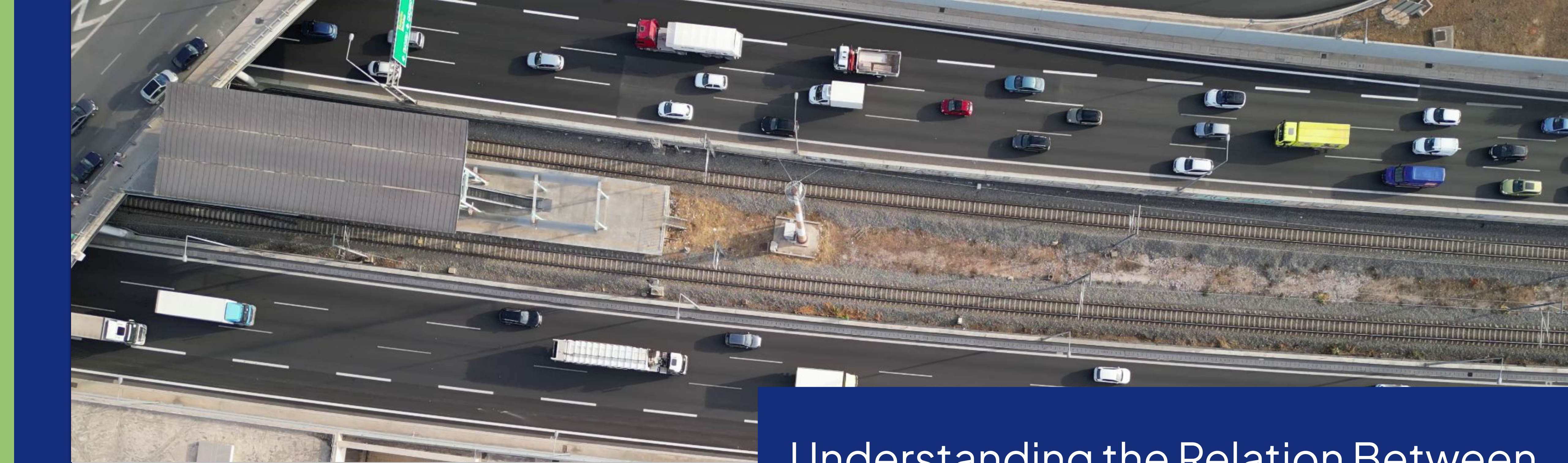




Understanding the Relation Between Traffic and Noise in Urban Motorways Using UAVs and Low-Cost Sensors

NoiseModelling Days 2025



MOBILYSIS

Oriol Pascual Anglès
Research Engineer



Who are we?

- MobiLysis is an EPFL spin-off
- 2 years in operations
- Drones and computer vision for high-quality data and analysis
- Partnering in 4 European projects
- Traffic management optimization framework with transport-related emissions



DELPHI project has received funding under grant agreement No 101104263. It is funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them. This work has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI



Co-funded by the
European Union



Previous experience

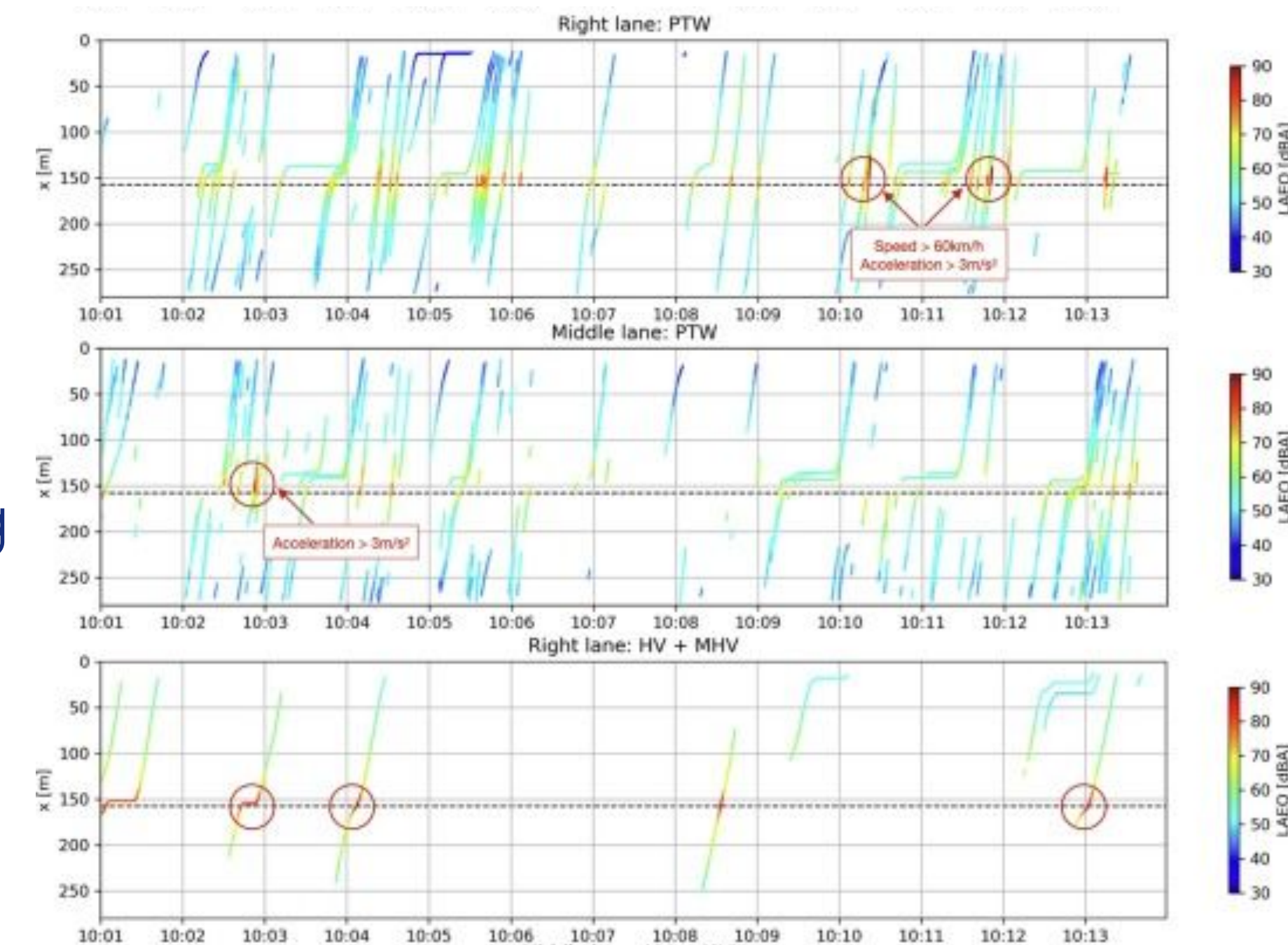
- We have successfully studied the relation between vehicle emissions and traffic dynamics.

- CO₂ emissions using the MOVES microscopic model

Barpounakis, E., Montesinos-Ferrer, M., Gonzales, E. J., and Geroliminis, N. Empirical Investigation of the Emission-Macroscopic Fundamental Diagram. Transportation Research Part D: Transport and Environment, Vol. 101, 2021, p. 103090.

- Noise emissions using the CNOSSOS model and NoiseModelling

Espadaler-Clapés, J., Barpounakis, E., and Geroliminis, N. Traffic congestion and noise emissions with detailed vehicle trajectories from UAVs. Transportation Research Part D: Transport and Environment, Vol. 121, 2023, p. 103822.

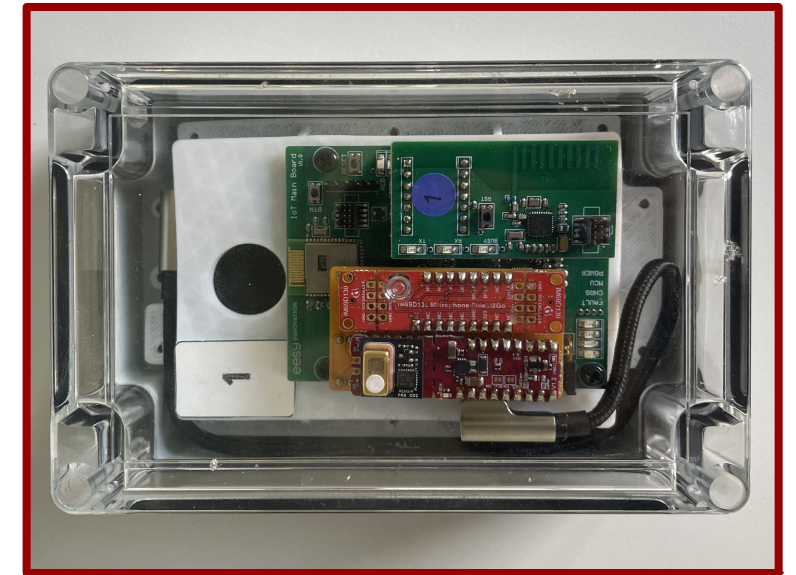


The study area

- 2-day data collection in an urban highway in Athens
- Drone flights simultaneous with noise recordings
- Low-cost sensors installed in the toll station
- Challenging environment

CO₂ and noise sensor

Infineon
IM69D130

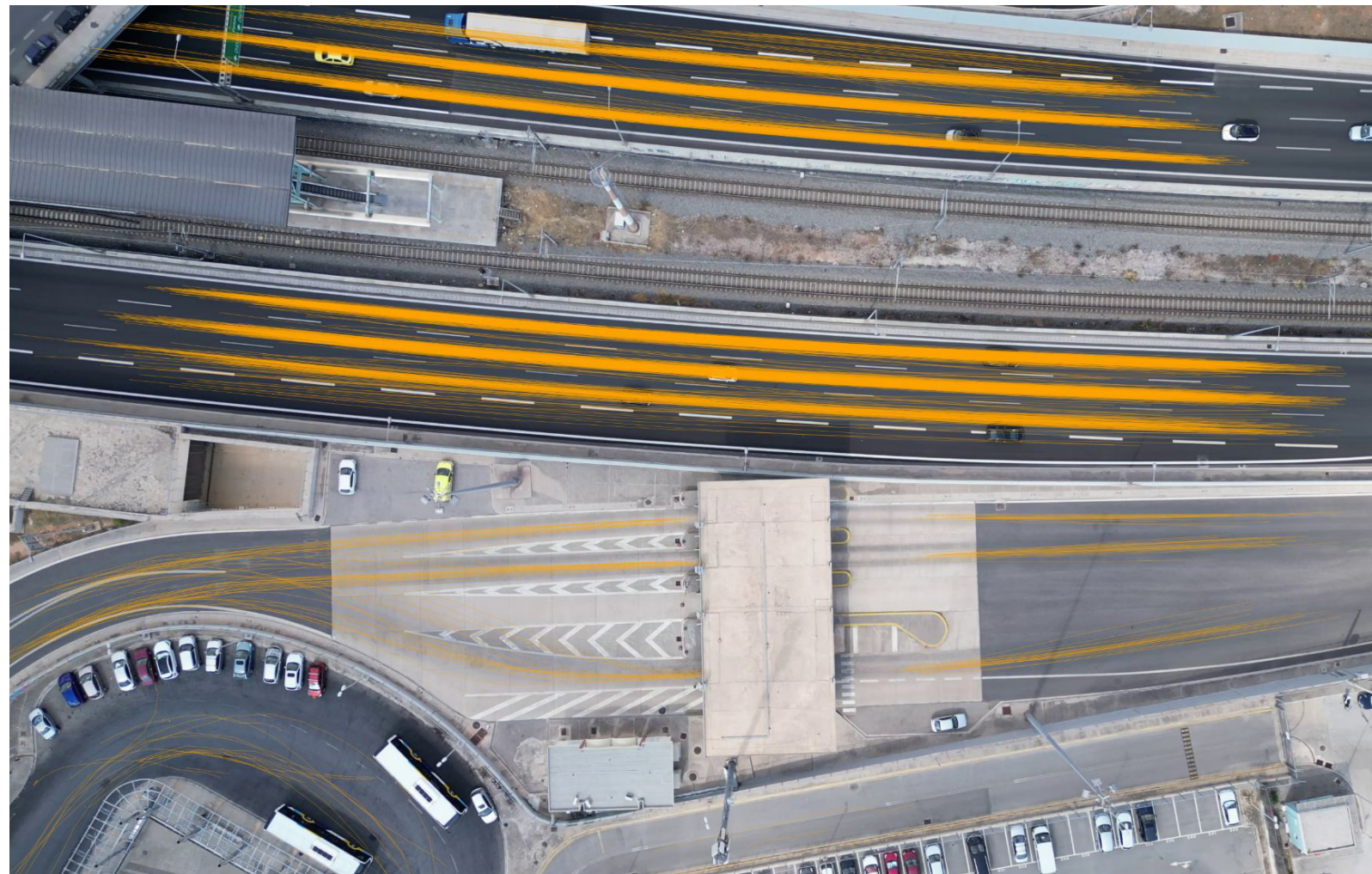


Microphone



The data

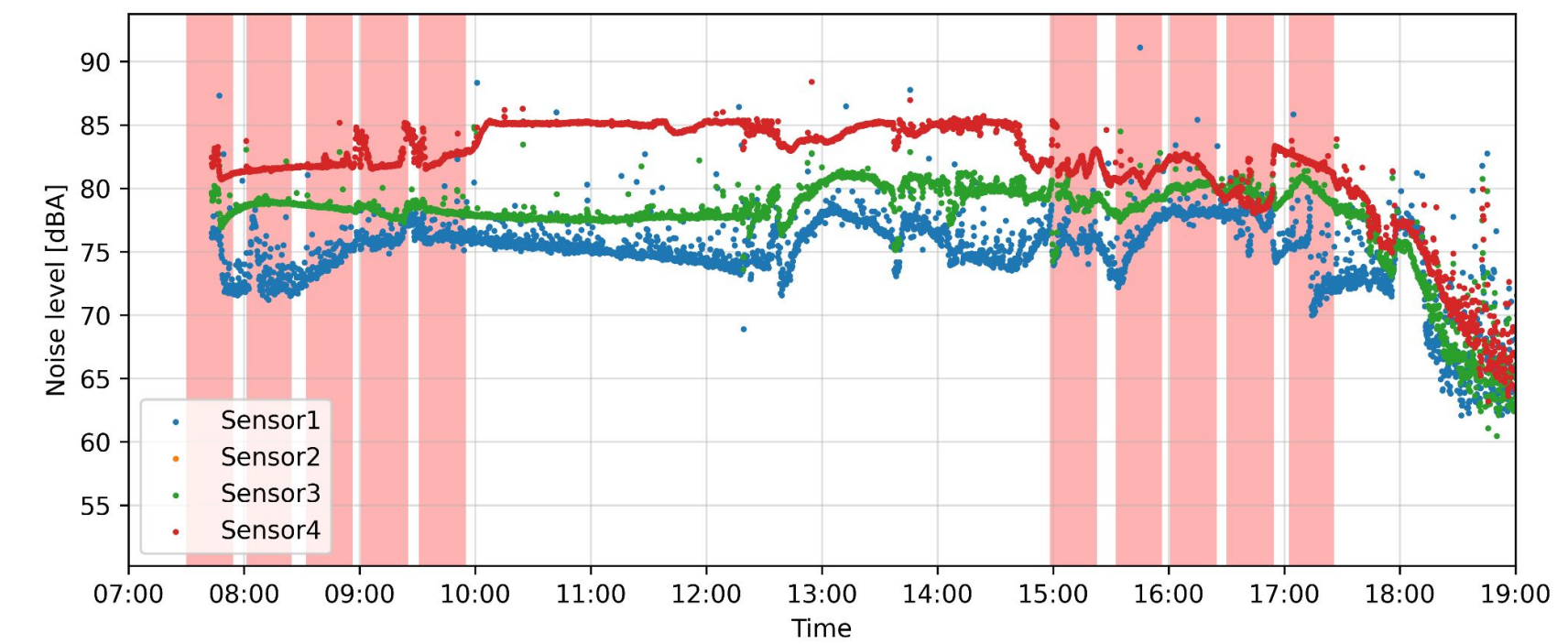
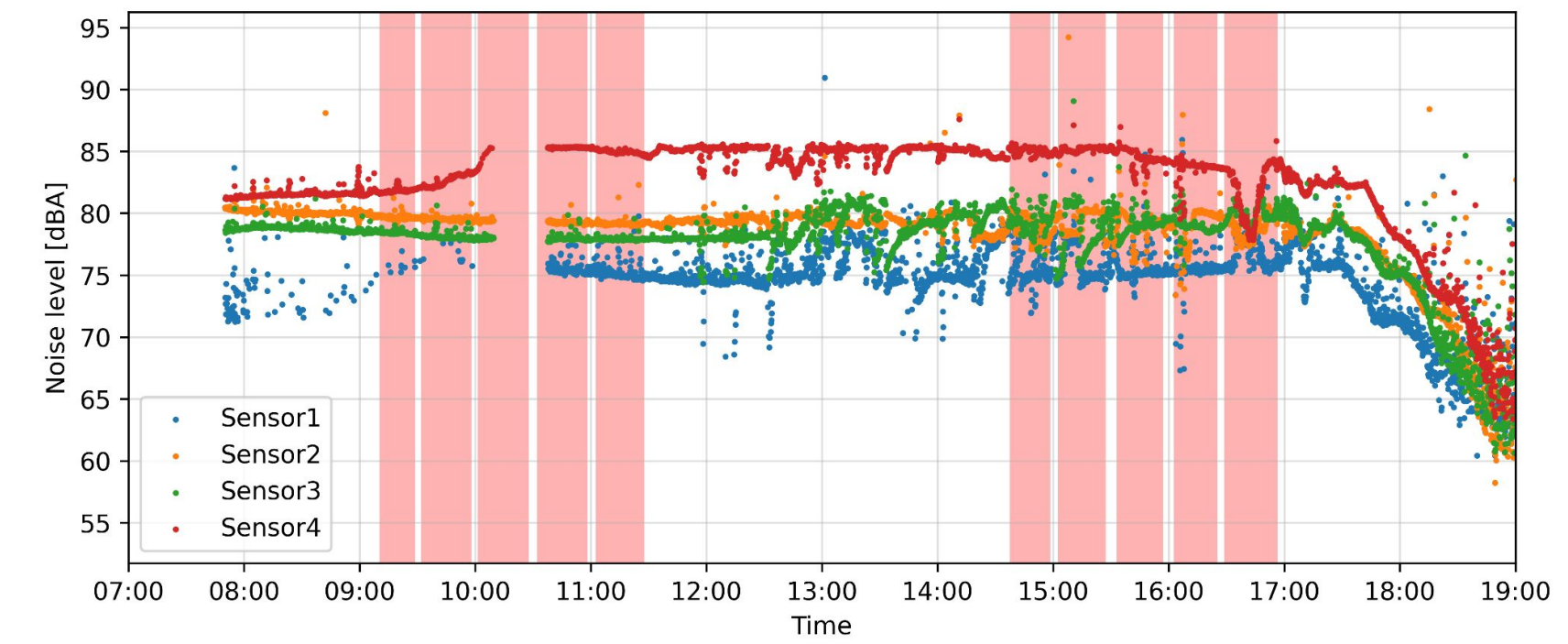
Vehicle trajectories



CNOSSOS-EU + NoiseModelling

Noise estimates

vs.

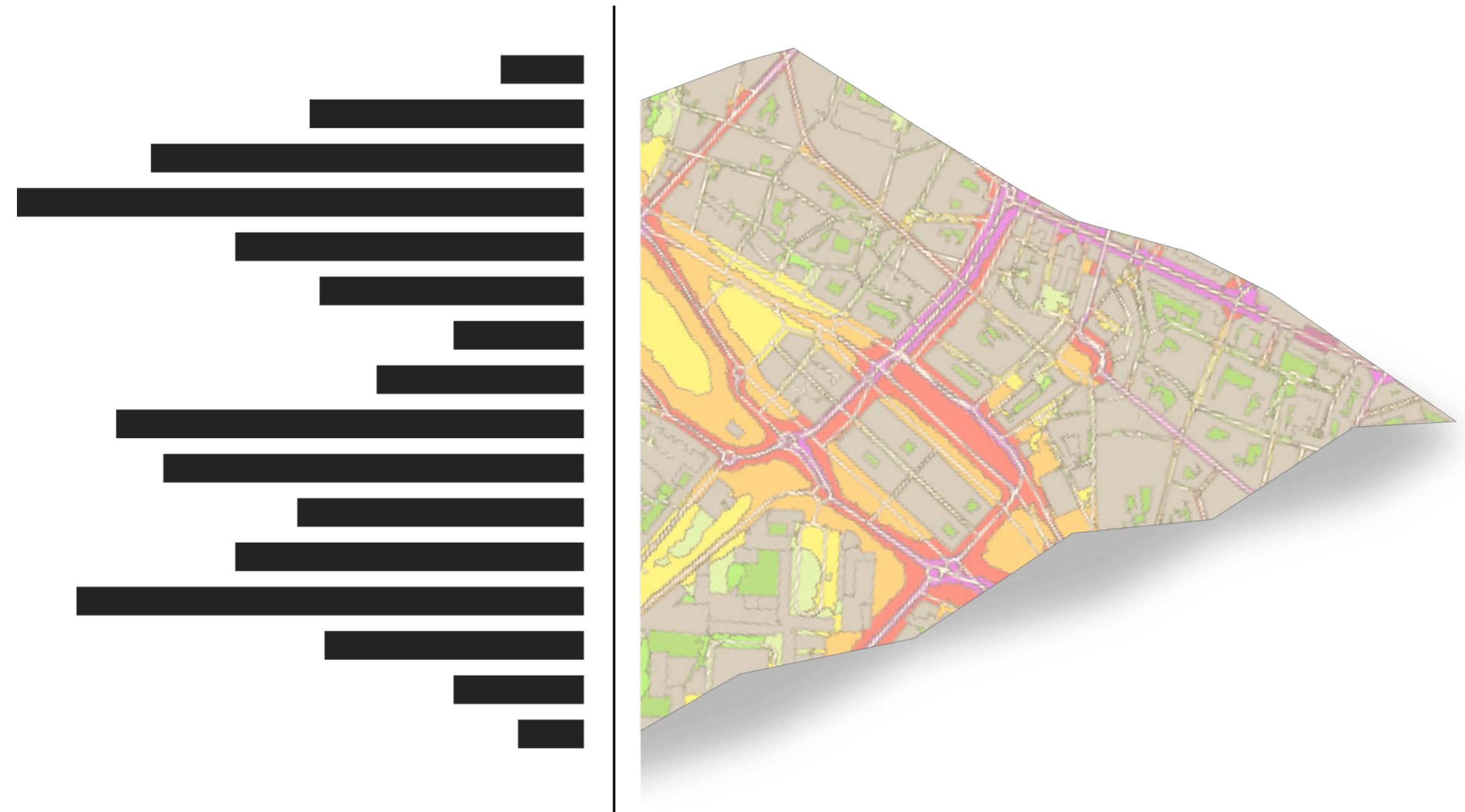


Noise measurements

NoiseModelling

v.4.0.0

Noise propagation simulation using
second-by-second individual sound power level
estimations

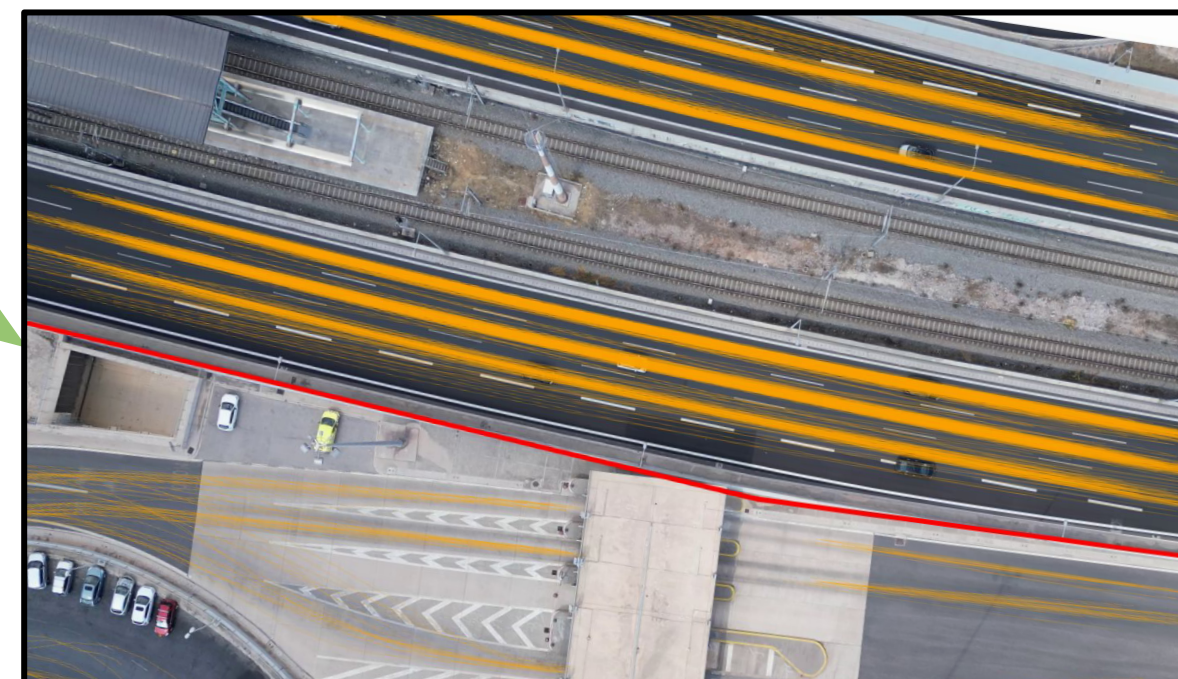


Inputs to NoiseModelling

Representation of the environment:

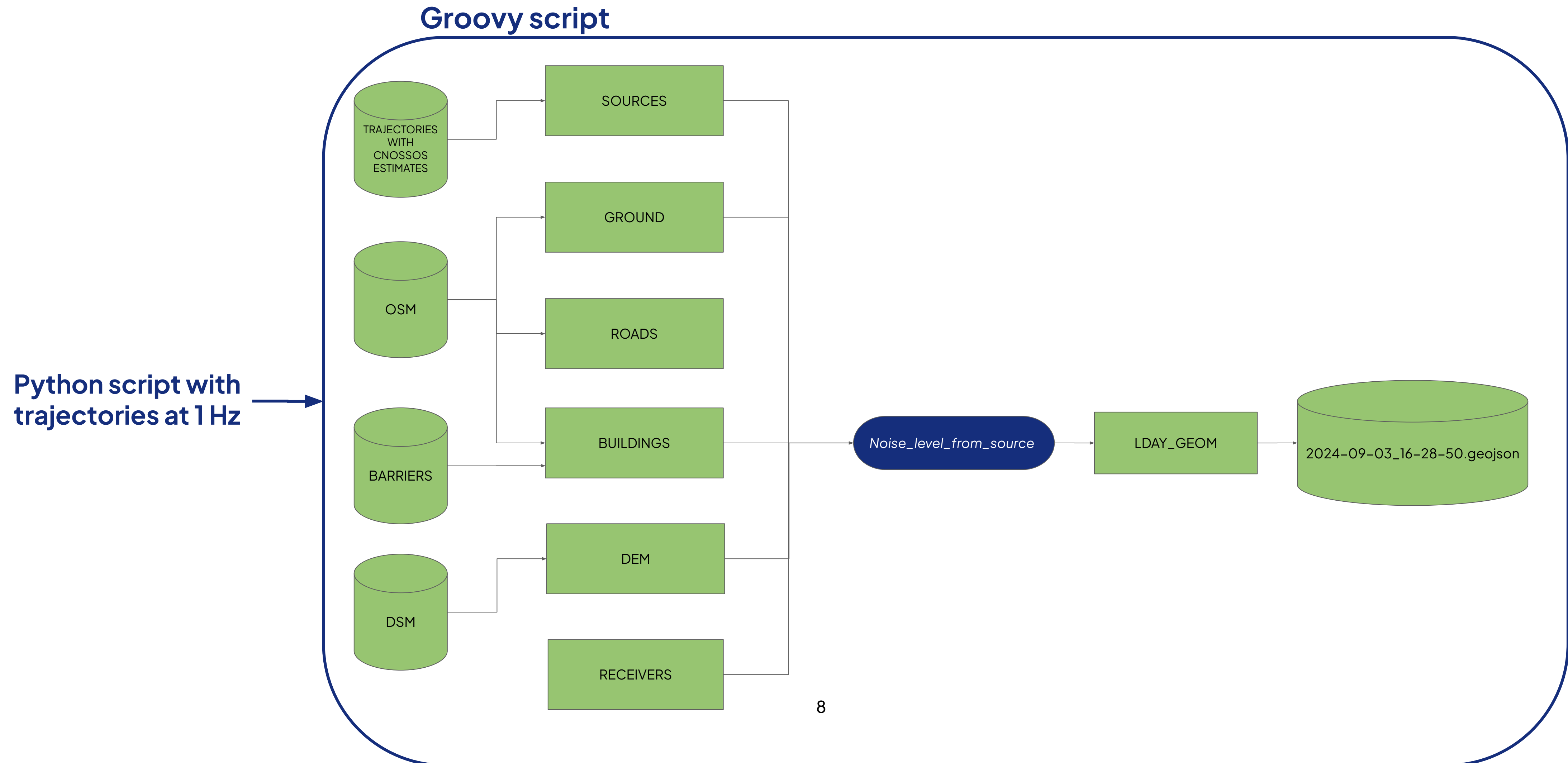


0.5 m²
Digital Surface Model
(DSM)



0.8 m x 0.3 m
Two manual barriers on
the table BUILDINGS

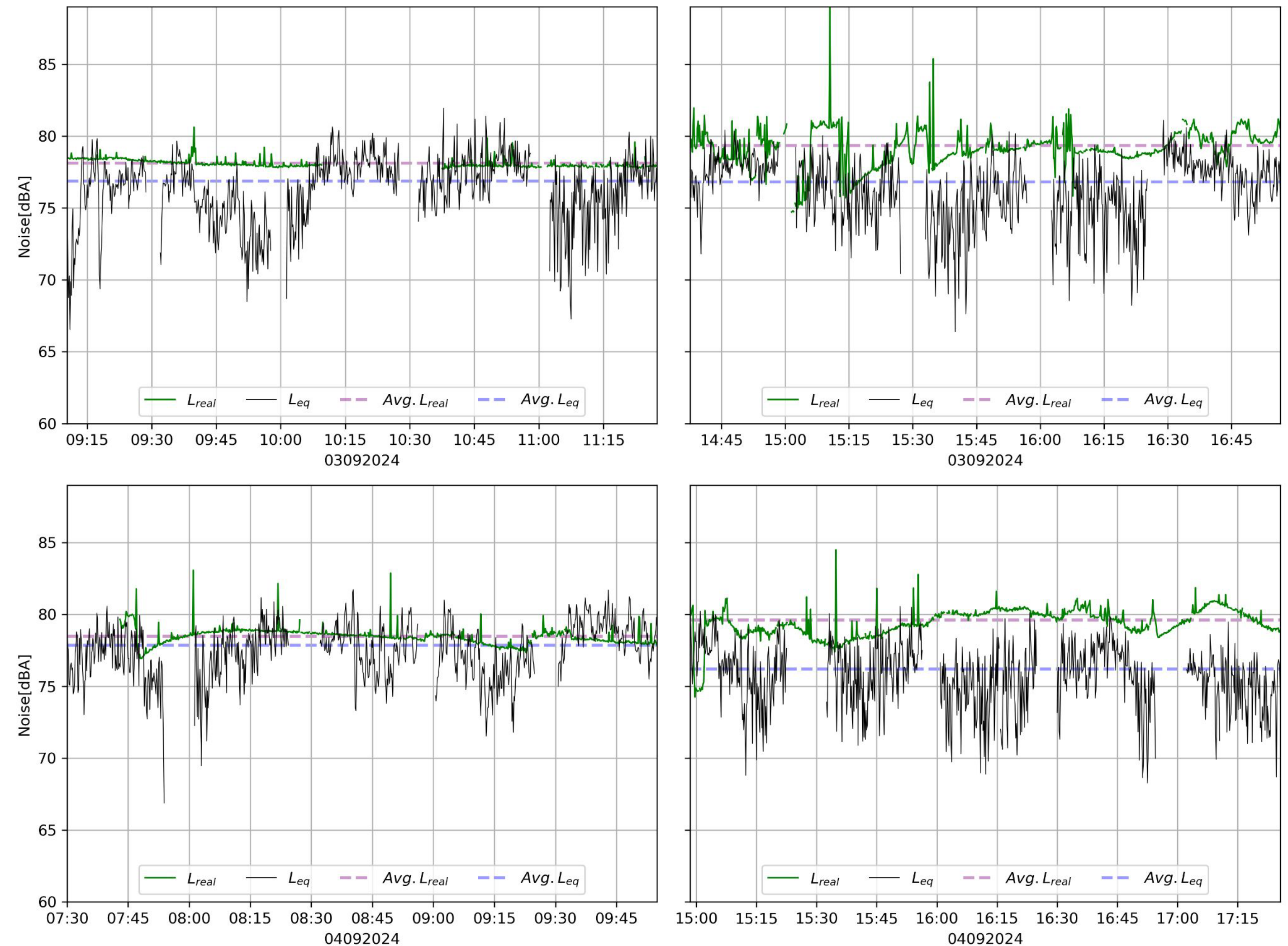
NoiseModelling pipeline



Results

Received volumes at the sensor

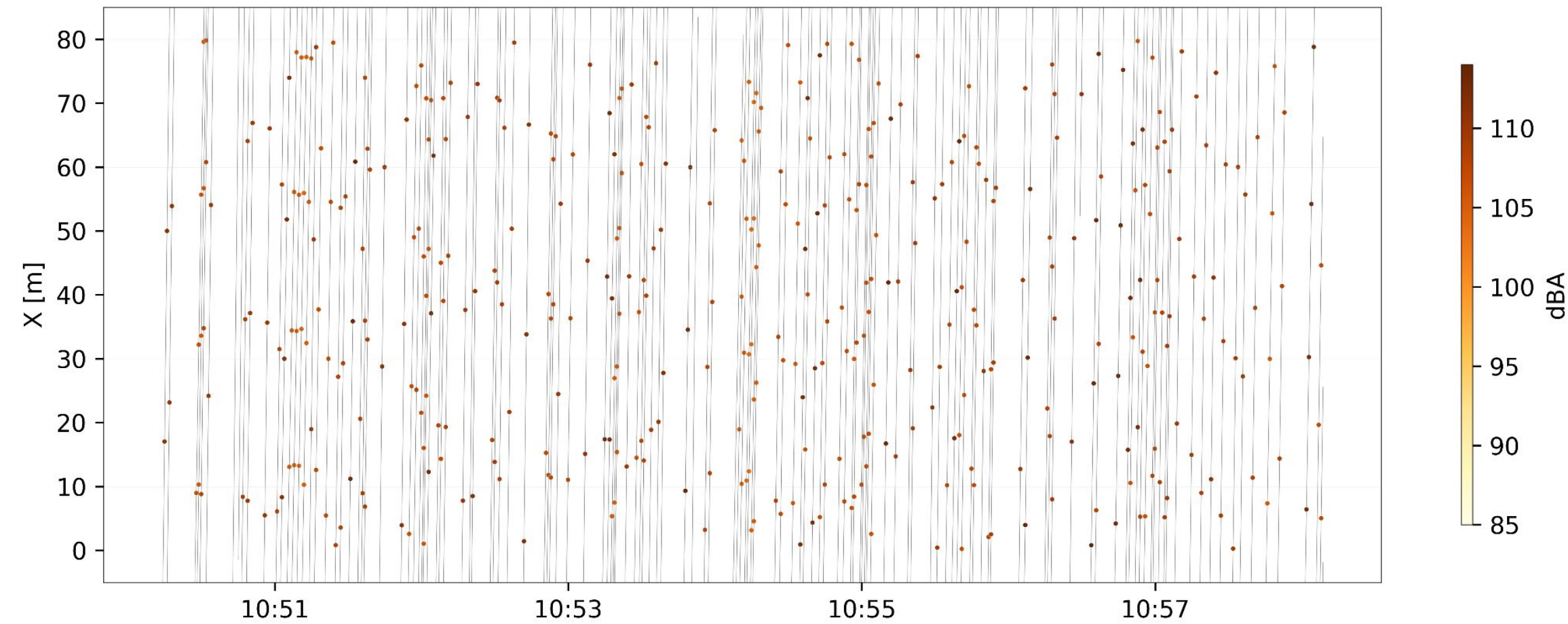
Mean Absolute Error: 2.85 dB
Mean Percentage Error: 3.15 %



Results

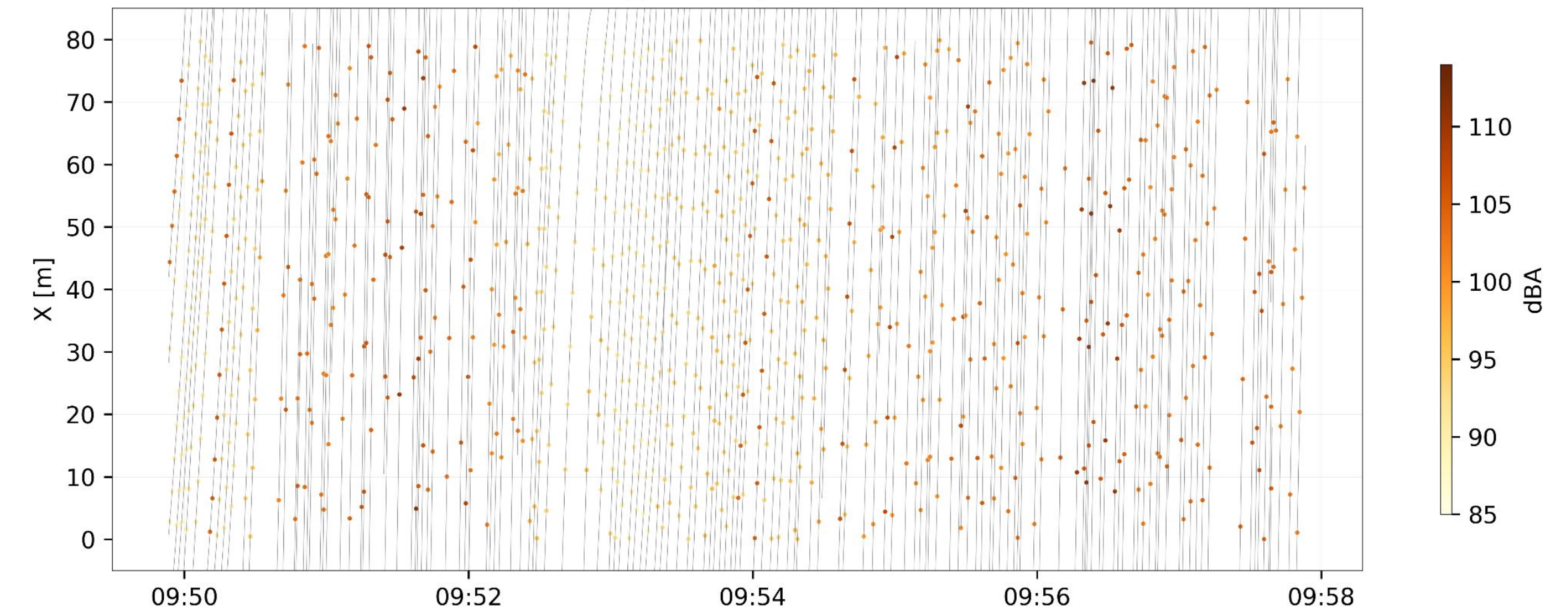
Free-flow

93.08 km/h - 108.96 dBA



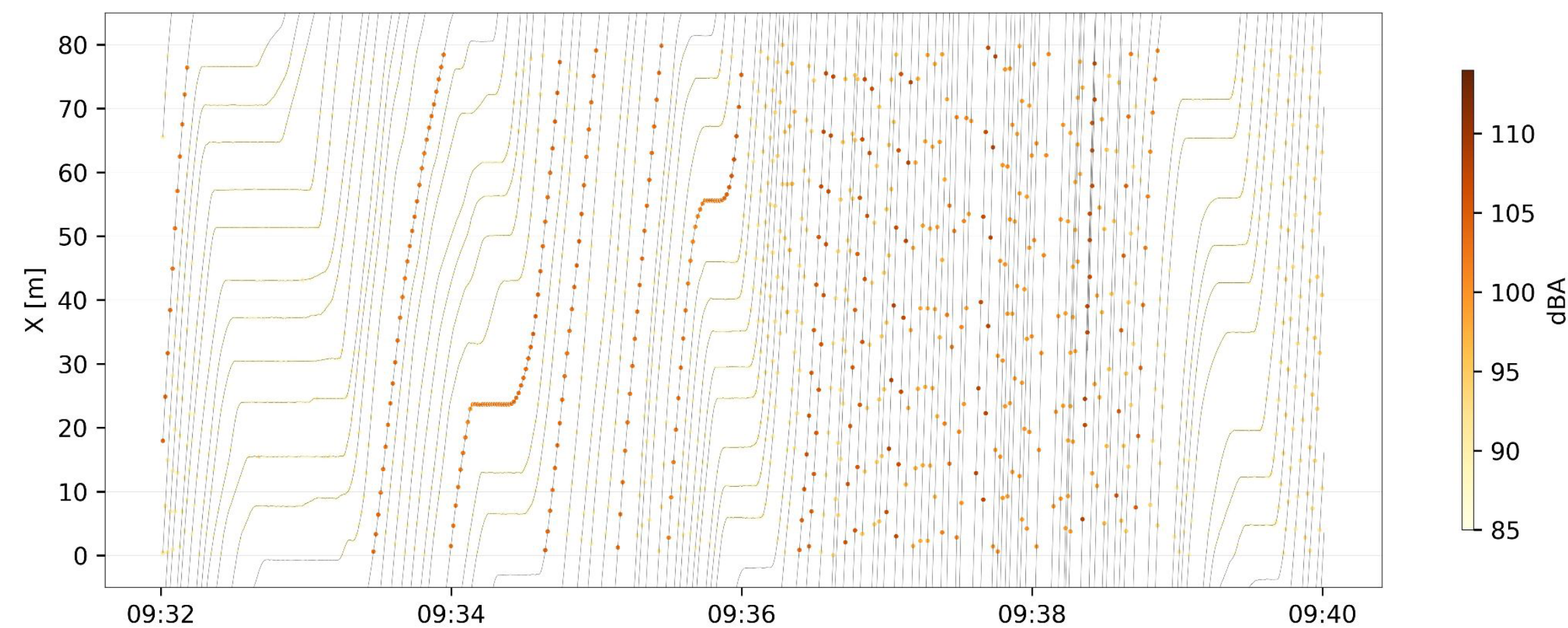
Steady speed

48.24 km/h - 101.16 dBA

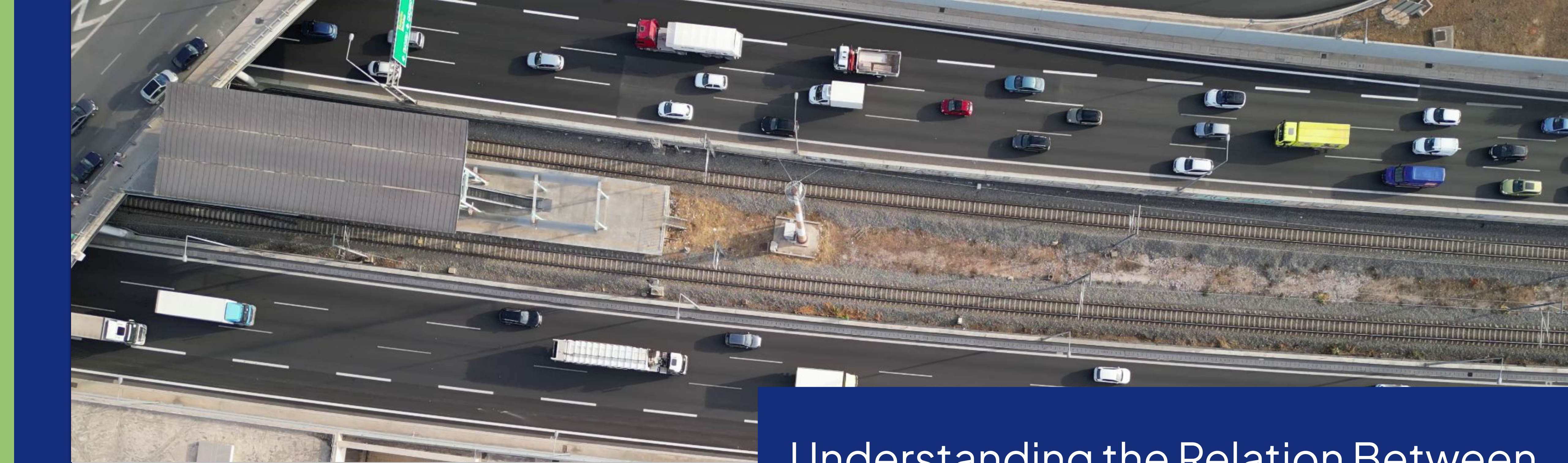


Congested

12.65 km/h - 95.69 dBA



- Time-space diagrams with estimates allows to understand emissions at microscopic level.
- Individual sound power level depends greatly on instant speed.



Understanding the Relation Between Traffic and Noise in Urban Motorways Using UAVs and Low-Cost Sensors

NoiseModelling Days 2025



MOBILYSIS

Oriol Pascual Anglès
Research Engineer

