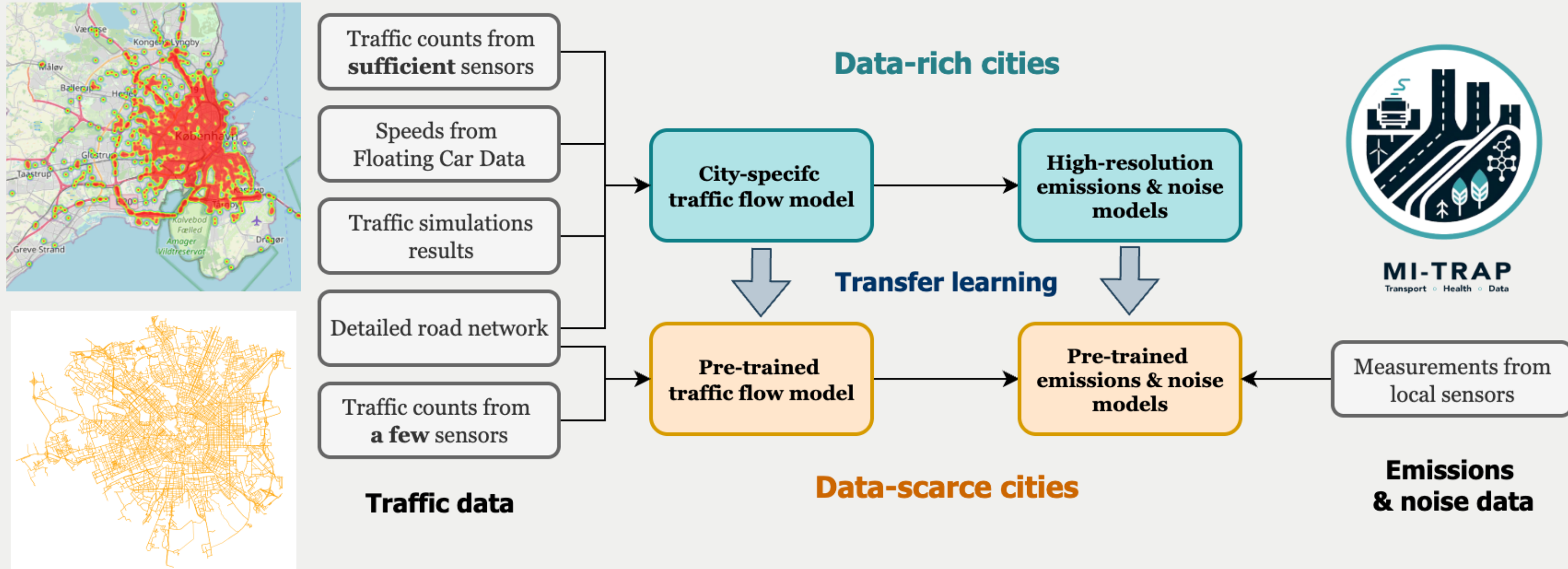
Diurnal Variability of Black Carbon Conc.



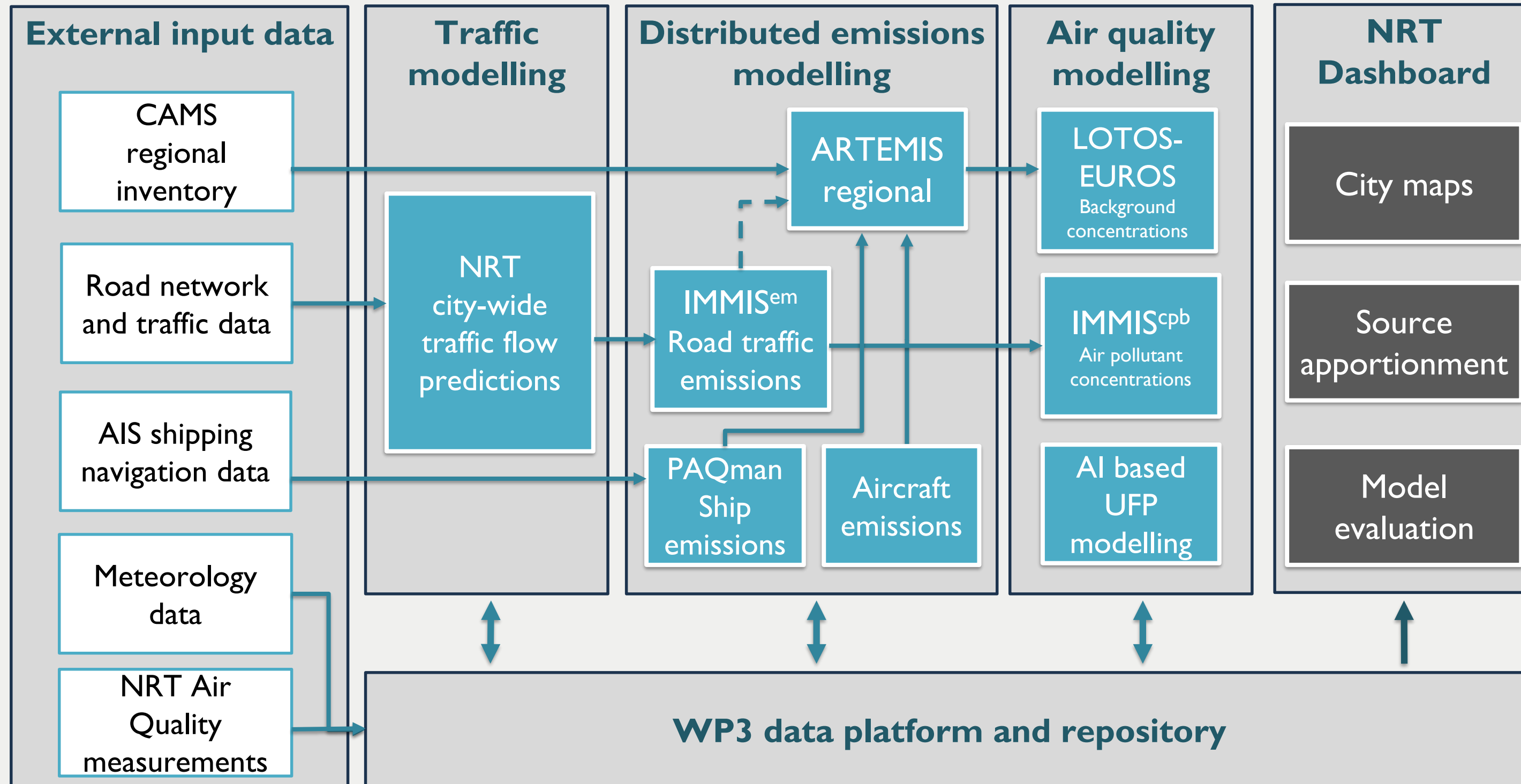
No Wavelength Variability for Black Carbon



Modelling Scope: To develop and extrapolate traffic, air quality and noise models to all 10 pilot cities using transfer learning



System Design for detailed Air Quality modelling in Copenhagen, Athens and Lisbon



Summary and Future Steps



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- NRT Dashboard is under development for Observations and Modelling
- Air Quality Metrics and Third Level products can be derived for Long term Policy Making
- MI-TRAP Tools and Data products can be successfully integrated in long term Monitoring Solutions for Horthpots

Thank you!



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