

Couplages trafic / acoustique

Séminaire de transfert COP-JTAV 2021

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Cité Végétale / Collection Luc Schuiten

Contexte

Urbanisation
croissante



Augmentation
mobilité



Nuisances
environnementales

Static modelling

Static

*Traffic
Input data
($Q, V, \%_{PL}$)*

Noise emission model

Sound propagation calculation

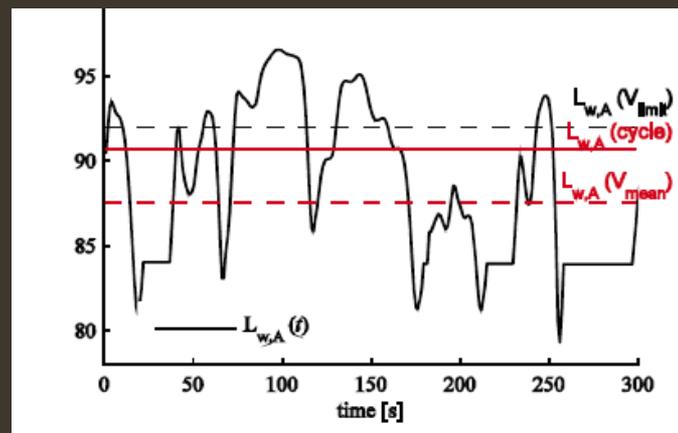
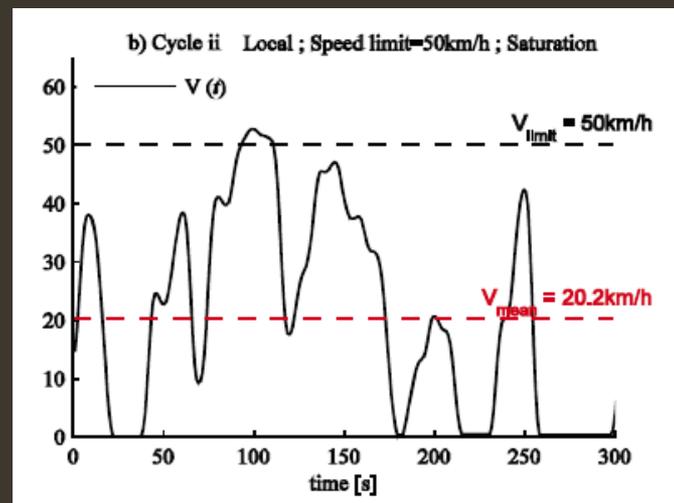


Static modelling - Limitations

Traffic
Input data
($Q, V, \%PL$)

Noise emission model

Sound propagation calculation

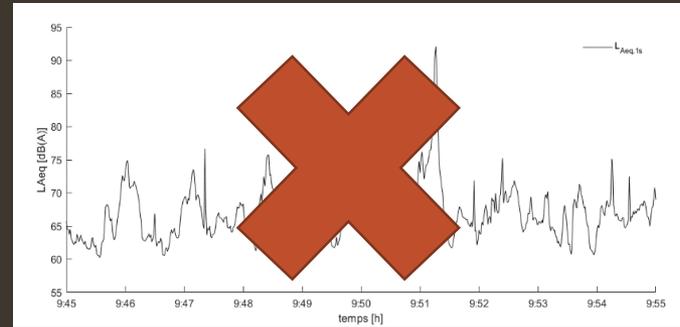


Static modelling - Limitations

*Traffic
Input data
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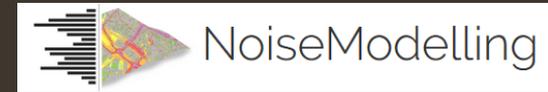
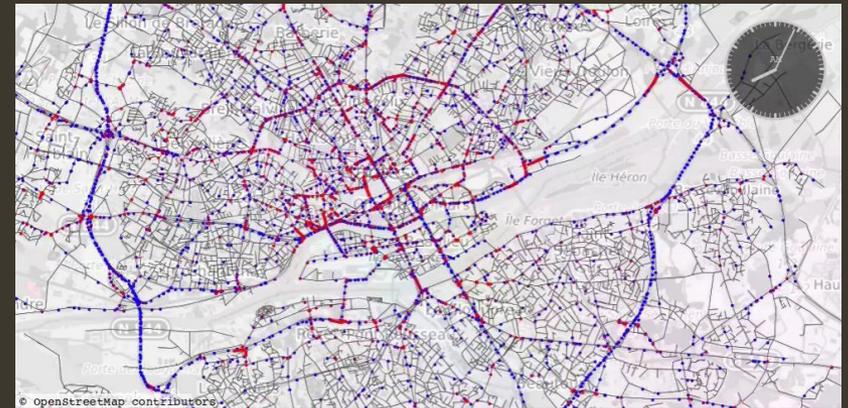


*Misses noise
dynamics*



*Misses traffic
dynamics*

Coupling with Noisemodelling



Zoom on traffic modeling SYMUVIA



Zoom on traffic modeling

MATSim



Comparison of both approaches

SYMUVIA

Open-Source

Agent = driver

Focuses on assignment and traffic flow

Neighborhood scale

Local traffic

Microscopic modeling

Local traffic strategies,
Specific noise indicators



MATSim

Open-Source

Agent = city-dweller with social attributes

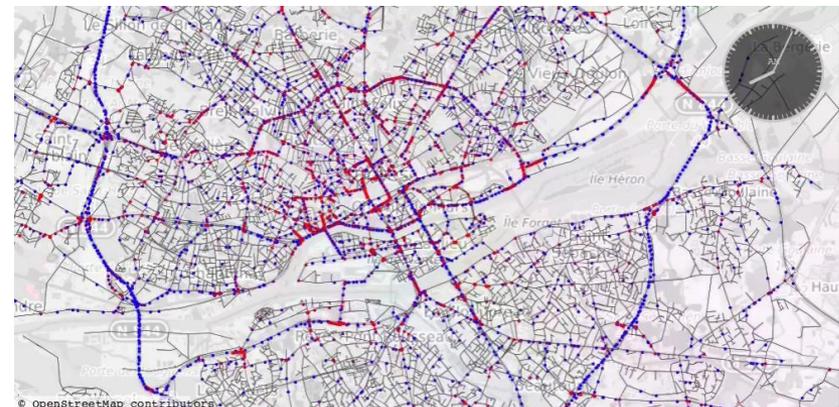
Focuses on activity

Urban scale

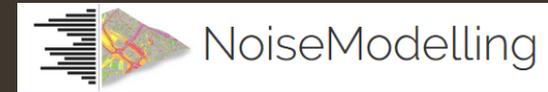
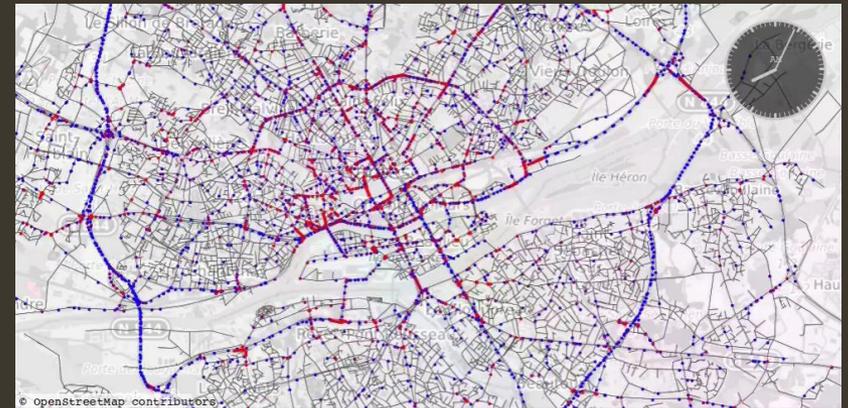
Mesoscopic modeling

Mesoscopic modeling

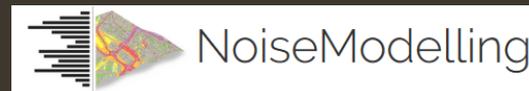
Environmental justice,
city-scale strategies,
Dynamic exposure



Coupling with Noisemodelling



SYMUVIA / Noisemodelling

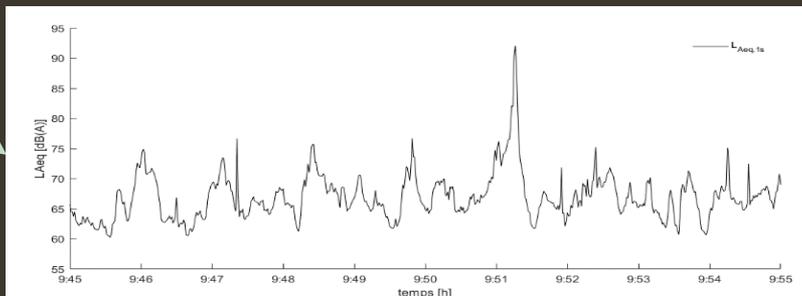


From Static to Dynamic modelling



Noise emission model

Sound propagation calculation



Advanced indicators:

- Statistical indicators
- Number of events
- Noise rhythm

From Static to Dynamic modelling



Noise emission model

Sound propagation calculation



Accounts for traffic dynamics

- Traffic assignment
- Changes in vehicle kinematics



*Successes in
decision making?*

From Static to Dynamic modelling



Noise emission model

Sound propagation calculation



Airborne pollutants,
consumptions

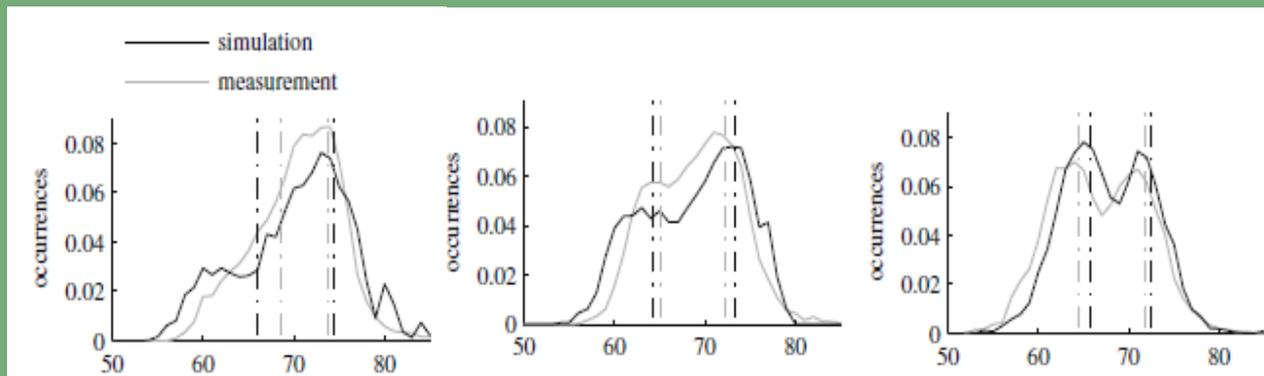


Multicriteria analysis

Dynamic modelling

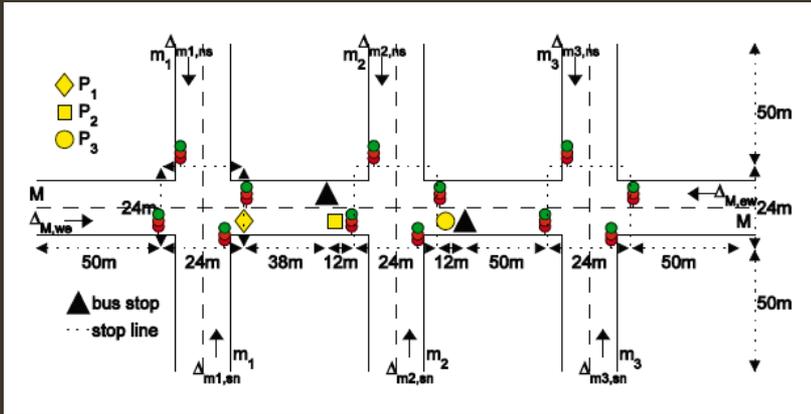
Experimental validation

- Ghent University
- Guandzhou University
- Université Gustave Eiffel

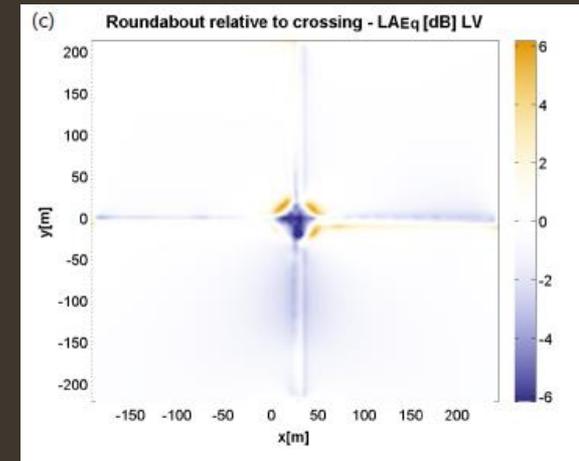


Dynamic modelling

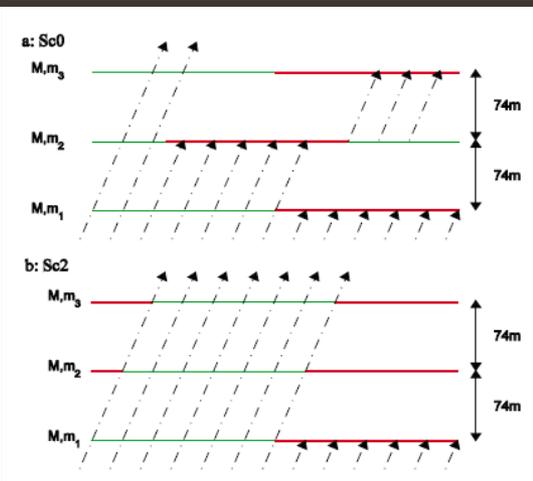
Case studies



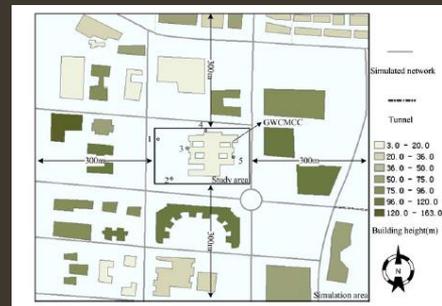
Li et al., 2017



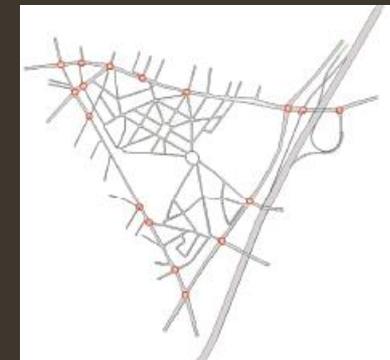
Estevez-Mauriz & Forssen, 2018.



Can et al., 2010.



Luo et al., 2012



ZOOM

SYMUVIA / NoiseModelling



PROCEEDINGS of the
23rd International Congress on Acoustics
9 to 13 September 2019 in Aachen, Germany

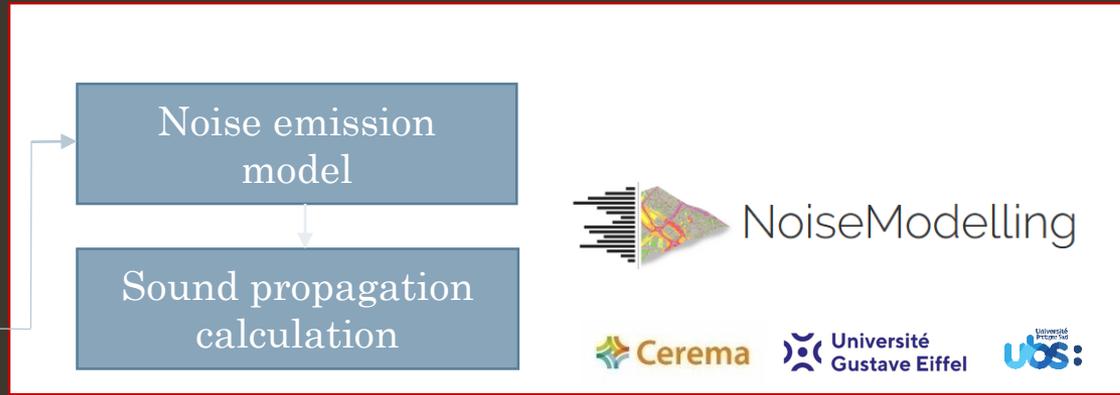
Dynamic approach for the study of the spatial impact of road traffic noise at peak hours

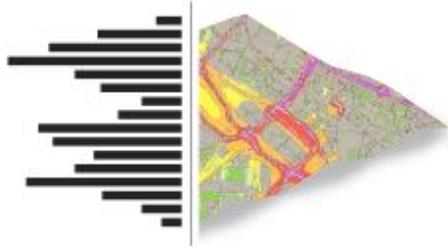
Arnaud CAN¹; Pierre AUMOND¹; Cécile BECARIE²; Ludovic LECLERCQ²

Dynamic modelling: Towards city scale evaluations



*Vehicle trajectories
(1s-position, speed, acceleration)*



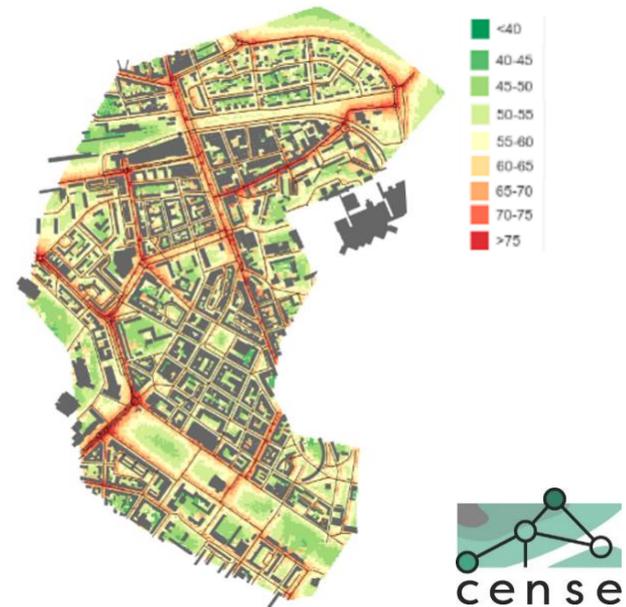


Noise Modelling

Free and Open-source tool for Noise Mapping



Ray Tracing

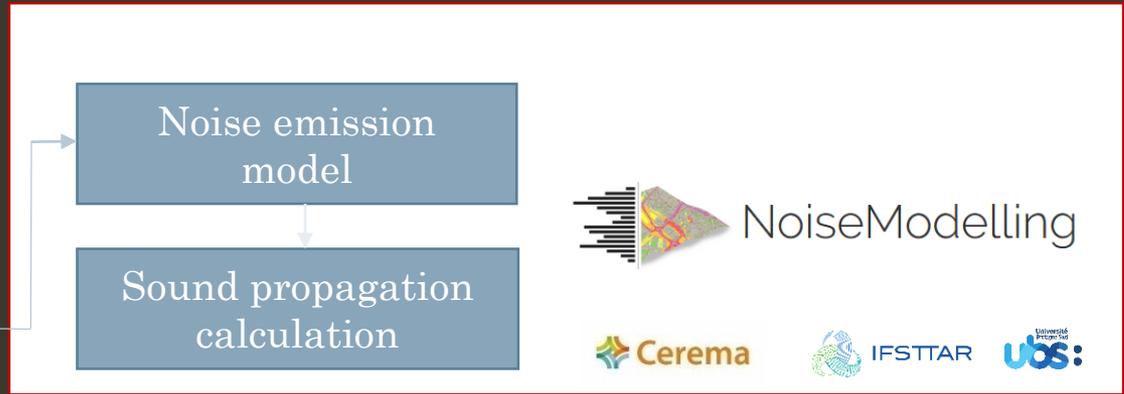


Noise mapping

Dynamic modelling: Towards city scale evaluations



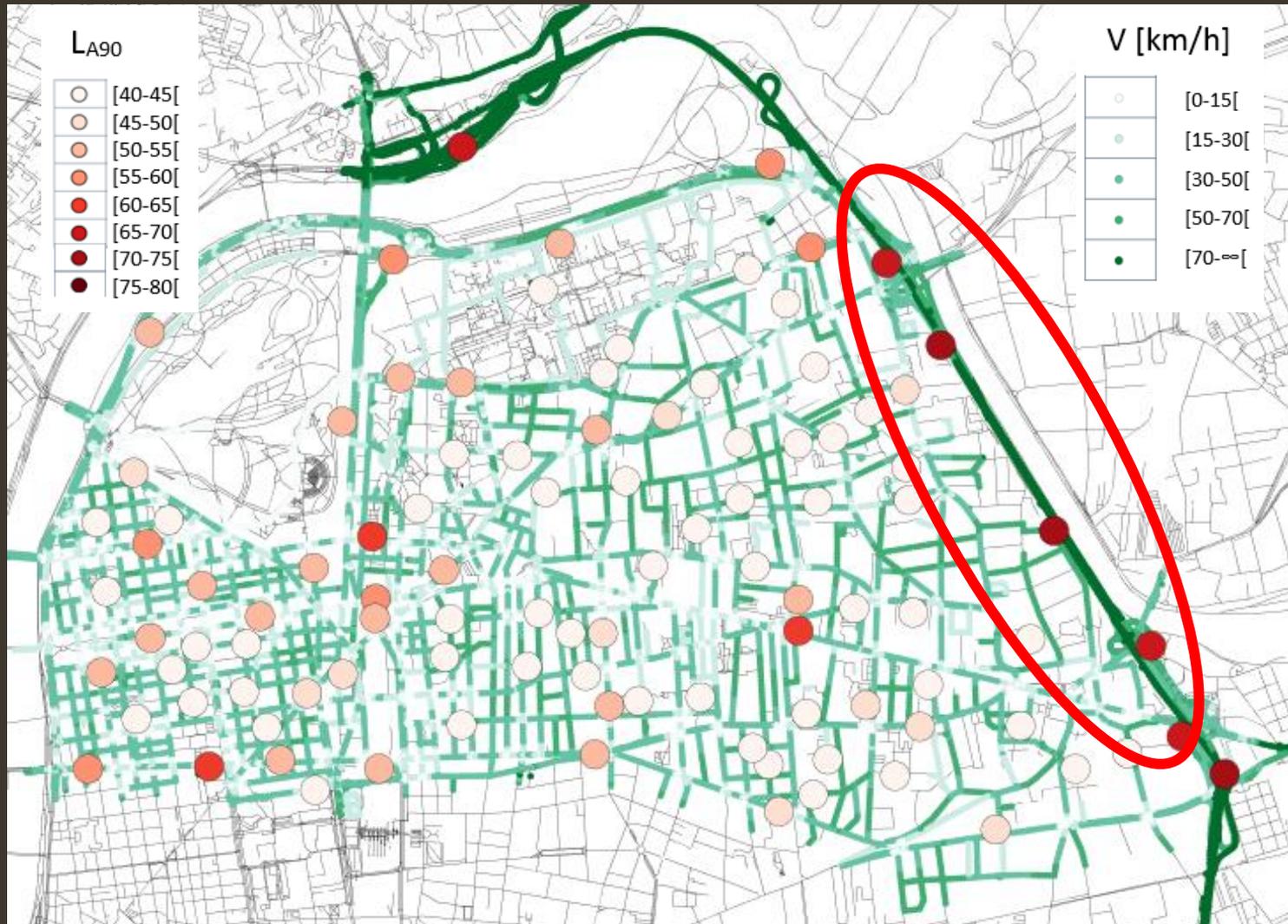
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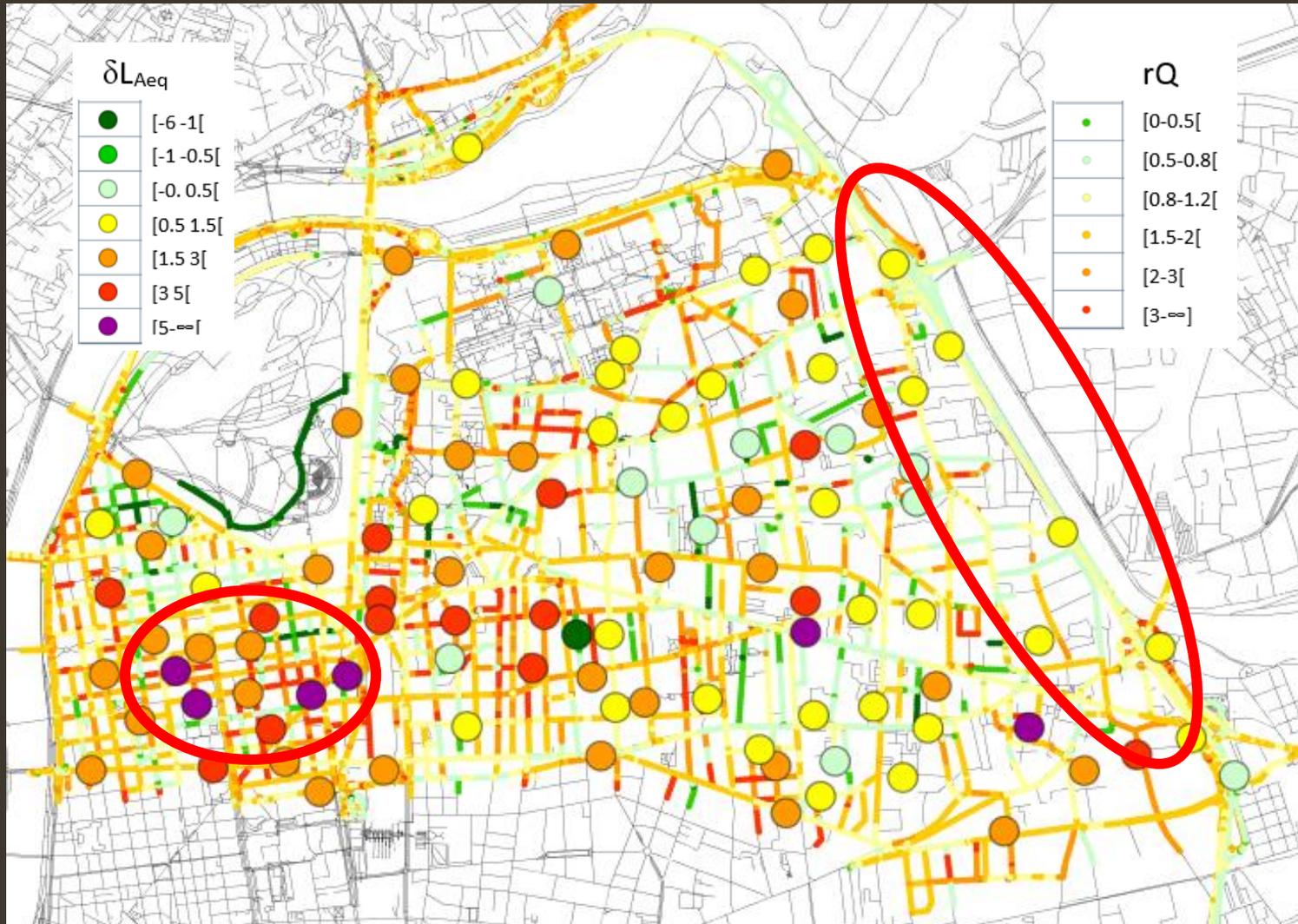
Period P_1 : Smooth Traffic



Period P_1 : Smooth Traffic



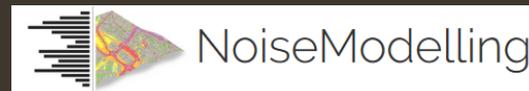
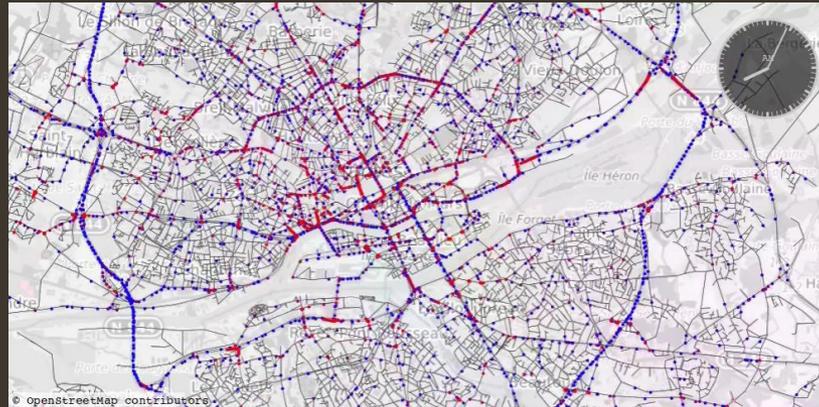
Period P_3 : Peak of travel demand



Zoom on acoustical results



MATSim / Noisemodelling



Multi-Agent Modeling

Exposition dynamique

Justice environnementale

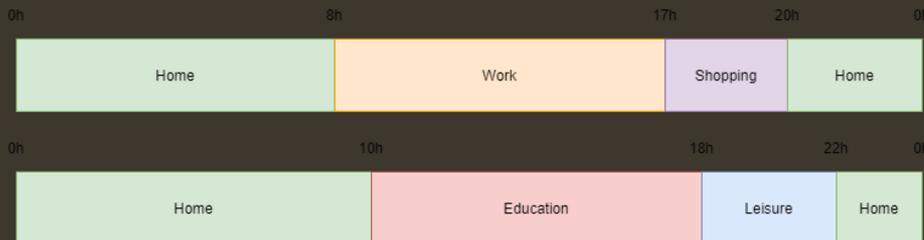
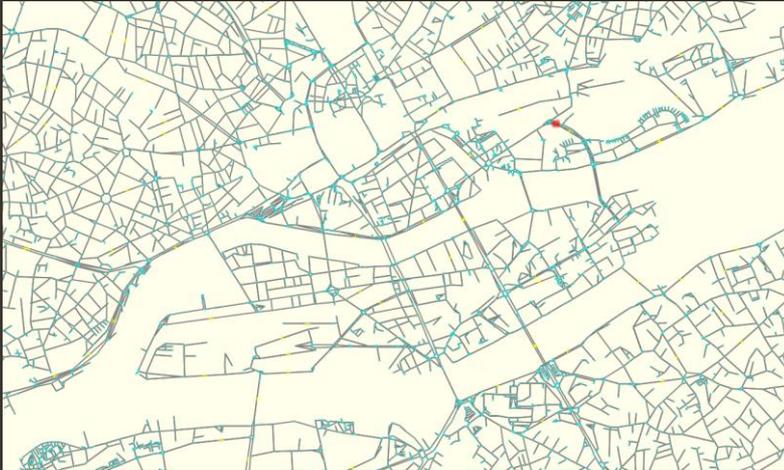
MATSim
Multi-Agent Transport Simulation



Multi-Agent Modeling

The Multi-Agent Transport Simulation

- Un réseau de routes
- Une liste d'agents



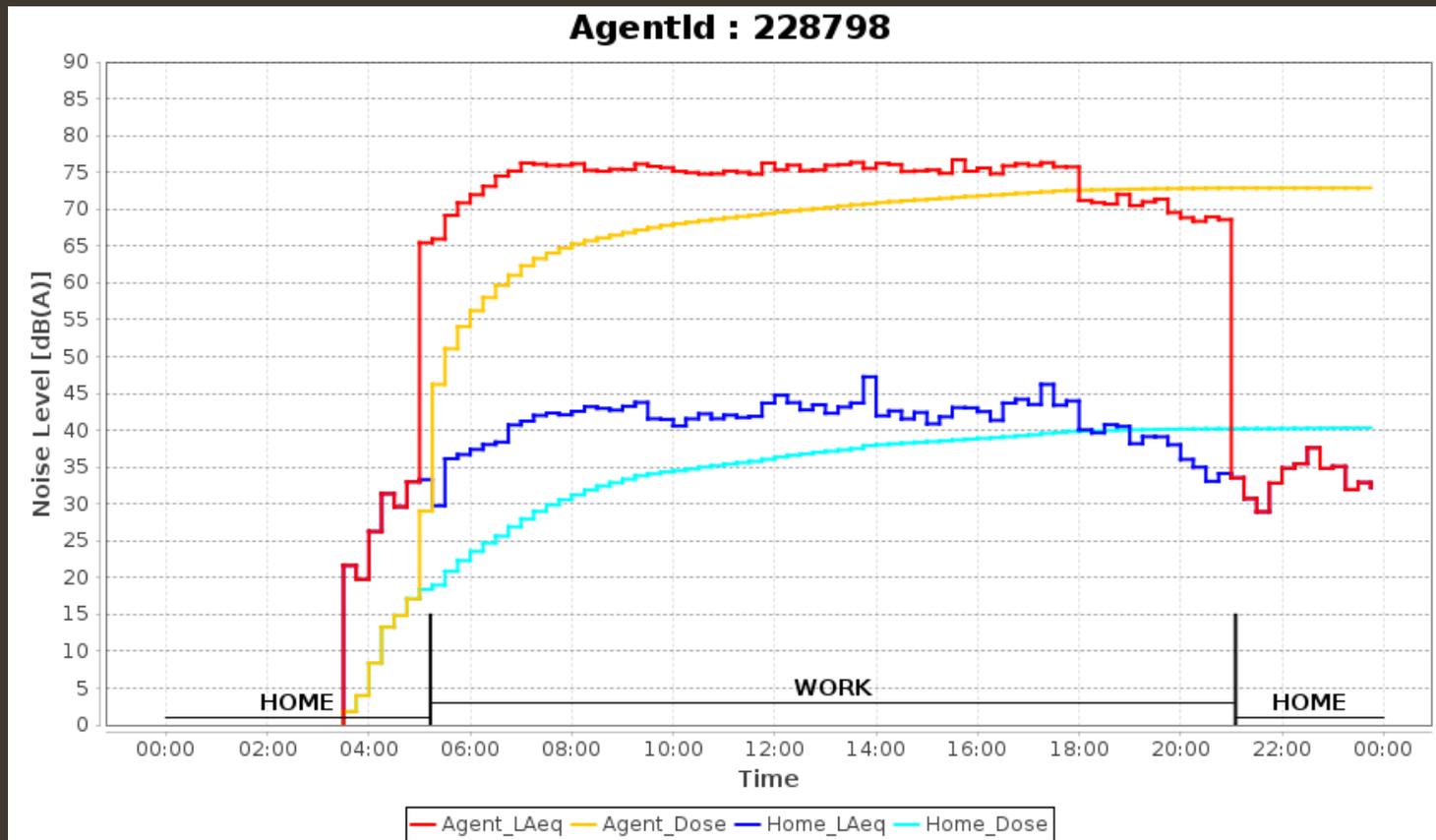
Nantes

Et, à 9h15 :



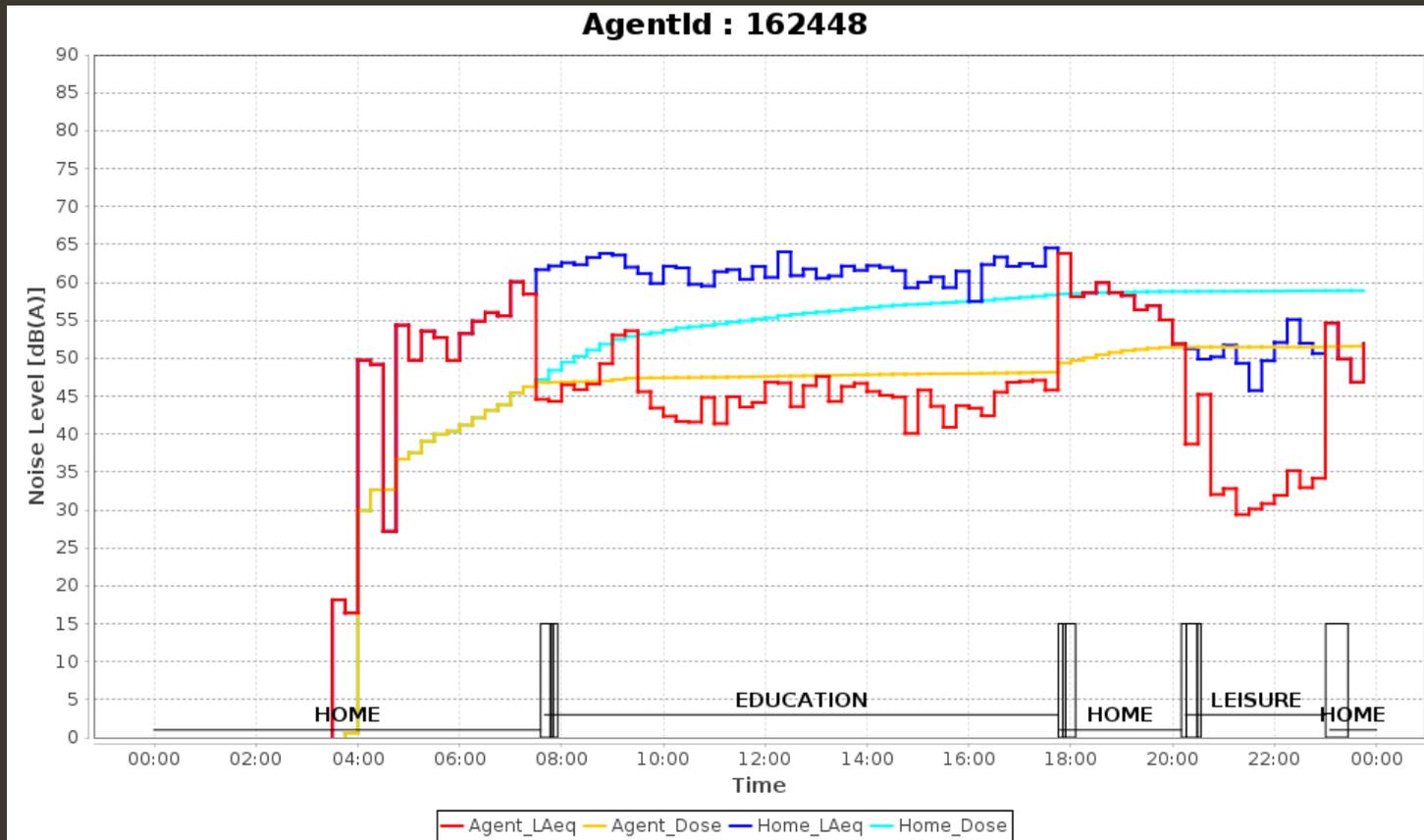
Nantes

Pour un agent travailleur :



Nantes

Pour un agent étudiant :



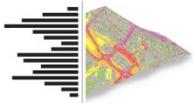
Thank you !

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**umr
ae**



Want to know more about Noise modelling ? :

On our website :

<http://noise-planet.org>

Dynamic modelling

Towards combined approaches

	Acoustics	Airborne pollutants	Consumptions
Health Impact	++ Quality of life decrease.	++ Morbidity related to exposure to air pollutants	+++ Consensus about the risk for global warming.
Spatial granularity	+++ Very fine: ideally about 10m.	++ Fine: however often the zones of interest are large.	+ Global. low interest towards the spatial repartition
Temporal granularity	+++ The temporal evolution of noise levels and noise peaks.	+ Limited influence.	- Long term balance sheets
Remanence	- No	++ Large	+++ Very large: Long term balance sheets
Indicators	Energetic indicators, stistic indicators, rhythm indicators, noise peaks	Average concentrations.	Global consumptions